

Teacher Guide



Watching
GLASS
Grow



SOUTH
AUSTRALIA



Government of
South Australia



Botanic Gardens
and State Herbarium

Challenge Course

MAKERS  EMPIRE

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Watching Glass Grow is a Challenge Course that will engage students in learning about how glass is made and ways that artists look to nature to inspire their artwork.

This free Challenge Course is suitable for years 3 – 6 and includes videos, quizzes and tutorials to help students build their knowledge and 3D design skills. Students are guided through a design thinking process to develop design solutions.

The Challenge Course culminates with a final design thinking challenge which invites students to design their own artwork inspired by nature, that could be 3D printed or even made from glass.

Highlights will form part of a public exhibit held at the Adelaide Botanic Garden.



Dale Chihuly, *Fiori Boat*, 2018, © 2018 Chihuly Studio. All rights reserved. Photograph by Nathaniel Willson

An exhibit will be held at the Adelaide Botanic Garden in early term 2, 2025, showcasing selected student entries of designs inspired by nature, drawn from responses to the final open-ended design thinking challenge within the Watching Glass Grow Challenge Course.

A panel of expert judges will view all completed designs and design reflections from the Talk Time component of the Challenge Course and select those to be showcased. Successful inclusions into the exhibit will be announced on the Makers Empire and Botanic Gardens and State Herbarium website.

This opportunity is open to any Australian school students who have completed the Watching Glass Grow Challenge Course during term 4, 2024 or term 1, 2025, either via a school account or individual home account.



Dale Chihuly, *Ethereal Spring Persians*, 2022, © 2022 Chihuly Studio. All rights reserved. Photograph by Nathaniel Willson



Dale Chihuly, *Walla Walla*, 2024, © 2024 Chihuly Studio. All rights reserved. Photograph by Nathaniel Willson



Vision

Every child is empowered to become a creator, innovator and problem solver, so they can make their world better.

Mission

Develop children's creative confidence and design thinking skills with our fun and easy to use 3D design software.



EDUCATION AT THE BOTANIC GARDENS AND STATE HERBARIUM

Learning Experiences

Join our experienced, qualified educator at Adelaide Botanic Garden for an inquiry-based learning program that will engage students with nature.

<https://www.botanicgardens.sa.gov.au/learn/for-schools/learning-experiences-2>

Digital Learning Hub

Explore the new range of digital learning resources, designed to bring the beauty of the Botanic Gardens from our classroom to yours

<https://www.botanicgardens.sa.gov.au/learn/for-schools/learning-hub>

Suggested Schedule



Before Week 1	Download and familiarise yourself with the Teacher Guide .
Week 1	Introduce students to Makers Empire 3D and complete in-app Basic Training Tutorials, if not completed previously. If students are familiar with Makers Empire 3D software, they can refresh their skills by revisiting the Training Lab. Visit the Pro Training Room to practice specific 3D design skills such as cutting and rotating. Visit the Video Room to view step-by-step videos narrated by student designers.
Weeks 2-5	Teachers facilitate learning processes, with students using Makers Empire 3D to complete the 5 x in-app videos, quizzes and pro-training tutorials
Weeks 6-8	Teachers support students to develop a solution to the design thinking challenge, employing design thinking methodologies that engage students in an iterative process of empathising, defining, ideating, prototyping and testing their design solutions.
Weeks 9-10	<p>Students reflect and communicate the key features of their design solution (Talk Time) and submit their final design solution.</p> <p>Teachers can assess the design solutions in the Teacher Dashboard, provide student feedback and print reports.</p> <p>Teachers complete a short online survey.</p>

New to Makers Empire? To get started:

- Sign into the Teacher Dashboard
- Add or join a class
- Create accounts for the students
- Download Makers Empire 3D app on student devices from:
www.makersempire.com/download
- Assign the Watching Glass Grow Challenge Course to your starred class(es).

For guidance, view the following short webinars and Help Articles:

[Webinar 1](#)

Learn how to sign in to the Teacher Dashboard and get your classes set up:

[Webinar 2](#)

Learn how to sign in to the Makers Empire 3D app, complete the Basic Training tutorials and navigate to Challenge Central where you and your students can access the Challenge Course:

[Webinar 3](#)

Learn how to use the Teacher Dashboard to assign a Challenge Course for your students, monitor their progress, leave helpful feedback and assess their learning.

Help Articles

[Assign a Challenge Course](#)

[To monitor student progress throughout the Challenge Course, leave feedback and assess their work](#)

Search Makers Empire Help Articles

Please contact us if you have further questions or require support:

info@makersempire.com



What is a Challenge Course?

