Maker Skill Sprint Cycle: Design Your Own

Use this tool to plan a skill sprint cycle. Determine up front what the focus will be for the cycle and then plan a series of skill sprints to support students' development of affective, skill-based and cognitive objectives. At the end of the cycle, plan a culminating activity in which students to apply their new knowledge and skills to solve an open-ended challenge.

What is the overarching theme for this skill sprint cycle? Take a look at the Organizing Themes section of the Maker-Based Instruction Resource Guide.

How does this skill sprint cycle align with learning objectives for your students?

Affective Learning Objectives:

Skill Learning Objectives:

Cognitive Learning Objectives:

Skill Sprint 1

Skill Sprint 2

Skill Sprint 3

Skill Sprint 4

Skill Sprint Cycle Challenge

SOURCE: Rouse, R., Krummeck, K., Higginbotham & Crum, R. (2018). Extending the reach of academic makerspaces into K-12 schools: Delivering maker-based instruction with a mobile makerspace. *Proceedings of the 3rd International Symposium on Academic Makerspaces (ISAM)*, Stanford, CA.

Maker Skill Sprint Cycle: Chi-Square Test for Independence

Use this tool to plan a skill sprint cycle. Determine up front what the focus will be for the cycle and then plan a series of skill sprints to support students' development of affective, skill-based and cognitive objectives. At the end of the cycle, plan a culminating activity in which students to apply their new knowledge and skills to solve an open-ended challenge.

What is the overarching theme for this skill sprint cycle? Take a look at the Organizing Themes section of the Maker-Based Instruction Resource Guide.

Tools: Laptops and tablets, Microsoft Office

Skills: Teamwork, brainstorming, data collection, presenting

How does this skill sprint cycle align with learning objectives for your students?

Affective Learning Objectives:

Students are engaged in their learning.
Students direct their own learning.
Students are mindful and can communicate their learning.
Students successfully collaborate with others.

Skill Learning Objectives:

Students gain competency with Microsoft Office.
Students gain confidence with presenting.

Cognitive Learning Objectives:

Students collaboratively collect data to conduct a chi-square test for independence and present their findings.

Skill Sprint 1

Microsoft Excel

EXPLORE: Students will be given a physical copy of a spreadsheet, and they will look through it to identify its different components (i.e., tables, calculations/formulas, charts).

SKILL BUILD: Students will view videos on how to create two-way tables, use formulas, and create charts in Excel. I will conduct walkthroughs to address any questions or issue any clarifications.

CHALLENGE: Given a list of data, students will create a two-way table. From that table, students will create at least two different charts (e.g., bar graph, pie chart) and use formulas to calculate the chi-square test statistic.

Skill Sprint 2

Microsoft PowerPoint

EXPLORE: Students will be given access to five different PowerPoints, each with different characteristics (too much writing and no images, too little writing, too many animations/transitions, no transitions, and the "just right"). Students will discuss the differences between them, identify the best one, and describe why that one is the most effective presentation.

SKILL BUILD: Students will view videos on how to add text, adjust animations, and import images into a PowerPoint presentation. I will conduct walkthroughs to address any questions or issue any clarifications.

CHALLENGE: Using the individually constructed explanation and feedback (see Unit Plan), students will create 2 PowerPoint presentations of their explanation using the skills acquired in the Skill Build: one that meets the "just right" criteria they identified, and one that is ineffective. In the Notes section of the PowerPoint, they will explain the differences between them, and why the first PowerPoint is more effective.

Skill Sprint 3

Skill Sprint 4

Students use their laptops and/or tablets equipped with Microsoft Office to create a presentation showing a full chi-square test for independence (see Model Text for a full written example).

Students begin by brainstorming, in pairs, the variables they want to include in their projects. After collecting the relevant data, students will organize the data in a table in Microsoft Excel and create at least two different charts to summarize their data. Once their data is organized, they will continue in Microsoft Excel to calculate the relevant statistics. They will use the relevant functions (e.g., sum, product, quotient) to assist in their calculations. Once completed, each of their tables and charts will be copied into Microsoft PowerPoint.

Once in PowerPoint, students will write their explanation of their process, using the deconstructed and jointly constructed examples to guide them. Students will include animations, transitions, and images to supplement their writing. Once completed, each pair will present their findings to the class.

