**Lesson 2**  **Technical Drawing (Art)**

**Problem statement:**

How do engineers work together to solve design challenges?

**Learning objectives:** Students will design a 3-dimensional package by making a drawing to meet the design requirements.

**Lesson standards (NGSS, CCSS, CTE): Visual Arts and NGSS**

VA.1.1 Generate and conceptualize artistic ideas and work.

VA.1.2 Generate and conceptualize artistic ideas and work.

VA.2.1 Organize and develop artistic ideas and work .

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Soft skills:**

Critical Thinking, Creativity and Collaboration

Students will work collaboratively to brainstorm and plan collectively to create a product that is innovative and meets the design specifications.

**Connections to career and educational pathways:**

Students will get an opportunity to work with the A component of the STEAM field. Realizing that there are careers in this field that require art, and creativity. Students can be engineers and work with CAD programs or graphic designers.

**Materials:**

-Examples of packing boxes of different shapes, sizes and for different purposes. (KEEP boxes from Lesson 1)

-Design specifications and Requirements

-Graph paper to draw/sketch

-Plastic egg

**- Copies of Shapes examples** for each group (Appendix A)

**Lesson preparation:**

Copy shape examples for each group

Dedicate spot in classroom for groups to keep drawings and prototypes in the future

**Time required:**

One 60-minute lesson

**Grouping of students for instruction:**

Students will be in their project groups

Roles:

**Engineer(s)** -in charge of experimentation of layering, folding, and bending materials to see which ones fit best for the purpose of protecting the package

**Graphic Design Artist(s)** -will decide how to use the packaging materials so that the package is aesthetically pleasing.

**Program Manager** -will keep track of time, make sure that everyone is doing their share of the work, lead the team in research and investigations

**What is the instruction?**

Students need to be able to identify the harm.

- “What happens if you don’t succeed?”

-“What happens if your package isn’t accessible to all?”

-”What happens if your egg does not make it safely to its location?”

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| **Teacher** | **Student** |
| **Introduction: 1 minute video-** Xbox Adaptive Controller - Accessible Packaging  <https://www.youtube.com/watch?v=8hWft3fUWTY>  Begin by showing the 36 second video of how the X-Box, packaging opens, so kids can see the “Gold Standard” | Students watch |
| **Discussion: 5 minutes**  Go back to the video.  Pause at 0:03- “What do you notice about how the exterior package is created?”  Follow up questions:  “Why do you think it isn’t colorful?”  “Why do you think it has those inside boxes?” | Possible answers:  -I noticed it’s made out of regular cardboard. (It’s less expensive, less carbon footprint)  -I noticed that it has boxes inside the box. (to take up space, for extra protection, to meet length requirements |
| Pause at 0:21  “What do you notice about the second package?”  Follow up question:  “Why do you think the designers add that function?” | -It has tabs to make it easy to open  -It has holes for things to sit in  -It has multiple layers |
| **Introduce Lesson’s purpose**  Today you’ll be drawing a 3-D model of your package to help protect your egg’s travel.  We’ll be thinking about how engineers work together to design possible solutions for their projects.. | **Introduce Lesson’s purpose**  Today you’ll be drawing a 3-D model of your package.  We’ll be thinking about how engineers work together to design possible solutions for their projects.. |
| **Practice Drawing 3-D figures:** 10 minutes  Use example in Appendix A. or Video: How to Draw Rectangular Prism Step by Step for Kids  <https://www.youtube.com/watch?v=4g1bnxwjzKA> | Students practice drawing 3-D models from different perspectives. |
| **Remind Students of the design Requirements.**  Remind students of the general size of the egg and specific package requirements determined in Lesson 1. | Students should have a copy of the requirements to refer to when designing. |
| **Time to design!** 40 minutes  Students now it’s your turn to draw a 3-D model of a package that meets your design requirements. | Students work independently or as a group on a 3-D model and agree on 1 version to use going forward in their plan.  \*Iterations can be made in the future, having students save ideas could potentially be useful for those future iterations. |
| Wrap up: 4 minutes  Now think what materials might you want to use? | Students should brainstorm materials. Outloud or in writing |

**Extensions:** Consider using a digital design tools for students who struggle to create their work by hand or want a different way to demonstrate their idea.

**Assessment:**

Formative Assessment in the Lessons: Check on students during the practice drawing to give support to help them be successful in the creation of their 3-D model.

**References/Resources:**

Introduction Video: <https://www.youtube.com/watch?v=8hWft3fUWTY>

Drawing Video: <https://www.youtube.com/watch?v=4g1bnxwjzKA>

*Appedix A:*





