COURSE: Discovery of 3D Design Using Tinkercad

Designed for learners in Grades 3-5.

COURSE DESCRIPTION

Young learners answer the questions "What is Tinkercad?" and "How does it work with 3D Printing?" Students will learn how to build and modify designs through Tinkercad and use Thingiverse to download items for print.

LESSON SEQUENCE AND LEARNING TARGETS

Lesson One: Design Tools

- ❏ I can navigate Tinkercad to change the workspace and use different design tools.

Lesson Two: Make a Signature

- ❏ I can navigate Tinkercad to change the workspace and use different design tools.
- ❏ I can create a 3D signature.

Lesson Three: Modeling

- ❏ I can use Tinkercad to design an object to print at full scale.
- ❏ I can search and modify an object already found in Tinkercad.
- ❏ I can use Tinkercad to model an object found in the real world.

Lesson Four: Modifying Designs

- ❏ I can search and modify an object already found in Tinkercad.
- ❏ I can begin to ideate a design of an object that could solve a real-world problem.

Lesson Five: Design a Stamp

- ❏ I can create a detailed blueprint and sketch of a design solution.

Lesson Six: Mirroring

- ❏ I can use the Engineering Design Process to develop and build a personal stamp.
- ❏ I can mirror an image.

Lesson Seven: 3D Printers

- ❏ I can label the parts of a 3D Printer.
- ❏ I can brainstorm and organize ways that 3D Printing can solve a real-world problem.

Lesson Eight: CAD Applications

- ❏ I can understand 3D printing applications.
- ❏ I can identify and define a design that solves a problem using CAD software.

Lesson Nine: Prepare for Print

❏ I can choose the best orientation of a model for 3D printing.
❏ I can calculate the cost of a 3D print.

Lesson Ten: Time to Reflect

❏ I can test a product solution.
❏ I can reflect on my design and my development experience and suggest improvements.
❏ I can share my results.

COURSE OVERVIEW AND PACING GUIDE

Lesson Title	Learning Targets	Materials Needed	Pacing (55-60 min.)
Design Tools	❏ I can navigate Tinkercad to change the workspace and use different design tools.	- Computers or Tablets with Internet Connection - Tinkercad Classrooms available on teacher's laptop - Tinkercad Keyboard Shortcuts sheets (1 per student)	**Engage**: Pique Interest and Prior Knowledge (5 min.) **Explore**: 2D and 3D Shapes and Tinkercad (10 min.) **Explain**: Tinkercad Workspace (10 min.) **Elaborate**: Design with Tinkercad (30 min.) **Evaluate**: Learning Review (5 min.)
Make a Signature	❏ I can navigate Tinkercad to change the workspace and use different design tools. ❏ I can create a 3D signature.	- Computers or Tablets with Internet Connection - Tinkercad Classrooms available on teacher's laptop - Tinkercad Keyboard Shortcuts sheets (1 per student)	**Engage**: Pique Interest and Prior Knowledge (5 min.) **Explore**: Tinkercad Workspace (10 min.) **Explain**: Shapes - Text and Numbers (10 min.) **Elaborate**: Design 3D Signature with Tinkercad (30 min.) **Evaluate**: Learning Review (5 min.)

		- Classroom whiteboard and markers	
Modeling	❏ I can use Tinkercad to design an object to print at full scale. ❏ I can search and modify an object already found in Tinkercad. ❏ I can use Tinkercad to model an object found in the real world.	- Computers or Tablets with Internet Connection - Tinkercad Classrooms available on teacher's laptop - Tinkercad Keyboard Shortcuts sheets (1 per student)	**Engage**: Pique Interest and Prior Knowledge (5 min.) **Explore**: Back to Tinkercad (10 min.) **Explain**: Design a Keychain (25 min.) **Elaborate**: Saving 3D Files (10 min.) **Evaluate**: Learning Review (5 min.)
Modifying Designs	❏ I can search and modify an object already found in Tinkercad. ❏ I can begin to ideate a design of an object that could solve a real-world problem.	- Computers or Tablets with Internet Connection - Tinkercad Classrooms available on teacher's laptop - Tinkercad Keyboard Shortcuts sheets (1 per student) -Classroom whiteboard and markers	**Engage**: Pique Interest and Prior Knowledge (5 min.) **Explore**: Back to Tinkercad (10 min.) **Explain**: Search an Object in Tinkercad (10 min.) **Elaborate**: Modify Objects in Tinkercad (20 min.) **Evaluate**: Real-World Objects in Tinkercad and Learning Review (15 min.)

