



Facilitation Guide: Moving Masterpieces

Challenge

Students will create artwork with movement that makes a statement. They will design a kinetic or moving sculpture that is powered by a form of motion such as an audience member, a simple machine, wind, or water and effectively communicates a message to the viewer.

Rationale

Kinetic sculptures have their roots in the early 20th century, when pioneering artists like Naum Gabo and Alexandre Calder began incorporating movement into their artistic designs. Their innovative pieces range from mesmerizing [whirligigs](#) to deceptively [complex mobiles](#). Modern kinetic artists like Theo Jansen or David C. Roy, showcase their art in myriad forms that include [compact desktop pieces](#), [walking beast-like sculptures](#), and [complex wall-hanging pieces](#).

If you can dream it, you can build it, and make it move, with Glowforge! Students at the [Cornish College of the Arts](#) have discovered that Glowforge is the ideal tool for creating kinetic sculptures. With precision cutting, your Glowforge can enhance the scale and detail of your joinery techniques, offering more options for connecting and moving pieces of your artwork.

Standards

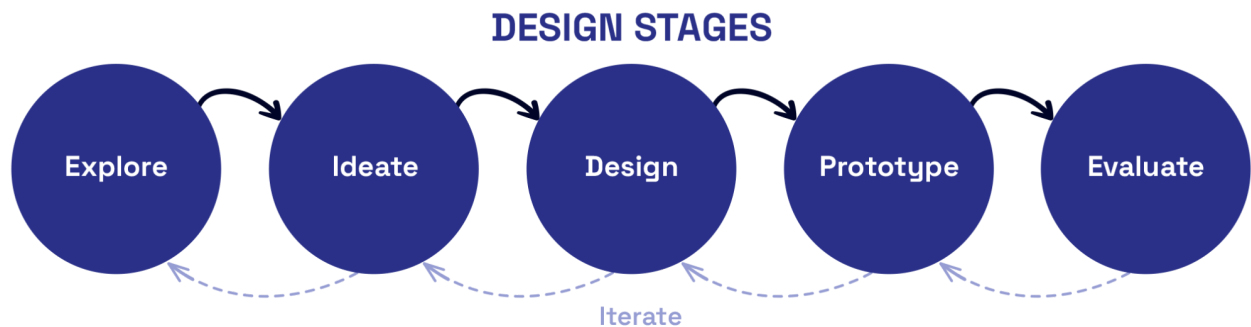
Common Career Technical Core Standards

- AR-VIS 2. Analyze how the application of visual arts elements and principles of design communicate and express ideas.
- AR-VIS 3. Analyze and create two- and three-dimensional visual art forms using various media.

ISTE Standards for Students

- 1.4.a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
- 1.4.c. Students develop, test and refine prototypes as part of a cyclical design process.

Facilitation Steps



Explore

In this stage, students focus on researching and investigating kinetic sculpture techniques. To ensure that students have the knowledge and skills they need to complete this stage, use the following steps.

1. Provide students with resources and a brief introduction to kinetic sculptures and joinery.
 - Share [How This Guy Builds Mesmerizing Kinetic Sculptures](#) featuring kinetic artist David. C. Roy.
 - Encourage students to engage with articles, websites, and videos such as David C. Roy's [Interesting Links](#) resource page to learn more about the common techniques and the history of kinetic sculptures.
 - For joinery ideas, explore the [Glowforge Community forum](#) or the [Joinery: Joints for Laser Cut Assemblies](#) that features several joinery options and extra resources.
 - Help students connect with industry professionals either in-person or virtually, to conduct interviews or question and answer sessions.
2. Provide students with question prompts from the Explore stage of the challenge to help inspire their research and consider how to create kinetic sculptures with digital tools.
3. Ask students to share their findings and discuss what they learned during the Explore stage.
 - Encourage students to share both in small and large groups. If students are working in groups to complete this design challenge, have different groups partner together to discuss what they discovered.

At the end of this stage, students will reflect on the research they did to learn more about kinetic sculptures. Encourage them to consider seeking out additional movement options or techniques that they could incorporate into their design.

Once they are finished, students will continue to the Ideate stage where they will brainstorm themes, movement options, or design elements for their kinetic sculptures.