Makers Empire's [Challenge Courses](#) deliver a customised education program that introduces students to the design thinking process and builds their problem solving skills. These in-app Challenge Courses are aligned to curriculum and provide a fun and engaging digital learning experience. Each themed Challenge Course is comprised of four components:



1. Educational Videos

Help students understand the context and parameters of a design problem and build empathy.



2. Quizzes

Ensure all students have attained a good understanding of a topic as they progress through the course.



3. Pro-Training Tutorials

Develop and reinforce students' skills using more complex 3D design tools and techniques.

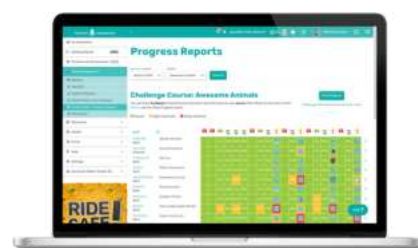


4. Design Challenge

Students combine all they've learned to respond to a topical design challenge. Talk Time provides an opportunity to communicate key features of their design solution.

Progress Reports

Teachers can easily monitor student progress via the Makers Empire Teacher Dashboard. Our intuitive [Progress Reports](#) make it instantly clear which students are progressing with confidence and which may need extra support.



	COMPONENTS
1	Video #1 - The History of Glass
2	Quiz #1 - The History of Glass
3	Pro-Training Tutorial #1 - A Pair of Glasses
4	Video #2 - Glass as an Art Form
5	Quiz #2 - Glass as an Art Form
6	Pro-Training Tutorial #2 - A Stained Glass Window
7	Video #3 - Let's Meet Some Glass Artists
8	Quiz #3 - Let's Meet Some Glass Artists
9	Pro-Training Tutorial #3 - Leaves
10	Video #4 - Where Do Artists Get their Ideas?
11	Quiz #4 - Where Do Artists Get their Ideas?
12	Pro-Training Tutorial #4 - Three Drinking Glasses
13	Video #5 - The Art of Dale Chihuly
14	Quiz #5 - The Art of Dale Chihuly
15	Design Thinking Challenge - Students will design their own artwork inspired by nature. It could be 3D printed or even made from glass.
16	Talk Time - Students share their thinking and communicate key features of their design solution
17	Students submit design to teacher, to be eligible for selection in a student exhibit at the Adelaide Botanic Garden, selected by a panel of expert judges

The **Watching Glass Grow** Challenge Course is aligned to the Makers Empire Design Curriculum. To view Design curriculum outcomes for your state or country please select the relevant curriculum in the drop-down list on the Teacher Dashboard.

The Course also addresses:

Visual Arts

- Explores and responds to art installations and how visual elements, materials and the natural environment interact to communicate ideas and perspectives
- Creates and makes their own artworks inspired by other artworks and nature.

Science

- Develops understandings about the properties of glass and how these properties influence its use and form.

General Capabilities

- Critical and creative thinking - inquiring, generalising, analysing and reflecting to solve problems
- Numeracy - exploring the geometric properties, position and location of shapes in space.

MAKERS EMPIRE DESIGN CURRICULUM

Band 3-4

Technology Applications

- Identifies factors that impact on the design of products and services to serve community needs
- Explains how forces and the property of materials affect the way a product behaves or performs
- Investigates the suitability of materials, systems, components, tools and equipment for a range of purposes

Investigating

- Defines a problem by identifying opportunities, critiquing needs, making predictions and analysing collected data
- Identifies criteria for success for a designed solution including sustainability considerations and constraints on materials, time or cost

Generating Ideas

- Generates and compares design ideas and makes decisions about design ideas most likely to meet the design criteria and constraints
- Communicates and records design ideas using technical terms and graphical representation techniques

Prototyping and Modelling

- Uses and chooses specific features in digital 3D modelling tools
- Interprets information and follows instructions using directional language
- Explains their design decisions related to the design criteria, including the use of symmetry, shapes, and angles
- Uses 3D modelling tools to create structurally sound designs, prototypes, and models

Testing and Evaluating

- Develops fair tests with guidance to evaluate designs against identified design criteria
- Makes further improvements and iterations of designs based on test results and feedback in order to address design criteria

Planning and Managing

- Plans a sequence of production steps when making designed solutions
- Works collaboratively with others to plan, make and evaluate designs that address identified criteria

Band 5-6

Technology Applications

- Explains how competing considerations, including sustainability are addressed in the design of products and services to meet community needs
- Investigates how sources of energy can control movement, sound, or light in a designed product
- Investigates characteristics and properties of a range of materials, systems, components, tools, and equipment, and evaluate the impact of their use