Skill Sprint Cycle Challenge

Maker Unit Design Tools

Organizing Themes

When developing your maker-based scope and sequence for the year, you can use any of the organizing themes below. By structuring the learning around tools, materials or skills, students will begin to develop their fluency with making by leveraging multiple approaches. Once you have chosen your organizing theme, select the topics within the theme as your unit foci.

Tools

- Crafting tools (scissors, glue, tape, etc.)
- Hot glue gun
- Hand tools (hammer, screwdriver, drill, saw, etc.)
- Power tools (drill, circular saw, etc.)
- Clay oven
- Soldering iron
- Sewing machine
- Vinyl cutter
- Laser cutter
- 3D printer
- CNC router
- CNC mill
- Laptops & tablets
- Graphic design software
- CAD modeling software
- Cameras, video, audio
- Others

Materials

- Paper
- Cardboard
- Tape (duct tape, masking tape, etc.)
- Glues (Elmer's, glue sticks, Super Glue, etc.)
- Crafting supplies
- Office supplies
- Salvaged materials
- Microcontrollers (Raspberry Pi, Arduino, etc.)
- Circuit supplies (solder, wire, LEDs, batteries, motors, etc.)
- Inks, dyes & paints
- Fabrics & fibers
- Wood
- Metal
- Vinyl
- Plastic (acrylic, ABS, PLA)
- Food
- Others

Skills

- Teamwork
- Sketching
- Brainstorming
- Designing
- Measuring
- Modeling & prototyping
- Fastening (adhesives, hardware, knots, etc.)
- Building & fabrication
- Graphic design
- Circuitry & soldering
- Coding
- Welding
- Jewelery making
- Casting
- Robotics
- Woodworking
- Metalworking
- Sewing & weaving
- Carving
- Storytelling
- Others

Maker Unit Design Tools

Challenges and Prompts

Use the challenge areas below when creating an open-ended activity for students to work on solving. Consider the scope and scale of the challenge. The prompts can help you frame the challenge for students.

Possible Challenge Areas

- Shelter
- Water
- Energy
- Animals
- Transportation (moving people; boats, planes, space, etc.)
- Waste & sustainability
- Internet of things
- Automation
- Medical devices
- Musical instruments
- Games & entertainment
- Toys
- Wearables
- Hacking & improving
- Others?

Scope and Scale

Home-based: morning routine, cooking, sleeping, etc.

School-based: lunch, recess, carpool/bus, bathrooms, etc.

Community-based: parks, waste pickup, bus stops, etc.

Industry-based: manufacturing, medical devices, technology, etc.

Globally based: clean water, climate change, disease control, etc.

Prompts

Tool prompts

Use this tool to solve...

Use this tool to invent...

Use this tool to create...

Materials prompts

Use this material to solve...

Use this material to invent...

Use this material to create...

Skill prompts

Use this skill to solve...

Use this skill to invent...

Use this skill to create...

Others

Problem-solving prompts

Solve _____.

Make _____ more _____.

Make _____ less _____.

How might we improve...

How might we increase...

How might we decrease...

How might we (verb that implies change)...

What if...

Can we at least try _____?

Others

Maker Unit Design Tools

Affective Learning Objectives

Affective learning objectives focus on the emotional domain and overlap with social and emotional skills, including values, attitudes and mindsets about ways of learning and working. Use the traits below to isolate particular affective learning objectives you want to focus on as a part of your maker-based activity.

- Students are engaged in their learning.
- Students direct their own learning.
- Students are mindful of and can communicate their learning.
- Students reflect on their progress.
- Students seek and receive feedback and work to improve.
- Students demonstrate self-reliance.
- Students demonstrate resilience.
- Students demonstrate the ability to persevere and overcome when they are stuck.
- Students successfully collaborate with others.
- Students demonstrate the ability to face open-ended, ambiguous problems and actively work to solve them.
- Students seek help and additional resources when they have exhausted their own process of problem solving.
- Students demonstrate curiosity when faced with a tough problem.
- Students demonstrate optimism when faced with a tough problem.
- Students demonstrate a willingness to make changes, fix problems and positively influence the world around them.