Ideate

In this stage, students will take what they learned in the Explore stage and brainstorm different ideas for their sculpture designs. This stage allows students to generate as many ideas as possible without judgment. Remind students to incorporate the use of digital tools with techniques for creating unique and innovative movements in their kinetic sculptures. To ensure that students have the knowledge and skills they need to complete this stage, use the following steps.

1. Provide students with question prompts from the Ideate stage of the challenge to help them brainstorm.
2. Encourage students to brainstorm ideas using one or more methods.
 - Allow students to brainstorm individually or in small groups to utilize multiple perspectives.
 - Provide students with examples of different ideation strategies to help them begin.

At the end of this stage, students will have generated multiple ideas for their kinetic sculptures and will be able to narrow their focus in order to develop a design that conveys their statement while introducing movement and possibly audience interaction.

Before moving on, students should consider which ideas they would like to advance and which joinery techniques they will use in their sculpture. Once they are finished, students will continue to the Design stage where they will select one or two ideas that they will develop further.

Design

In this stage, students will develop their ideas from the Ideate stage to draft a detailed plan for their kinetic sculpture. Students should focus on one or two ideas to better understand their needs and final design before printing and assembling their sculptures. Encourage students to consider how their design can communicate their statement and aesthetic vision while using joinery techniques to enable movement. To ensure that students have the knowledge and skills they need to complete this stage, use the following steps.

1. Provide students with question prompts from the Design stage of the challenge to help them design.
2. Introduce, review, or model available design software options, including [the Glowforge App](#).
 - Assist students as they create sketches or digital mockups of the components of their sculpture.
 - Remind students that [the Glowforge App](#) can cut or engrave from SVG files. Students can design their joinery in CAD software and then [follow these steps](#) for tips on exporting the design as an SVG file.
 - Students can import a hand drawn or digital design to be etched using the Glowforge App's [trace feature](#).

- Review page 28 in the [Glowforge Educator Guide](#) for more software tools and information.

At the end of this stage, students will have a detailed plan for their kinetic sculpture design, including sketches or digital mockups, as well as an idea about how they may assemble their final product.

Before moving on, students should consider if they would like to revisit their design further to change anything. Once they are finished, students will continue to the Prototype stage where they will select and test one of their fully developed design plans.

Prototype

In this stage, students will use their design plan to create and assemble a physical version of their kinetic sculptures. Students will select one of their fully developed design plans, create necessary elements on the Glowforge, assemble the pieces, and test their techniques and design. To ensure that students have the knowledge and skills they need to complete this stage, use the following steps.

1. Model how to use your Glowforge in a safe and efficient manner.
 - Review [Glowforge safety guidelines](#).
 - Remind students of any applicable classroom or school policies.
 - Use [this video](#) to show students a demonstration of how to use Glowforge.
 - Review the [Glowforge Community Forum](#) or page 25 in the [Glowforge Educator Guide](#) for tips and tricks for scaling designs.
2. Provide students with question prompts from the Prototype stage of the challenge to help them develop their prototype.
3. Give students the time and resources needed to produce Glowforge elements for their print, assemble their pieces, and test the elements of their print.
 - Provide students with access to your Glowforge using a classroom print schedule to ensure that all students are able to produce the elements they need efficiently.

At the end of this stage, students will have a finished prototype of kinetic art that incorporates both their statement and kinetic elements.

Before moving on, students should review their assembled kinetic sculpture prototype to ensure that its moving elements function properly. Students may need to test multiple times or return to earlier stages of the design process before moving on. Once they are finished, students will continue to the Evaluate stage where they will receive feedback on their finished kinetic sculpture.

Evaluate

In this stage, students will evaluate their kinetic sculpture design and receive feedback from others. Feedback can be provided in pairs, small groups, or as a whole class. Encourage students to reflect on their process and consider their alignment to their original intent. To ensure that

students have the knowledge and skills they need to complete this stage, use the following steps.

1. Provide students with question prompts from the Evaluate stage of the challenge to help them reflect on their print.
2. Encourage students to share and discuss their ideas to generate feedback and suggestions from their peers to refine and enhance their print.
 - Students can use the question prompts from the Evaluate stage to guide their discussions.
 - Use a peer feedback model, such as a gallery walk, affinity mapping, or a concentric circle discussion, to support students as they work in pairs, small groups, or as a whole class.
3. Provide students with question prompts to help them reflect on the feedback that they received. These might include:
 - How can you further improve and refine your design?
 - If making additional changes to your kinetic sculpture, which of the design process stages will you return to?
4. If applicable, provide students with time to complete a learning reflection, self-assessment, and/or peer critique.
 - Use the provided Assessment Suggestions for more ideas.

