

Lesson Plan: Introduction to Tinkercad

Grade: 7-8

Subject: Integrated Math, Science, and Visual Arts

Lesson Topic: Introduction to 3D Design and CAD for Grade 7 & 8 Students

Length of Lesson: 90 minutes

Curriculum Expectations:

Grade 7 Curriculum Expectations

- **Mathematics:**
 - **E1:** Apply an understanding of geometric properties to construct 3D objects from 2D views.
 - **E2.1:** Solve problems involving surface area and volume of right prisms and cylinders.
- **Science (Strand A - STEM Skills and Connections):**
 - **A1.1:** Use a scientific research process to investigate and create 3D models.
- **Science (Strand D - Form, Function, and Design of Structures):**
 - **D2.1:** Classify structures as solid, frame, or shell structures.
 - **D2.6:** Identify the factors that determine material suitability for constructing a structure.
- **Visual Arts:**
 - **D1.1:** Create art using traditional forms and media technologies to express ideas.
 - **D1.3:** Use elements of design to communicate ideas and messages.

Grade 8 Curriculum Expectations

- **Mathematics:**
 - **E1:** Analyze 3D objects and apply geometric principles in design tasks.
 - **E2.2:** Solve problems involving the volume and surface area of composite 3D objects.
- **Science (Strand A - STEM Skills and Connections):**
 - **A1.2:** Apply the engineering design process to develop solutions to a problem using CAD.
- **Science (Strand D - Structures and Mechanisms):**
 - **D2.2:** Design and build models of structures and systems, and test their effectiveness in solving specific problems.
- **Visual Arts:**
 - **D1.2:** Demonstrate an understanding of composition by applying principles of design in artworks.
 - **D1.4:** Solve complex design challenges using various tools and media.

Learning Goals:

- Students will understand the basics of 3D design and CAD (Computer-Aided Design).
- Students will learn how to create simple 3D objects using Tinkercad.
- Students will explore the applications of CAD in various careers and fields.
- Students will connect geometric and structural concepts to their designs.

Success Criteria:

- Students can create a basic 3D object using Tinkercad.
- Students can describe how CAD is used in different careers and industries.
- The final design demonstrates an understanding of geometric properties, stability, and structural design.
- Students can evaluate and refine their designs based on feedback.

Prior Knowledge:

- Basic understanding of geometry and 2D shapes.
- Familiarity with using digital tools and technology for creating simple drawings or models.

Materials/Resources:

- Computers or tablets with internet access
- Tinkercad accounts for each student
- Rulers and graph paper (optional, for initial sketches)
- Projector or screen for demonstrations

Lesson Sequence:**Introduction (10 minutes):**

1. **Discuss the Importance of 3D Design and CAD:**
 - Introduce the concept of CAD (Computer-Aided Design) and its significance in various careers such as engineering, architecture, product design, and manufacturing.
 - Show a brief video or presentation that highlights the use of CAD in real-world applications.

2. Explain the Learning Goals:

- Outline the goals for the lesson: understanding basic 3D design, creating a simple 3D object in Tinkercad, and exploring the role of CAD in different fields.

Step 1: Introduction to Tinkercad (15 minutes):

1. Overview of Tinkercad:

- Provide an introduction to Tinkercad, explaining that it is a beginner-friendly, web-based CAD tool used for creating 3D models.

2. Navigating the Interface:

- Demonstrate how to navigate the Tinkercad interface, including how to start a new project, access the shapes library, and use basic tools for creating and modifying shapes.

Step 2: Creating a Simple 3D Object (25 minutes):

1. Guided Demonstration:

- Guide students through the process of creating a simple 3D object, such as a basic keychain or cube with a name engraved on it.
- Show how to use the basic shapes (e.g., box, cylinder) to construct the object and how to modify dimensions, position, and orientation.

2. Hands-On Practice:

- Allow students to experiment with creating their own 3D object, encouraging them to explore different shapes and tools in Tinkercad.
- Provide support and guidance as needed, ensuring students understand how to use the tools effectively.

Step 3: Exploring CAD Applications and Careers (15 minutes):

1. Discussion of CAD Applications:

- Discuss the various applications of CAD in different careers, including engineering, architecture, product design, and animation.
- Highlight the importance of CAD in designing complex structures, products, and systems.

2. Interactive Exploration:

- Encourage students to explore how CAD is used in a career they are interested in, either through a brief online search or a prepared resource.
- Ask students to share what they discovered about the role of CAD in that career.

Step 4: Reviewing and Refining Designs (15 minutes):

1. Peer Review and Feedback:

- Organize a peer review session where students can share their 3D designs with classmates.
- Encourage constructive feedback, focusing on the design's functionality, aesthetics, and adherence to geometric principles.

2. Refining the Design:

- Allow students time to refine their designs based on the feedback they received.
- Discuss how the changes improve the design's stability, appearance, or usability.

Step 5: Reflection and Discussion (10 minutes):

1. Reflect on the Learning Process:

- Ask students to reflect on what they learned about 3D design, CAD, and its applications in different careers.
- Discuss the challenges they faced and how they overcame them.

2. Share Final Thoughts:

- Encourage students to share their final designs with the class and explain how they applied what they learned to their project.
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Differentiated Instruction:

- **Visual Learners:** Use visual examples and demonstrations to explain CAD concepts and Tinkercad tools.
 - **Kinesthetic Learners:** Provide hands-on practice with Tinkercad, allowing students to explore the software through trial and error.
 - **Advanced Learners:** Challenge students to create more complex designs or to explore additional Tinkercad features such as importing SVG files or using shape generators.
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Assessment:

- **Formative:** Monitor student engagement and understanding during the introduction and hands-on practice, providing feedback as needed.
 - **Summative:** Evaluate the final 3D designs based on creativity, functionality, and application of geometric and structural concepts.
 - **Reflection:** Assess students' reflections on their learning process and their understanding of CAD applications in different careers.
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Next Steps:

- **Extension:** Encourage students to design a more complex 3D object using Tinkercad, integrating multiple shapes and advanced tools.
- **Follow-up:** Introduce students to other CAD software or design challenges that build on the skills learned in this lesson.