

Cell Phone Case Design

Lesson Plan for Grades: 6th – 8th

Length of Lesson: 3 hr 30 min

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Subject area/course: Technology Applications, Engineering

Materials:

- Post-its
- Markers/Pens
- Computers
- Internet
- Rulers
- Protractors
- Graphing Paper

TEKS/SEs:

§126.14, §126.15, §126.15 – Technology Applications

(4) Critical thinking, problem solving, and decision making. The student makes informed decisions by applying critical-thinking and problem-solving skills. The student is expected to:

- (B) plan and manage activities to develop a solution, design a computer program, or complete a project
- (D) use multiple processes and diverse perspectives to explore alternative solutions
- (E) make informed decisions and support reasoning
- (F) transfer current knowledge to the learning of newly encountered technologies

Lesson objective(s):

- Students will design a phone case that can be printed in 3-D. Students will measure a phone to create case dimensions; design their case and create their model in a 3-D modeling program.

Differentiation strategies to meet diverse learner needs:

- The teacher should ask students whether they prefer to read or watch videos to learn about concepts; then have students learn in their preferred learning style. However, the teacher may assign students certain methods to improve their skills. For example, if a student prefers reading, teachers may have them watch a video and take notes to improve their listening skills.
- ELL students and students with learning disabilities should have multiple forms of instruction including visual and written instruction sheets as well as a verbal instruction and demonstration.

ENGAGEMENT (15 minutes)

- Teacher shows the brainstorming video with Judy Lee (www.youtube.com/watch?v=SJkius1KMml or www.engineeryourlife.org/cms/6196.aspx)
- Teacher highlights main steps in brainstorming process (defer judgement, build on ideas of others, be visual, encourage wild ideas & go for quantity).

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- Students are divided into teams of 4-5 and will have 10 minutes to come up with as many for designing a new cell phone case. Ideas can be sketched or written out in post-its.
 - Teachers should encourage students to follow the brainstorming rules.
 - Teachers should ask open ended questions to encourage critical thinking (“Why did your team think about adding this feature?”, “What are some of the features you currently like in a cell phone case?”, “What are some of the features you wish a cell phone case had?”).
- Post the different ideas on one side of the classroom and have all the students do a gallery walk to see what others have come up with.
- Teacher introduces the project for this lesson: design a phone case that can be printed in 3-D. Students will measure a phone to create case dimensions; design their case and create their model in a 3-D modeling program.

EXPLORATION (30 minutes)

- Teacher leads a discussion on what are some types of cell phone cases available (cases, wallets, flip cases, with stands, armbands, sleeves). Teacher may want to focus on one specific type of case (standard rectangular case) as a starting point so it may be easier for teams to change the shape or add features to their case.
- Students will work in teams and select a phone type and size. Groups will research in the internet existing cases for that phone.
- Students will then design a phone with something “extra”. Each group will select a new physical feature they wish to add to a cell phone case (for example a pencil holder, a loop to attach keys, etc.)
 - Teacher walks around questions about their research (“Which phone type did you pick?”, “What is the feature that you wish to add to your case?” “What are some basic shapes you can use to create the shape?”).
 - Teacher listens to student ideas as they talk to each other.

EXPLANATION (30 minutes)

- Teacher facilitates discussion regarding cell phone case design. Ask open ended questions like:
 - To create a cell phone case, what measurements do we need? (Height, width, length).
 - What other features do we need to worry about (camera holes, speakers, headphone jack, etc.)?
 - Are there any special geometric features in your phone (i.e. Samsung edge, etc.)?
 - How do you measure angles?
- Students will continue working in teams to measure the cell phone and determine basic case measurements. Groups can sketch out their basic design in the handout provided using basic measurement tools, including ruler and protractor.
- Teacher will facilitate discussion on how to create complex figures from basic shapes (cylinders, prisms, etc.).
- Groups will then modify their basic cell phone case by adding one additional physical feature they brainstormed in the engagement activity. New feature should also contain exact measurements so it can be draw in 3D modeling software.
- Team designs are posted in a gallery walk. Each team will review at least TWO other groups using the rubric provided.