At the end of this stage, students will be able to reflect on the strengths and areas for improvement of their kinetic sculpture. Students should determine whether revisions are needed and return to the appropriate stage in the design process to adjust their sculpture. Consider assessing student work using one of the Assessment Suggestions or extending the challenge using provided Extension Activities.

Supplemental Supports

- Consider providing examples of kinetic design, such as [Kinetic Public Art](#) or [Alexander Calder: The Artist as Inventor](#).
- For students who have a limited experience with adding joinery or kinetic elements to their design, introduce them to [The Miracle Hinge](#) or [Noticing Patterns](#) lessons that help develop an understanding of hinges and gears. Additionally, share resources like [Meet Dana Business Owner + Toy Designer](#), [How to Make a Kinetic Sculpture](#) or the [Simple Marble Run Discussion](#) to highlight the designers' reflections and process.
- For newer Glowforge users, demonstrate how to use your Glowforge and its design features, including the design software, engraving capabilities, and cutting functionality. Check out the [Glowforge Educator Guide](#) for more ideas.
- For students who struggle with adding visual details to their designs, use [Glowforge's Magic Canvas](#) to generate examples based on a provided prompt.

Assessment Suggestions

Overall Learning Reflection

Learning reflections allow students to consider their experiences, identify key concepts, and explain how they have grown throughout the design process. Ask students to write or record a video about what they learned throughout the challenge and how their learning will impact their future designs, including the use of joinery, movement, and when applicable, audience interactivity in their artwork. Students can incorporate feedback elements from the Evaluate stage to describe their strengths and areas for improvement.

Self-Assessment

Self-assessments allow students to reflect on their learning through portfolios, presentations, or learning journals that involve evaluating their own progress and identifying areas for improvement. Consider providing criteria to students prior to beginning the challenge that can be used by the student to reflect on their progress throughout the challenge. The criteria may include:

- Use of joinery and movement: How well did I incorporate movement and joinery techniques into my design?
- Aesthetics and statement: How well did I use visual design elements to convey an idea or statement?
- Use of digital tools: How well did I use digital tools to enhance the design?
- Use of the design process: How well did I develop, test, and refine prototypes as part of a cyclical design process?

Educator or Peer Assessment

Educator or peer assessments allow educators or students to review the quality and effectiveness of the finished print. The assessment can be based on specific criteria, such as use of kinetic techniques, innovation, or creativity. Some criteria to consider may include:

- Movement: Did the sculpture utilize joinery and movement elements?
- Composition: Did the sculpture convey a message, idea, or statement effectively?
- Design: Did the sculpture effectively utilize design software features?

Extension Activities

Design challenges often inspire students to think about what's next. For some, this could mean connecting with people within the visual or kinetic art industries or applying their skills in new ways. Here are a few ideas for how you can help students extend this challenge:

- Kinetic sculptures are captivating for people of all ages. Have students create a kinetic sculpture that represents the values or story of their community that can be displayed in a public place such as their school, a park, a civic building, or a library.

- A wonderful balance of physics, math, and art, Rube Goldberg machines utilize complex kinetic elements to perform simple tasks. Using the skills developed in the kinetic sculpture challenge, have students create Rube Goldberg machines with custom elements designed using Glowforge. Explore additional instructional ideas at the [OK Go Sandbox](#).
- Many artists incorporate captivating optical illusions into their kinetic sculptures. From spinning whirligigs in the school's garden to the [hypnotic undulation of David C. Roy's creations](#), kinetic elements are the perfect way to create awe-inspiring visual designs. Have students design kinetic art with elements that create optical illusions for the audience. Explore additional instructional ideas at the [OK Go Sandbox](#).

If your students enjoyed this challenge, they might also enjoy [Merging the Traditional with Cutting Edge](#), a design challenge that encourages students to create original artwork by combining traditional printmaking techniques with cutting and engraving technology.

Ready to take students to the next level? Try the Capstone Challenge [Celebrating Arts and Community](#), where students plan and promote a Community Art Celebration that includes an art installation to showcase student work and engage with the community.