

Facilitation Guide: Condense the Nonsense (Workshop Organization)

Challenge

Students will manufacture an organizational solution for a workshop or classroom space. They will work through Design stages to develop, create, and refine their solution to address an authentic organization or logistics challenge in the workshop. Throughout the process, they will use manufacturing production principles to identify inefficiencies, develop solutions, and use iterative testing to refine their solutions to maximize safety, efficiency, and space.

Rationale

In manufacturing, logistical workflows and the storage locations of materials can have a huge impact on efficiency, quality, safety and costs. Your school's workshop or classroom is no different! These spaces must fit the needs of everyone utilizing them. Your classroom or workshop must work for a variety of different needs, projects, and workflows, and learning styles. Because of this, it's vital that these spaces are efficient, safe, and productive. Ideally, your workshop or classroom should empower everyone to thrive and create.

Throughout this challenge, students will develop manufacturing logistics and inventory skills. They will identify areas of organization improvement through partnering with stakeholders to understand their needs and developing creative solutions.

If multiple students or small groups identify similar areas for improvement, help facilitate the selection process to avoid redundancies or interruptions. Alternatively, have students or groups develop and pitch possible solutions, then have the class, or a stakeholder, select one solution to be fully implemented.

Manufacturers are increasingly using 2D and 3D print technology to develop innovative solutions for organization and workflow. Glowforge is the ideal tool to manufacture physical prototypes and bring organization products to life. Its ability to cut, engrave, and score a range of materials into full products or individual product components makes it great for customizing solutions for your space and workflow.

Standards

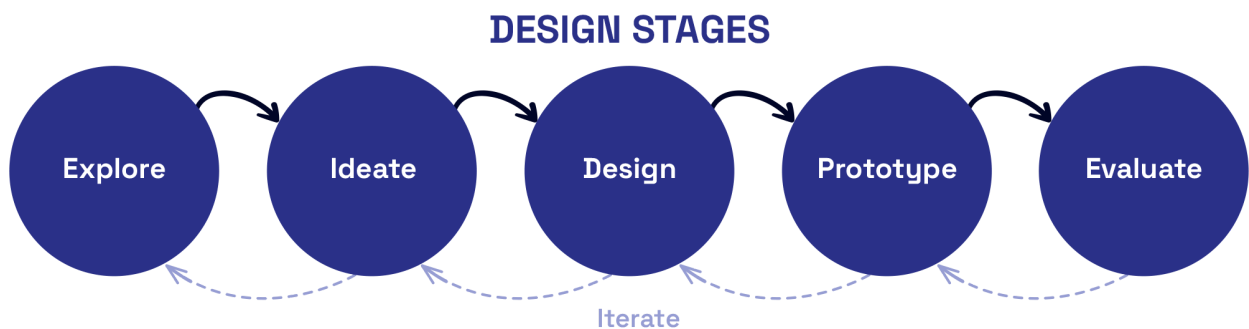
Common Career Technical Core Standards

- MN-LOG 4.1 Monitor location of materials during production process using a prescribed plan.
- MN-LOG 4.2: Monitor placement of station materials to ensure production flow.
- MN-LOG 4.8: Adjust logistic processes and inventory in response to engineering changes.

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 to Support the Design Process



Explore

In this stage, students will research and investigate how logistical manufacturing skills can help identify and solve organization challenges. To ensure that students have the knowledge and skills they need to complete this stage, use the following steps:

1. Determine if there are specific organization or shop guidelines that the students need to follow. This could mean connecting with school or district administrators, reviewing building or CTE guidelines, or other local processes. Share specifications or documentation with your students.
 - Curate documentation templates, formats, or guidelines that students should follow. Share any examples with students so that they can follow specifications.
2. Provide students with resources and guidance on identifying needs and how they impact stakeholders. Consider using the following resources to support your students:
 - Teach students the principles of [empathetic design](#) and discuss why it's important when reorganizing the workshop spaces and processes.

- Introduce the concept of [problem statements](#) to your students. This will help them determine the needs of their stakeholders and could be used to guide the rest of the design process.
 - Participate in the conversation about stressors or pain points in the workshop. You do not need to facilitate or dominate the conversation, but, as a stakeholder, be sure to share any challenges that you experience or witness so that the students' may resolve the issues.
3. Provide students with question prompts from the Explore stage of the challenge to inspire their research and help them consider concepts of workshop organization designs.
 4. 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 identifying stakeholder needs and existing organizational products. Encourage them to consider if there are any options that may be suitable for your workshop or that sparked their interest.

Before moving on, students should consider if there are any other resources or manufacturing techniques that would be helpful to explore. Once they are finished, students will continue to the Ideate stage where they will brainstorm the needs of your workshop and possible solutions that they could create.

Ideate

In this stage, students will take what they learned in the Explore stage and brainstorm and experiment with different ideas for improving workshop organization and processes. This stage allows students to explore as many ideas as possible without judgment. Remind students to focus on understanding the needs of the people who regularly use the workshop. 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.
3. Identify which challenges or workshop areas the students plan to address. Ensure that multiple individuals or groups are not working on the same issues as this could lead to competing solutions. Here are some options to consider:
 - Create a signup sheet with specific areas around the workshop or classroom.

- Have students interested in the same workshop area develop pitches for stakeholders.

At the end of this stage, students will have generated multiple ideas for workshop organization solutions and be able to narrow their focus in order to develop a design that improves manufacturing organization, safety, or processes.

Before moving on, students should consider which ideas will have the greatest impact for the workshop. 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 solving the organizational challenge. Students should focus on one or two ideas to better understand their needs and final design before printing. Encourage students to consider how their design will impact the people and materials in the workshop. To ensure that students have the knowledge and skills they need to complete this stage, use the following steps:

1. Use question prompts from the Design stage to help them design their solutions.
2. Model how to use your Glowforge in a safe and efficient manner.
 - Review [Glowforge safety guidelines](#).
 - Use this [video](#) to demonstrate how to use Glowforge.
 - Remind students of any applicable classroom or school policies.
 - Review the [Glowforge Community Forum](#) or page 25 in the [Glowforge Educator Guide](#) for tips and tricks for scaling designs.
 - Explore [this guide](#) to learn more about printing joinery. Check out how to create a living hinge with the help of [Glowforge TV](#) or the [Glowforge Community](#).
3. Assist students as they create sketches or digital mockup of their solution. Consider having students use CAD software like [SketchUp](#) or [AutoCAD](#) to create detailed 2D and 3D designs.
4. Assist students as they develop documentation for their solution and any accompanying manufacturing processes.

At the end of this stage, students should have a detailed plan for their design, including sketches, models, or digital mockups, as well as any necessary accompanying documentation.

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 manufacture a physical, printed design. Students will select one of their fully developed plans, print necessary elements on the

Glowforge, and test their techniques. To ensure that students have the knowledge and skills they need to complete this stage, use the following steps:

1. Model how to use Glowforge in a safe and efficient manner.
 - Review the [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.
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 the Glowforge elements of their design, assemble their pieces, and test the elements of their design within the workshop.
 - 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.
4. Facilitate a self-check or peer-review process for any accompanying documentation based on your workshop or school guidelines.

At the end of this stage, students will have a finished solution that's ready to be tested with their peers and stakeholders in the workshop using their accompanying documentation.

Before moving on, students should review their finished organizational solution to ensure it aligns to their problem statement and helps solve the stakeholder problem. 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 solution.

Evaluate

In this stage, students will evaluate their organizational solution and receive feedback from others such as their peers or stakeholders. 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 problem statement. 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 organizational solution.
2. Encourage students to demonstrate their solution and share their documentation with peers or stakeholders. Students will share their ideas to generate feedback and suggestions from their peers to refine and enhance their organizational solution.
 - Students can use the question prompts from the Evaluate stage to guide their discussions.
 - Use a peer feedback model, such as a gallery walk, 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 or documentation?

- If making additional changes to your design, 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 organizational solution and documentation. Students should determine whether revisions are needed and return to the appropriate stage in the design process to adjust their concept. Consider assessing student work using one of the Assessment Suggestions or extending the challenge using provided Extension Activities.

Supplemental Supports

- 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.
- Adam Savage from Mythbusters created a video series about workshop organization. Share all or some of the following with students to help spark inspiration:
 - [Workshop Hardware Storage](#)
 - [Material Storage Improvements](#)
 - [Additional videos](#)
- For students who are stuck or would like to adapt an existing Glowforge Catalog design, share organization designs from the [Glowforge Catalog](#) or [Community](#):
 - [Drill bit organizer for the shop](#)
 - [Drawer organizers](#)
 - [Tool box with removable tray](#)
 - [Chest of Drawers](#)
 - [Small parts organizer](#)
 - [Battery organizer](#)
 - [Multi-purpose organizational chart](#)
 - [Pegboard screwdriver and bit organizer](#)
 - [Transport caddy](#)

Assessment Suggestions

Overall Learning Reflection

Learning reflections allow students to reflect on their learning 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 how they approach problems, inefficiencies, or organization in the future. 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 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?
- Stakeholder needs: How well did I meet my stakeholders' needs?
- Process or solution documentation: How well did I document and share any new manufacturing processes?

Educator or Peer Assessment

Educator or peer assessments allow educators or students to review the quality and effectiveness of the finished organizational solution. The assessment can be based on specific criteria, such as the effectiveness of the solution, or use a more open approach like short demonstrations. Some criteria to consider may include:

- Problem statement and identification: Did the student identify and develop a strategy for solving an authentic stakeholder problem?
- Problem solving solution: Did the design improve or solve an organizational challenge?
- Documentation: Did the student create accompanying documentation that supports the organizational solution?

Extension Activities

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

- Workshops aren't the only places that benefit from being organized. Have students reach out to other teachers around the school or local organizations to develop solutions for their spaces. Encourage them to spend time observing the spaces, interviewing the people affected, and crafting customized designs that help solve their problem.
- Help students become members of the thriving Glowforge Community. Submit students' designs to the [Glowforge Catalog](#) or to the Glowforge Community's [Free Laser Design](#) board so that others can benefit from their creativity and problem solving skills.

If your students enjoyed this challenge, they might also enjoy [Shrink-o-matic Challenge](#), a design challenge within the Manufacturing series where students develop a scaled version of a design.

Ready to take students to the next level? Try the Capstone Challenge [Sustainable Strategies for Circular Design](#), where students apply their manufacturing skills to manufacture a sustainable product.