3D Design and Printing

Content Area: STEAM
Course(s): STEAM
Time Period: MP2
Length: 3 weeks
Status: Ongoing

Big Idea

In the new economy, goods will be deliverable and producible on demand. Students will learn how to measure, design, and manufacture goods and items using physical and digital tools. Students will follow step-by-step tutorials to learn the basics of one of the most ubiquitous 3d design websites: Tinkercad. Students will recreate objects to scale based on sketches or physical measurements. Students will design their own shapes, objects, and widgets and share their designs. Finally, students will continually sharpen their skills by designing and testing projects of various types throughout the year.

Enduring Understanding

Students will understand the following: how to measure and convert inches, millimeters, feet, and meters; how to use digital calipers to take precise measurements of various objects; how to manipulate objects in a 3D plane for design purposes; how to operate 3D slicer software and 3D printer hardware; how to prototype and test an idea by creating various physical models; how to express complex physical shapes through a variety of basic shapes and permutations.

Skills

SWBAT measure an object with various physical tools
SWBAT convert inches, centimeters, and millimeters
SWBAT convert feet to meters and vice versa
SWBAT perform basic functions on Tinkercad
SWBAT perform intermediate to advanced functions on Tinkercad
SWBAT import and integrate image or text files in their designs
SWBAT create model files in 3D slicing/printing software
SWBAT print and troubleshoot technical issues on 3D printing hardware
SWBAT create 3D designs that adhere to appropriate scales and resolutions

Standards

1. **Empowered Learner:** *Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.*
1d: Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.
3. **Knowledge Constructor:** *Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.*
3d: Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.
4. **Innovative Designer**: *Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.*
4a: Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
4b: Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.
4c: Students develop, test and refine prototypes as part of a cyclical design process.
4d: Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
7. **Global Collaborator:** *Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.*
7a: Students use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning.
7b: Students use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints.
7c: Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.

7d: Students explore local and global issues and use collaborative technologies to work with others to investigate solutions.

Assessments

Tinkercad Basics Quiz
Tinkercad Intermediate Skills Project
Cura & Lulzbot Performance Assessment
Design Project(s): Project Rubrics

Resources/Instructional Materials

https://www.tinkercad.com/
https://www.tinkercad.com/learn
STEAM Activities: Curriculum Ideas
www.makercase.org

Modifications

- Individual accommodations per IEP
- Additional support // Peer-tutoring placement
- Adapting lessons to meet various learning styles
- Struggling students may use a calculator
- Students will be given scaffolded definitions for terms
- Enrichment Challenges

Integration of 21st Century Skills

Focus on the development of 21st Century Content Skills:
- Global awareness
- Environmental literacy

Focus on the Development of Learning and Thinking Skills:
- Critical Thinking and Problem Solving Skills
- Communication Skills
- Creativity and Innovation Skills
- Collaboration Skills
- Contextual Learning Skills

Focus on the Development of Life Skills:
- Leadership
- Accountability
- Adaptability
- Personal Productivity

- Personal Responsibility
- People Skills
- Self Direction
- Social Responsibility

Interdisciplinary Connections

- Academic and Technical Rigor - Projects are designed to address key learning standards identified by the school or district.
- Authenticity - Projects use a real-world context (e.g., community problems) and address issues that matter to the students.
- Applied Learning - Projects engage students in solving problems calling for competencies expected in high-performance work organizations (e.g., teamwork, problem-solving, communication, etc.).
- Active Exploration - Projects extend beyond the classroom by connecting to community explorations.
- Adult Connections - Projects connect students with the wider community.
- Assessment Practices - Projects involve students in regular, performance-based exhibitions and assessments of their work; evaluation criteria reflect personal, school, and real-world standards of performance.