Investigating

- Investigates a range of needs, opportunities, or problems by posing testable questions and gathering data; and defines them in terms of functional design requirements
- Negotiates criteria for success and design constraints, including sustainability considerations

Generating Ideas

- Generates and compares design ideas and evaluates competing design solutions using a systematic process to determine how well they meet the negotiated criteria and constraints
- Communicates and presents design ideas and processes for specific audiences using appropriate technical terms and graphical representation techniques

Prototyping and Modelling

- Demonstrates efficient use of the tools and features of 3D modelling software
- Creates and interprets 3D models and diagrams
- Explains their design decisions in terms of the design criteria including the specific applications of features and properties of 2D and 3D shapes
- Uses 3D modelling tools to create structurally sound designs, prototypes and models including 3D printed prototypes

Testing and Evaluating

- Develops fair tests and analyses test data to evaluate designs against identified design criteria and constraints
- Uses a systematic process to make modifications and iterations of designs based on test results and feedback in order to address design criteria and constraints

Planning and Managing

- Develops project plans that include consideration of resources for making designed solutions
- Works collaboratively with others to design processes, production techniques and testing procedures to achieve negotiated design criteria



Dale Chihuly, *Nijima Floats*, 2024, © 2024 Chihuly Studio. All rights reserved. Photograph by Nathaniel Willson

Providing time to embed the Challenge Course within a broader program of excursions, online and offline experiences can enhance opportunities for student engagement.

Slowing down and deepening the design thinking process provides greater opportunity for students to develop their skills and confidence in areas such as problem solving, spatial reasoning, project management and critical and creative thinking.

Many of these suggested strategies are drawn from teachers already using Makers Empire tools and programs to facilitate thoughtful design thinking processes that engage students in designing innovative solutions.

Adopt, adapt or use these strategies as a springboard to innovate and design your own learning strategies that best meet your needs and context.

DESIGN THINKING

EMPATHISE

Learn about your audience / Gain deep and meaningful insights into the knowledge and experiences of others to improve understanding

At the Adelaide Botanic Garden:

- Explore, describe, analyse, interpret and evaluate Dale Chihuly's art installations, identifying a variety of visual elements and principles employed in his 3D artworks including movement, scale, symmetry, balance, pattern and repetition.
- Students photograph or sketch elements of Chihuly's artwork that they are drawn to.
- Students work in pairs to unpack the emotion and mood Chihuly's artwork evokes, sharing their personal responses.
- Compare and contrast two of Chihuly's sculptures, uncovering common elements and uniqueness in each of these artworks.
- Identify and capture visual elements in the flora of the Adelaide Botanic Garden that are imitated in Chihuly's artworks.
- Students take a moment to tune into all of their senses to absorb the sounds, smell, sights and feelings of the garden environment; they may choose to lie down in silence for 2 minutes and tune into what they can hear, or sit in silence for 2 minutes and focus on what they can see and feel. Invite students to capture their personal reflections through sketching. These sketches can provide inspiration for their final design later in the course.
- Share key words in response to Chihuly's artworks (e.g. vibrant, organic, movement, repetition, playful, shiny, mesmerising, imposing, translucent, elaborate).

At school:

- Practise observation skills and observe nature's fractals, patterns, colours, shapes and forms in the school and local community and in key artworks. Visit Google's [Arts and Culture website](#) to zoom closely into a range of artworks, including sculptures by Chihuly.
- Include additional tools such as magnifying lenses and colour chips to direct the noticing and focus observation on visual elements including colour, shape, line, form and texture.
- Explore the uses and forms of a range of everyday items made of glass. Notice their use of design principles including symmetry, pattern, movement and rhythm.

DEFINE

Decide how you can best help your audience and where you can you make the biggest difference.

- Draw on the feedback and insights gained at the empathise stage to identify a design challenge, considering the message or emotion the design aims to evoke.
- Consider any specific design criteria that will form part of the design response (such as form, colour, symmetry and pattern).

IDEATE

Be creative and think of as many solutions as you can.

- Revisit sketches, photographs and notes collected from observations at the Adelaide Botanic Garden and personal research to generate possibilities.
- Use a range of ideating strategies such as mind mapping, storyboarding, [brainstorming](#) and sketching, to encourage students to think beyond the obvious and generate many possible design solutions.
- Explore the Showcase Feature located as a button on the Challenge Course in the Teacher Dashboard. This feature highlights design solutions made by students who have already completed the Design Thinking Challenge.
- Access online digital collaboration tools such as [Padlet](#) and [Lucidspark](#), to promote collaborative brainstorming and mind mapping. with other class members.
- Structure the ideation process, such as adding time limits and quantity goals, to promote creative thinking. For example, 'Aim for 100 ideas in 10 minutes.'
- Encourage students to synthesize ideas by identifying separate ideas that could be combined into one idea.
- Engage students in a [process to rank](#) their ideas and select one idea to prototype. They may consider criterion for ranking such as the most original idea, or the idea they think will have the greatest impact on the intended audience.
- Incorporate group processes such as Think-Pair-Share (TPS) to provide opportunity for students to work with a partner to discuss their ideas and communicate the reasons for their personal ranking.

PROTOTYPE

Make something that explains your best ideas to other people. Rough is okay!

- Students sketch their design solution from different perspectives (e.g. birds-eye view, side view) drawing on inspirations from glass artists and nature
- Students create 3D prototype models of their design solution using natural materials, playdough as well as designing within the Makers Empire 3D app.
- As a class, discuss the importance of investing time in the design to ensure it meets personal design criteria. Highlight the [effort score](#) with students as one tool that can assist you as their teacher, to measure complexity and time dedicated to a design.
- View time and effort put into student designs via the Teacher Dashboard. Provide feedback and pose design challenges to nudge thinking. This may include questions about the visual elements and form of their design prototype and how nature has inspired their design solution.
- Students add [notes](#) (written or audio) to their prototype within the app to communicate their design choices.
- Students create a video of their prototype to share it with others and explain its design elements and features.

TEST

Show your prototypes to your audience to see if they work, or can be improved.

- Students seek critical feedback from peers and teachers, looking for ways to improve their design solution. Here are some tips for [developing feedback routines](#).
- Invite students to pitch their final prototype to the class and seek feedback on ways to improve their design.
- Students use [augmented reality](#) technologies to embed their design solution within a real world natural environment to enhance it's meaning and relevance. Investigate further strategies for incorporating [AR Technologies](#).
- Teachers demonstrate how a GLB file (3D file) can be [imported and animated](#) within a digital presentation to help to bring a design to life. [Download GLB files](#) for students from the Teacher Dashboard.
- Students provide constructive feedback to class members within the Gallery tab in the app. The school's [privacy settings](#) can be managed from the Teacher Dashboard.
- Teachers [provide tokens](#) to students to acknowledge effort and increase motivation.
- Students work with a partner to reflect on the design process. Reflective questions could include: What does this design mean to me? How did the work of other artists inspire my design? How did nature inspire my design? What did my first iteration teach me and how did I improve my design? How can I reshape my design to share my ideas or point of view? What skills did I learn? What did I find hard and how did I overcome any challenges? What might I do differently next time?

REPEAT

Your first idea probably won't be perfect. That's okay - keep trying.

- Encourage students to identify where they might revisit aspects of the process to improve their design solution such as creating another prototype that has been informed by user feedback.
- Invite students to research prototypes in the everyday world that began their life as [prototype failures](#), and discuss the importance of mistakes as a part of a growth and innovation mindset.
- Read the picture book, *Trying*, by Kobi Yamada to facilitate discussion about perseverance, failure and reframing challenges as opportunities.



GLASS, ART AND NATURE

PLACES TO VISIT

Chihuly in the Botanic Garden Experiences, for schools

Term 4, 2024 and Term 1, 2025, Bookings required.

Self-guided and educator-led tours available. Make a booking to receive a complimentary self-guided resource. See website for further details.

<https://www.botanicgardens.sa.gov.au/learn/for-schools/chihuly-in-the-botanic-garden-experiences>

Jam Factory Guided School Tours

Guided tours and a behind the scenes glimpse into the iconic Jam Factory studios, galleries and shops.

<https://www.jamfactory.com.au/school-engagement>

WEBSITES

Chihuly in the Botanic Garden, Botanic Gardens and State Herbarium

<https://www.botanicgardens.sa.gov.au/chihuly#>

Educator Resource, Engaging with Nature, Art and Nature, The Huntington, Library, Art Museum and Botanical Gardens

<https://huntington.org/educators/learning-resources/art-and-nature/beauty-and-natural-world/nature-artistic-inspiration>

Google Arts and Culture - search for Chihuly to explore and zoom into Chihuly's artworks

<https://artsandculture.google.com/>

Jam Factory Glass Exhibitions

<https://www.jamfactory.com.au/exhibitions-jamfactory-adelaide>

Visual Arts Support Resource, Australian Curriculum, V9 (link to download, below)

https://v9.australiancurriculum.edu.au/teacher-resources/learning-area-resources/visual_arts_examples_of_knowledge_and_skills.html

PICTURE BOOKS

The Art in Country: A Treasury for Children, Dr. Bronwyn Bancroft, Little Hare, 2020

Collecting Colour, Kylie Dunstan (Author) Lothian Children's Books, 2009

Colors in Nature, Jana Sedláčková & Štěpánka Sekaninová (Authors) Magdalena Konečná (Illustrator), Albatros Media, 2021

A Flash of Color and Light: A Biography of Dale Chihuly, Sharon Mentyka (Author), Shelley Couvillion (Illustrator), Little Bigfoot, 2024

Noticing, Kobi Yamada (Author), Elise Hurst (Illustrator), Compendium Publishing & Communications, 2023

Outside In, Deborah Underwood (Author), Cindy Derby (Illustrator), Harper Collins, 2020

Shapes and Patterns in Nature, Jana Sedláčková & Štěpánka Sekaninová (Authors)
Magdalena Konečná (Illustrator), Albatros Media, 2022

NON-FICTION TEXTS

The Art Book for Children (Volumes 1 & 2), Gilda Williams Ruggi & Amanda Renshaw (Authors), Phaidon Press Ltd, 2005 & 2007

The Boathouse: The Artist's Studio of Dale Chihuly, by Leslie Jackson Chihuly (Author), Portland Press, 2023

Botanicum (Welcome to the Museum), Kathy Willis (Author), Katie Scott (Illustrator), Big Picture, 2016

Chihuly Garden Installations, Dale Chihuly (Author), Abrams, 2011

Growing Patterns: Fibonacci Numbers in Nature, Sarah C Campbell, Astra Publishing House, 2022

Mysterious Patterns: Finding Fractals in Nature, Sarah C Campbell, Astra Publishing House, 2023

World of Glass: The Art of Dale Chihuly, Jan Greenberg (Author), & Sandra Jordan (Author), Abrams, 2020

STEM AND DESIGN THINKING

WEBSITES

Stanford d.school

<https://dschool.stanford.edu/>

Good Design Australia - Universal Design

<https://good-design.org/universal-design/>

PICTURE BOOKS

The Most Magnificent Thing, Ashley Spires, Kids Can Press, 2014

Rosie Revere, Engineer, Andrea Beaty (Author), David Roberts (Illustrator), Abrams, 2013

The Imagineer, Christopher Cheng (Author), Lucia Masciullo (Illustrator), National Library of Australia, 2022

The First Scientists: Deadly Inventions and Innovations from Australia's First Peoples, Corey Tutt (Author), Blak Douglas (Illustrator), Hardie Grant Explore, 2021

Trying, Kobi Yamada (Author), Elise Hurst (Illustrator), Compendium Publishing and Communications, 2020

VIDEO #1 THE HISTORY OF GLASS

Take a look around you. What can you see that is made of glass? Perhaps you are looking out of a window, or can you see your reflection in a mirror? Perhaps you can see someone wearing eyeglasses or using a smartphone. Or perhaps you can see someone drinking a glass of water or pouring from a glass bottle.

Glass is certainly a useful material that we use every day. So where does glass come from, and when did humans start using glass? Let's go back in time to find out. Over 700, 000 years ago, early humans discovered natural glass called obsidian. Obsidian is formed when lava from volcanoes cools very quickly. Early humans used obsidian to make blades, arrowheads, and even mirrors.

About 3,500 years ago, ancient Egyptians were the first to make man-made glass. Early glassmakers melted together sand and limestone. They cleverly worked out that adding ash from burnt plants helped melt everything together at a lower temperature. Special types of plants known as glasswort worked best for glassmaking. Glasswort plants absorb sodium from saltwater. When the plant is burned, the sodium turns into other chemicals that help to reduce the melting temperature of the glass mixture.

Around 2,000 years ago, ancient Romans took glassmaking to a whole new level when they invented glassblowing. By blowing molten glass, they could make objects much faster and, in more shapes than ever before. They created things like glass bottles and vases.

Can you believe that owning glass objects was once considered a luxury? Glass was becoming popular and a useful material for manufacturing. These days, most glass is manufactured in factories. The process starts with sand. The same kind of sand you find at the beach. First, the sand is mixed with other ingredients and melted in a huge furnace at really high temperatures, over 1,700 degrees Celsius, or 3,900 degrees Fahrenheit. That's hotter than a volcano. The melted sand turns into a thick, gooey liquid. This hot liquid glass is then poured into moulds to make things like bottles and jars, amazing pieces of art, or it's rolled out to make sheets for windows.