Design a Stamp	❏ I can create a detailed blueprint and sketch of a design solution.	- Computers or Tablets with Internet Connection - Tinkercad Classrooms available on teacher's laptop - Tinkercad Keyboard Shortcuts sheets (1 per student) - Classroom whiteboard and markers	**Engage**: Pique Interest and Prior Knowledge (5 min.) **Explore**: Engineering Design Process (5 min.) **Explain**: Define Criteria and Constraints (5 min.) **Elaborate**: Imagine and Design (40 min.) **Evaluate**: Learning Review (5 min.)
Mirroring	❏ I can use the Engineering Design Process to develop and build a personal stamp. ❏ I can mirror an image.	- Computers or Tablets with Internet Connection - Tinkercad Classrooms available on teacher's laptop - Tinkercad Keyboard Shortcuts sheets (1 per student) - Classroom whiteboard and markers	**Engage**: Pique Interest and Prior Knowledge (5 min.) **Explore**: Engineering Design Process (5 min.) **Explain**: Revisit Previous Lesson (10 min.) **Elaborate**: Mirroring (30 min.) **Evaluate**: Learning Review (5 min.)
3D Printers	❏ I can label the parts of a 3D Printer. ❏ I can brainstorm and organize ways that 3D Printing can solve a real-world problem.	- Computers or Tablets with Internet Connection - Tinkercad Classrooms	**Engage**: Pique Interest and Prior Knowledge (5 min.) **Explore**: Printers (5 min.) **Explain**: Design Process

		available on teacher's laptop - Tinkercad Keyboard Shortcuts sheets (1 per student) - Classroom whiteboard and markers	(10 min.) **Elaborate**: Imagine and Organize Solutions (30 min.) **Evaluate**: Learning Review (5 min.)
CAD Applications	❏ I can understand 3D printing applications. ❏ I can identify and define a design that solves a problem using CAD software.	- Computers or Tablets with Internet Connection - Tinkercad Classrooms available on teacher's laptop - Tinkercad Keyboard Shortcuts sheets (1 per student) - Classroom whiteboard and markers	**Engage**: Pique Interest and Prior Knowledge (5 min.) **Explore**: CAD Applications (15 min.) **Explain**: 3D Printing in the Future (10 min.) **Elaborate**: Solve a Problem Using CAD (25 min.) **Evaluate**: Learning Review (5 min.)
Prepare for Print	❏ I can choose the best orientation of a model for 3D printing. ❏ I can calculate the cost of a 3D print.	- Computers or Tablets with Internet Connection - Tinkercad Classrooms available on teacher's laptop - Tinkercad Keyboard Shortcuts	**Engage**: Pique Interest and Prior Knowledge (5 min.) **Explore**: Create Design (20 min.) **Explain**: Orient and Slicing (15 min.) **Elaborate**: Costing 3D Print (20 min.) **Evaluate**: Learning Review (5 min.)

		sheets (1 per student) - Classroom whiteboard and markers	
Time to Reflect	❏ I can test a product solution. ❏ I can reflect on my design and my development experience and suggest improvements. ❏ I can share my results.	- Computers or Tablets with Internet Connection - Tinkercad Classrooms available on teacher's laptop - Tinkercad Keyboard Shortcuts sheets (1 per student) - Classroom whiteboard and markers	**Engage**: Pique Interest and Prior Knowledge (5 min.) **Explore**: Test Design Solution (10 min.) **Explain**: Testing Solutions (20 min.) **Elaborate**: Improve Design Solution and Share Results (20 min.) **Evaluate**: Learning Review (5 min.)

COURSE PREPARATION

Students will create 3D Designs using Tinkercad. There are 2 options for having students log in to Tinkercad:

Option 1: Student logs in with Class Code and Nickname provided by Teacher
Teacher setup is required.

Teacher Setup Directions:

1. Access Tinkercad Classrooms (https://www.tinkercad.com/teach), by selecting Classes under the profile navigation.
2. If you do not see this feature, please confirm you have identified as a teacher on the Teach page. If you've previously identified as something other than a teacher, you can contact Tinkercad support to have your account corrected.
3. Select "Create new class." You will be prompted to create a name for your class and to then add the grades/ages taught and the subject. Then click on the "Create class" button.
4. Click on the "Add students" button, and add each student's name (anything identifiable to you) and a Nickname that your student will use to enter Tinkercad. Tinkercad will auto-generate a suggested Nickname based on the student name you enter. (You can customize it to anything you or the student prefers.) Click "Save changes" to add the student to the class. Repeat these steps for all students. Click on the "Back to class" button to return to the roster.
5. From the Class Roster page, click on the "Class Code" button to generate a class code that the students will use to access the class.

Option 2: Students log in using their Google Account. - _Teacher setup is not required._

Student Login Directions

1. Direct students to click on the "Sign in" button at the top right of the Tinkercad site.
2. Tell students to click the "Sign in with Google" button and use their information to log in.