Skill-Based Learning Objectives

Skill-based learning objectives focus on skills students acquire that are not specific to a content area. These skills are focused on a particular tool or material or technique. Use the traits below to identify particular skill-based learning objectives you want to focus on for your maker-based activity.

- Students learn a new skill to solve a problem.
- Students gained confidence in the new skill.
- Students gained competency in the new skill.
- Students can apply the new skill to a variety of challenges.
- Students gained confidence using a new material.
- Students gained competency with a new material.
- Students can apply the use of the new material to a variety of challenges.
- Students gained confidence using a new tool.
- Students gained competency with a new tool.
- Students can apply the use of the new tool to a variety of challenges.

Maker Unit Design Tools

Cognitive Learning Objectives

Cognitive learning objectives focus on the thinking domain and overlap with subject area knowledge acquisition and recall as well as higher-order thinking such as application, analysis, synthesis and evaluation. Use the boxes below to isolate particular content areas you want to focus on as a part of your maker-based activity.

Language Art
e.g., Creative Writing, Poetry

Social Studies
e.g., Topography, Historic Shelters and Tools

Math
e.g., Measurement, Geometry

Science
e.g., Habitats, Gravity

Art
e.g., Sculpture, Drawing

Other

Taxonomy for Teaching, Learning and Assessment

Remember	Apply	Evaluate
Understand	Analyze	Create

Maker Skill Sprint: Design Your Own

Use this tool to plan one skill sprint within a cycle. Determine up front the focus of the skill sprint and then plan an activity for each mode of maker-based instruction (exploration, skill-builing and challenge). These activities will support students' developingment of affective, skill-based and cognitive objectives.

What is the organizing theme for this skill sprint cycle?

What is the focus of this skill sprint?

How will I use the Exploration Mode to kick off this skill sprint?

Reference the pink Introduction to the Exploration Mode sheet for ideas.

How will I use the Skill-Building Mode to develop a specific skill in students?

Reference the dark blue Introduction to the Skill-Building Mode sheet for ideas.

How will I use the Challenge Mode to serve as a culmination for this skill sprint?

Reference the light blue Introduction to the Challenge Mode sheet for ideas.

How does this skill sprint align with your overall learning goals for your students?

Affective Learning Objectives:

Skill Learning Objectives:

Cognitive Learning Objectives:

Exploration Mode

Describe how you will use the Exploration Mode to build excitement while tapping into students' prior knowledge and abilities.

Skill-Building Mode

Describe how you will introduce a new skill and build proficiency in that skill during the Skill-Building Mode.

Activities should preserve opportunities for creativity when possible but instruction may be procedural.

Challenge Mode

Describe how you will use the Challenge Mode to encourage students to apply their new skills to solve an open-ended problem.

THE SMU MAKER EDUCATION PROJECT

World Changers Shaped Here SMU

Maker Unit Design Tools: Introduction to the Exploration Mode

The Exploration mode of this maker education framework is designed to launch a unit, build excitement and engagement, and draw on students' prior knowledge to help guide their process of exploring the unit focus.

Activities should be open-ended and student-driven in order to maximize the students' ownership over their own learning. The students' process of exploration should be scaffolded to help them progress while preserving variability and opportunities for experimentation and self-expression whenever possible.

A recommended flow for an Exploration activity is as follows:

- Launch challenge
- Connect to prior knowledge
- Describe workflow & materials control
- Facilitate transitions in the process of learning
- Check for progress
- Facilitate sharing

Teacher's posture

When facilitating an Exploration activity, the teacher is mostly a helpful guide, launching the activity with a specific prompt, facilitating the use of tools and materials, and helping students continue to progress toward a solution or end goal.

When at all possible, teachers should allow students to generate their own ideas and their own solutions to issues and manage their own team dynamics. By facilitating the students through process steps (without focusing on a particular end product), the teacher can help students progress (and ease frustration) while minimizing his or her influence over students' thinking and creativity.

Students' posture

When participating in an Exploration activity, the students should be the primary driver of generating ideas, solving problems, experimenting and overcoming stuck points. Students should be encouraged to take ownership over their exploration of the domain, and seek help first from peers before turning to the teacher.