Sometimes, glass is shaped by blowing air into it with a long tube, just like the Romans did. This is how we get beautiful, unique glass art. The way that glass is made today has not changed that much in thousands of years.

Glass is extremely useful because it can be made into so many different things. It's clear, so we can see through it, but it's also strong and can be used to build homes and other structures.

Glass is almost an important material to help us use the Earth's resources in sustainable ways and to look after the environment. Glass is 100 percent recyclable and can be used over and over again to make new glass objects. Glass objects can also be reused in new and creative ways.

VIDEO #1 THE HISTORY OF GLASS (CONT)

Glass is a great material for keeping other things fresh, safe and protected. That's because glass is inert. This means that it won't react to other chemicals or substances. You'll often see food stored and packaged in glass containers. Glass plays a big part in helping food last longer and helping to reduce waste.

Glass is also great at reflecting and absorbing solar energy from the sun. Have you ever noticed that it's warmer near a window on a cold day? The energy absorbed by glass means that we can convert sunlight into useful energy. Many businesses and homes around the world are already generating energy through their windows and panels. Glass houses and terrariums are made of glass, because they trap heat inside and this creates an ideal climate for plants to grow.

But glass is so clever that it can also refract solar energy. This means that a glass container can keep heat and sunlight away from whatever is inside it. This is very useful for protecting products that might deteriorate, such as drinks, oils, and medicines. The colour of a glass container determines what type of light can pass through the surface. That's why you can often see amber, green and blue bottles.

So next time you look through a window, or drink from a glass, remember the incredible journey it took from sand to the shiny, useful object in your hand.



Dale Chihuly, *Sapphire Star*, 2010, © 2010 Chihuly Studio.
All rights reserved. Photograph by Nathaniel Willson.



Dale Chihuly, *Jet and Crimson Fiori* (detail), 2024, © 2024 Chihuly Studio.
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VIDEO #2 GLASS AS AN ART FORM

In our last video, we learned about what an amazing and useful material glass is. Glass can also be used to create beautiful art pieces, and artists from all over the world have found clever ways to turn glass into amazing works of art over thousands of years. Have you ever wondered how artists create amazing glass sculptures, intricate vessels or stained-glass windows?

Glass is a special material that can be shaped and coloured to create beautiful art. Glass artists work with glass in many different ways. They might blow it, shape it, mould it, or join pieces of glass together to create unique works of art. Glass artists use equipment such as kilns and ovens to heat glass at high temperatures. They then use specialist tools, like paddles and jacks, to bend and shape the hot glass.

Before starting the making process, artists need to plan the size, colour and rough shape of the glass object that they want to make. They also need to know how different pieces might fit together and what order pieces might need to be made in. Artists might start with a piece of glass that they want to transform into a whole new shape.

Firstly, they will need to cut the glass into the shapes that they need. They use a special tool called a glass cutter. A glass cutter is extremely sharp and is used to score straight lines on the glass. Glass can then be snapped along these lines. And once the artist has the pieces, they can put them together like a puzzle to make their design. This technique is called a mosaic.

For some projects, artists will heat glass until it's really soft, and then they can shape it. This is called glass blowing. It's like blowing up a balloon but made of glass. Glass is heated to incredibly high temperatures until it is molten and has the consistency of runny honey. The molten glass is then gathered on the end of a hollow pipe, inflated to a bubble, and formed into a vessel by blowing, swinging, or rolling on a smooth stone or iron surface called a marver. Artists also make use of gravity to help manipulate the glass into the shapes that they want.

Another way that artists use glass is to make stained glass windows. These are made by fitting colourful pieces of glass into a frame to make pictures. When the sun shines through, it creates beautiful colours. Stained glass windows have been created for churches and other special buildings for nearly 2000 years.

The next time you see a piece of glass art, think about the techniques, tools and materials that may have been used to create it.

VIDEO #3 LET'S MEET SOME GLASS ARTISTS

Learning how to work with glass is a skill that takes time and practise. There are lots of different steps to making glass, and a very important part of the whole process is keeping safe in the hot shop. In this video, you'll be introduced to some incredibly talented South Australian artists, all with different styles, who use glass to create their artworks.

Hi, my name's **Gabriella Bisetto**. I'm a senior lecturer at the University of South Australia in the School of Contemporary Art. I became introduced to glass when I grew up in a regional town in New South Wales. My art teacher was kind enough to let me experiment with glass in the kiln. When I went to university, I assumed I would do ceramics. It was something I was more familiar with and I was very excited when I saw glassblowing and I heard people talking about devitrification and other thrilling titles and I was hooked and I signed up. I've been working in glass for about 30 years. So glass isn't only glassblowing. There's many facets to glass. We do glass casting, coal working processes with glass and hot glass is probably the most commonly known.