ELABORATION (2 hours 15 minutes)

- Teams will use Thinkercad to sketch out the 3D model of their cell phone cases. It is recommended that the

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team splits up into two smaller teams so each student has an opportunity to try out Tinkercad:

- Each student (or team) will need to create a user account to Tinkercad.
- For the first part of the activity, it is recommended that students learn how to use the software by completing the following lessons (“Learning the Moves,” “Camera Controls,” “Creating Hole,” “Scale, Copy, & Paste,” and “Die on the Workplane”). Each lesson should take about 5-10 minutes to complete.
- Teams should then design their model in Tinkercad according to the measurements sketched. Projects can be saved and then printed in a 3-D printer (if available).

EVALUATION (throughout)

- Students will be evaluated on their designs during the gallery walk.
 - Teachers ask questions that provide insight into student progress.
 - Teachers observe students as they create products and look for evidence of understanding.

SOURCES AND RESOURCES

- Dr. Carolyn Seepersad’s *Hot Science – Cool Talks* #98, www.hotsciencecooltalks.org
- Brainstorming video with Judy Lee: www.youtube.com/watch?v=SJkius1KMml or www.engineeryourlife.org/cms/6196.aspx
- Tinkercad (www.tinkercad.com) – 3D modeling software available free online (no download or installation required)
- Article “10 ways to get started with 3D printing”:
www.iste.org/explore/articleDetail?articleid=251&category=Toolbox&article=

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ENGAGEMENT ACTIVITY (15 minutes)

Purpose: Students learn the process for brainstorming design ideas

Materials: Post-its, pencils, internet and July Lee video (www.youtube.com/watch?v=SJkius1KMml or www.engineeryourlife.org/cms/6196.aspx)

Safety Information: N/A

Procedure:

- Teacher shows the brainstorming video with Judy Lee.
- Teacher highlights main steps in brainstorming process (defer judgement, build on ideas of others, be visual, encourage wild ideas & go for quantity).
- Students are divided into teams of 4-5 and will have 10 minutes to come up with as many ideas as they can in how to create a new cell phone case. Ideas can be sketched or written out in post-its.
 - Teachers should encourage students to follow the brainstorming rules.
 - Teachers should ask open ended questions to encourage critical thinking (“Why did your team think about adding this feature?”, “What are some of the features you currently like in a cell phone case?”, “What are some of the features you wish a cell phone case had?”)
- Post the different ideas on one side of the classroom and have all the students do a gallery walk to see what others have come up with.

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STUDENT PAGE(S): Exploration Activity

Our team will design a case for _____ cell phone. (Write in the name and model)

Research **THREE** types of cell phone cases available for your phone. Draw a sketch for each one and write out 1-2 important features for each case.

Case #1:

Case #2:

Case #3:

Now, pick one “extra” physical feature you would like to add to a regular cell phone case. Sketch your idea below.

Resources:

- Go to Google or Amazon and do a search using the cell phone type and “cases”.
- Or, take a look at some unique case design on the back page.

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Unique cell phone cases



Chocolate phone cover by
Tomko Empire



3D Mug phone cover by
Vococal



Panda phone cover by
Petagadget



LEGO® phone case by Belkin

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STUDENT PAGE(S): Exploration Activity

Step 1: Sketch out the exact dimensions of your cell phone. Here are some measurements to keep in mind:	
Length	Holes (cameras, speakers, etc.)
Width	Edges (square, rounded)
Height	Special features (i.e. Samsung Edge, etc.)
Step 2: Once your basic case is sketched out, design the additional physical feature you want to add to your case. Be sure to include exact dimensions when creating your new design.	

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STUDENT PAGE(S): Exploration Activity (Design Rubric)

Team: _____

1	2	3	4
Design is missing measurements. Drawing is not clearly labeled. No new features added.	Most parts present and correct. Some measurements are missing or not clearly labeled. No new features added.	Basic cell phone case is clearly labeled with exact measurements. New feature is added but exact measurements not included.	Basic cell phone case is clearly labeled with exact measurements. New feature is added with exact measurements.

Comments:

Questions:

Team: _____

1	2	3	4
Design is missing measurements. Drawing is not clearly labeled. No new features added.	Most parts present and correct. Some measurements are missing or not clearly labeled. No new features added.	Basic cell phone case is clearly labeled with exact measurements. New feature is added but exact measurements not included.	Basic cell phone case is clearly labeled with exact measurements. New feature is added with exact measurements.

Comments:

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Team: _____

1	2	3	4
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Comments:

Questions: