WISELearn Resources

Career Academy Teacher Externship Program

Title: Forging using a 3D Printer

Author: Todd Taylor

Externship Business: Walker Forge

Overview / Description:

In an earlier lesson, students learned about the steel making and forging process. In this lesson, students will create a die using a 3D printer and then forge a part using play-dough. The lesson culmination will be a trip to the local business "Walker Forge" located in Clintonville, WI.

Subject(s):

STEM

Grade Level(s):

Grades 5-8

Learning goals/objectives:

After completing this activity, students should be able to:

- Use a 3D printer to design, create, and explain a die used in the steel forging process.

Type of Activity:

- ✓ Individual
- ❑ Small Group
- ✓ Whole Class

Teaching Strategies:

- ✓ Discussion
- ❑ Partner work
- ✓ Use of Technology
- ❑ Role Playing
- ✓ Simulation
- ✓ Performance Assessment

Content Standards

Wisconsin Standards for Science

Crosscutting Concept: Cause and Effect

SCI.CC2.m - Students classify relationships as causal or correlational, and recognize correlation does not necessarily imply causation. They use cause and effect relationships to predict phenomena in natural or designed systems. They also understand that phenomena may have more than one cause, and some cause and effect relationships in systems can only be explained using probability.

Science and Engineering Practices: Asking Questions

SCI.SEP1.A.m

- Students ask questions to clarify or refine a model, an explanation, or an engineering problem.
- Students ask questions that require sufficient and appropriate empirical evidence to answer.
- Students ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations

Model Academic Standards for School Counseling

Academic Development Domain

Content Standard C: Students will understand the relationship of academics to the world of work, and to life at home and in the community.

- Core Performance Standard 1: Understand how to relate school to life experience

Length of Time and length of class periods:

2 Class periods (3D Printing every student's die could take several days)

Materials List:

- 3D Printer
- 3D Software Program (Tinkercad)
- Computers with access to 3D software for each student
- Playdough press (acts as forging press)
- https://www.youtube.com/watch?v=MDTVAU68qF8 (Die Making Video)
- Several 3D printed part examples
- https://www.youtube.com/watch?v=dMt1tqDI1nM (Forging Press)
- 3D Printer and Die Forge Rubric

Directions (Step-by-Step):

1. Present Die Making Video https://www.youtube.com/watch?v=MDTVAU68qF8
2. Introduce students to the outcome that they will be creating their own dies using a 3D Printer.
3. Show students the 3D Printer and also show them several parts created by the 3D printer.

4. Have students log into the Tinkercad program. For those not familiar with the Tinkercad program, here's a handy tutorial: https://youtu.be/6SuV5VoAJl0
5. Demonstrate to students how to create their own dimensions.
6. Explain to students that they will be designing their own die and that they are also going to turn in their "blueprint."
7. Explain to students that the the world of science utilizes the metric system and that our blueprints will be created using centimeters.
8. Once students are finished designing their blueprint, have them turn in their design. They will need to save their digital design as a .stl document.
9. Since a 3D object can take hours to print, students will need to print these dies on their own time.
10. Once all of the dies have been printed, hand them back to the students and show them the forging press video: https://www.youtube.com/watch?v=dMt1tqDI1nM
11. Show students the play dough forging press.
12. Have students roll the dough into steel billets (explain what a billet is).
13. Have students line up at the forging press and have them forge their parts.

Wrap-Up:

Share the dies and forged parts.
Take a tour of the local forging business - "Walker Forge" will be the destination for our class.

Formative/Summative Assessment:

Finishing the blueprint and forging their parts will be a summative assessment assessed using the attached rubric.

Extension Activity for differentiation:

- Ensure to check IEPs for students that may have unique needs.\
- Have a representative from a forging company visit the class either during the blueprint process to offer feedback or after the students have "forged" their Playdough parts to provide feedback on their products.

OER Commons License:

NAME _____

DATE _____

HOUR _____

RUBRIC
3D Printer Die and Forge

Directions: Create a 3D blueprint of a die that will be used to forge a piece of play-dough. Once the blueprint is complete, hand in the digital copy to the teacher who will then print the 3D die. At a later class date, your die will be used to forge a piece of play-dough.

	Yes (2) Somewhat (1) No (0)
Blueprint is labeled in cm	
Blueprint is handed in on time	
Apparent effort	