My name is **Tom Moore**, and I've been working with glass for over 30 years and I grew up in Canberra and there's an art school there that has a glass program and when I was a kid I really enjoyed painting and drawing and making things with wood and clay and I hoped I would go to art school and do ceramics. So I went to an open day at the art school in Canberra, and I walked into the glass studio, and I thought, I really want to do this instead. I was really excited to see glassblowing for the first time, because it's a group process. It's done in a team and it's quite quick. It's like juggling fire and at the end of it you have a thing. As a kid, a lot of the imagery that I was excited by were pictures of combined creatures like mythical creatures. And so I was very excited about combining plant and machine and animal and human into these sort of new creatures that inhabit a sort of parallel world.

So when I'm planning to make something, sometimes I'll just start with tiny little drawings. So I might just start doing this sort of little sketch. And then I'll decide I'd really like one of them, and I'll start on a bigger piece of paper because I'm working towards a full size drawing and all the parts are the right size for the drawing and so I'll put them on the paper and move them around and then I will start to draw and a lot of erasing until I'm happy and often, you know, I'll do a rough drawing and then I'll have to go cut some of the rods up and heat them up and at home I can get these really hot and then shape them with different tools and then bring them back to the drawing, make sure it's all exactly where I want it and then I heat all of those up again back at the large studio at the Jam Factory and then I'll make the body and put more of those coloured rods over the top and then blow the shape and then attach all the parts. So I have to know exactly where they all go.

VIDEO #3 LET'S MEET SOME GLASS ARTISTS (CONT)

My name's **Liam Fleming**. I'm a glass blower and artist from Adelaide. I've been blowing glass for 13 years now. My favourite thing about making glass is gathering out of the furnace, where the furnace is at 1,160 degrees Celsius and so it's like gathering up honey on the end of a pipe. But the most exciting part of making is actually taking the work out of the kiln the next day, and that's always like opening presents, because you're never quite sure how it actually goes in, and it's not until you can actually handle the piece, that's when it's exciting and it feels the freshest. There's a lot of dangerous things in the hot shop. A lot of heat, so I always wear my safety glasses and long sleeves. And I'm always wary of hot metal surfaces, because they don't look hot. We never burn ourselves on the glass because that looks hot, so you don't touch it, but it's being wary of the tools. And then also we use Kevlar gloves to handle things, and so lots of fire resistant clothing. In the hot shop we work as a team, and we have to be very careful of everyone around us. And one way we always talk, it's like in a hot kitchen, where we always say when we're behind someone, and say backs, communicating, lots of talking.

My name's **Nick Mount** and I'm a craftsperson. My main material is glass but I like to involve myself with other materials as well at the same time in my practice. I got involved with glass because I met a bloke that I really liked who was a glassblower and that was in the mid 70s at the art school. Some opportunities came up to travel and work with him at different places around the world. A lot of what inspires me is our environment, the garden, our family and children, the things that we see day to day and involve ourselves with and enjoy. A while ago we had a beautiful crop of olives on one of our olive trees, a standard olive tree, and so I made some olive shapes. And then those olive shapes turned into more fruit sort of forms, because they're voluptuous, they're glassy, they involve different materials, and I love to work with different materials, with the steel or bronze or wood, and carving wood, and creating compositions of those different materials.

Hi, well, I'm **Clare Belfrage** and I've been making glass for over 35 years now. I sort of stumbled across it when I went to university to study ceramics in the 80's and it was one of the classes that we had to do and I really, really loved it, so I shifted from ceramics into glass at that point. As a young person going to university, I didn't even imagine I would have a career as an artist. But I knew I really loved ceramics and then glass, so I just decided to follow that because I figured that was my best shot at being good at it, was doing something I really loved. All of my work really is inspired by the rhythms and patterns found in the natural world. I really, really like the detail in things, so I come in close and, examine shells, leaves, rocks, trees, bark, all sorts of things in plants, and then I try and look at them in terms of elements and break that down and then play with those elements and put them back together.

I hope you enjoyed meeting these amazing artists who use glass in their artwork. These artists have so many interesting and creative ideas to help them make their work. In our next video, we will learn more about how artists come up with their ideas.

VIDEO #4 WHERE DO ARTISTS GET THEIR IDEAS?

Artists are creative, imaginative, and skilled at expressing ideas and stories through their artwork. Every piece of artwork you see has started with an idea or an inspiration from the artist. They might have a story or message to tell, they might want to try a new technique, or use a tool in a different way.

Artists develop their craft over time. They practise new skills, try new techniques, and experiment with materials, colours and textures. But have you ever wondered where artists get their ideas from? Sometimes artists are inspired by the work of other artists. They might visit galleries, exhibitions, and museums to view artworks. Looking at other works of art is a great way to get ideas and be inspired to create your own works of art. Artists learn a lot from each other and often like to share ideas and talk about their art. Have you ever been inspired to create your own art when you look at a painting? What about looking at a sculpture or a cool design?

Artists also draw upon their own lives when they create art. They take notice of the world around them and they make observations using all of their senses. Artists can be inspired by the things they see, hear, touch, taste and smell. Artists get ideas from their own experiences. The places they have been to, the people they have met and the things that have happened to them. They also find ideas from reading books and magazines, watching films, listening to music, and learning about history and the world around them.

Artists often look to nature for inspiration. From the colourful flowers in a garden, to the tall, majestic mountains, there's so much beauty to capture. But did you know that nature also has patterns and mathematical concepts that artists use? Take a look at this sunflower. Do you see the spiral pattern in the middle? This pattern is called a Fibonacci sequence. It's a series of numbers where each number is the sum of the two before it. This pattern is found in many plants and flowers. Artists sometimes use these patterns to create beautiful designs that are pleasing to look at. They might not always think about the Maths behind it, but they're often inspired by the way that these patterns look in nature.

Another example of patterns in nature can be found at the beach. Have you ever noticed the repeating patterns of the waves in the ocean and the patterns they leave behind on the sand? Waves have a natural rhythm. Many artists have taken inspiration from these rhythms to create music, poetry, and other works of art that feel natural and soothing.

Spirals are another pattern found in nature. Look at this snail shell. Can you see how it spirals outwards? This is called a logarithmic spiral. Artists have used this pattern to create stunning visuals. You might see it in paintings, sculptures, and even in architecture.

VIDEO #4 WHERE DO ARTISTS GET THEIR IDEAS? (CONT)

Artists learn from nature's patterns to make their own art more interesting and pleasing to look at. So, the next time you're outside, take a close look at the world around you. Notice the colours, the shapes, and the patterns.

This Challenge Course asks you to take inspiration from nature and from the work of other artists you have met to create your own piece of art. What ideas do you have? What inspires you to create art? It is important to remember that there are lots of different styles of art and that artists are constantly being inspired by things that are special to them. Take your time to think about the things that are special to you as you develop your own artistic style.



Dale Chihuly, *The Sun*, 2014, © 2014 Chihuly Studio. All rights reserved. Photograph by Nathaniel Willson

VIDEO #5 DALE CHIHULY

Dale Chihuly is a world-famous artist. His work has captivated and inspired millions of people all over the world. Dale Chihuly was born in Washington, in the United States in 1941.

He first started to use glass in his art when he was studying interior design at the University of Washington. He was fascinated by everything about glass and went on to learn more at the Rhode Island School of Design and the Venini Glass Factory in Venice, in Italy. It was in Venice where Chihuly learned about how to work as a team to make glass. In 1971, Chihuly set up the Pilchuck Glass School in Washington. The school is now recognised as an important place for glass artists from all over the world to learn.

Chihuly is famous for finding new ways to use glass to make art. He uses vibrant and interesting colours and designs organic shapes often inspired by nature. His work has inspired and influenced other artists since the late 1970s.

Chihuly is very experienced and talented as an artist. He has amazing skills using glass and other mediums, like drawing and painting, to create art. He has many other skills and characteristics that have made him a successful artist, including creativity, imagination, innovation, and problem solving.

Chihuly is famous for his magnificent art installations that include complex designs which work with the environment that they are placed in. His pieces are often inspired by nature, including delicate sea creatures and intricate floral arrangements. Chihuly's art pieces are always special.

He is an expert at manipulating glass to create amazing colours, shapes and textures. His work is often displayed in museums and botanical gardens. Chihuly uses his pieces to transform galleries and gardens into unique spaces, which transform light and create a unique experience for visitors.

Adelaide Botanic Garden is the latest space to be transformed by Chihuly's amazing world of glass. His exhibition will be on display for the first time in Australia amongst the majestic trees and through the lush landscapes of Adelaide Botanic Garden. The exhibition is designed to make most of the light as it changes throughout the day and throughout the seasons to bring vibrant, large-scale artworks to life in a beautiful botanic destination.

What does Chihuly's work inspire you to create?

This educational program is a successful collaboration between Botanic Gardens and State Herbarium, and Makers Empire.



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