By creating a truly student-centered (but teacher-facilitated) learning experience, students will build their confidence, ownership and excitement for the topic. This process will create momentum as the students face more complex skill-building tasks.

Exploration Mode: Planning Considerations

Learning Objective Design

- What are the affective learning objectives for this activity?
- What are the skill-based learning objectives for this activity?
- What are the cognitive learning objectives for this activity?
- When will I introduce the cognitive learning objectives in the work flow?
- What are the possible "stuck points" in this activity?
- When do I anticipate students will struggle with technical or conceptual aspects of the activity?
- How might I facilitate students overcoming those "stuck points?"
- What questions might I ask students to help them overcome those "stuck points?"

Pedagogical Design

- What is the prompt for this Exploration activity? Give the students an open-ended activity to structure their exploration around.
- How might I scaffold students directing their own progress and learning?
- What forms of assessment might I use?
- How might I encourage student ownership?
- How might I encourage student participation?
- How might I encourage students to problem solve on their own before seeking help from me?
- How might I encourage students to help each other first before seeking help from me?
- How might I structure a process of giving and accepting feedback to encourage iteration?
- How might I encourage students to reflect on what they are learning?
- How might I encourage students to reflect on how they are learning?

Work Flow Design

- Describe the process steps that will support this activity.
  - How will I launch the activity?
  - How will I connect to students' prior knowledge?
  - How will students generate possible solutions to the prompt?
  - How will students move from their ideas to tangible solutions?
  - How will students progress towards completing the activity?
  - How will I check on student progress?
  - When will I introduce the cogntive learning objectives?
  - Will students work individually or in groups?
  - How will I organize the students' work area?
  - What tools and materials will the students need?
  - Where will tools and materials be located?
  - When will students access tools? How will students access tools? How will I monitor tool use?
  - When will students access materials? How will students access materials? How will I monitor material use?

Maker Unit Design Tools: Introduction to the Skill-building Mode

The Skill-Building mode of this maker education framework is designed to facilitate the development of students' confidence and competence with a particular skill. Instruction during the Skill-Building mode is far more prescriptive than the other two modes.

Activities should be designed to help students with varying degrees of ability to begin to develop mastery of a particular concept, such as CAD modeling. While the teacher may be giving more procedural instructions, he or she is encouraged to design learning experiences to be as hands-on as possible, preserving variability and opportunities for creativity whenever appropriate.

A recommended flow for a Skill-Building activity is as follows:

- Introduce technical skill
- Connect to prior knowledge
- Instruct on skill development
- Check for understanding
- Give more advanced students a task to work on once they have gained initial mastery
- Answer questions and help those who are struggling

Teacher's posture

When facilitating a Skill-Building activity, the teacher plays a far more traditional role – potentially lecturing and providing much more procedural, prescriptive, step-by-step instructions. The teacher maintains tighter command over the class in order to build specific knowledge and skills, check for understanding, and help individual students progress.

When at all possible, teachers should facilitate students to learn by doing. By instructing students using a more prescriptive approach, the teacher can help students progress (and ease frustration).

Students' posture

When participating in a Skill-Building activity, the students will be focused on acquiring new knowledge and skills from their teacher's instruction. Because students have already engaged in the topic in an open-ended activity, hopefully they will have developed an interest in the hard work required to build specific skills.

Skill Building Mode: Planning Considerations

Learning Objective Design

- What are the skill(s) you are hoping to develop in your students during this skill-building activity? What will your students be able to do at the end of this skill -building activity?
- What are the affective learning objectives for this activity?
- What are the skill-based learning objectives for this activity?
- What are the cognitive learning objectives for this activity?
- When will I introduce the cognitive learning objectives in the work flow?
- What are the possible "stuck points" in this activity?
- When do I anticipate students will struggle with technical or conceptual aspects of the activity?
- How might I facilitate students overcoming those "stuck points?"
- What questions might I ask students to help them overcome those "stuck points?"

Pedagogical Design

- How might I preserve opportunities for variability in the lesson? When and how are students given the opportunity to express themselves, generate new ideas and solutions, and pursue their own solutions?
- How might I scaffold students directing their own progress and learning?
- What forms of assessment might I use?
- How might I encourage student participation?
- How might I make this the most hands-on experience possible?
- How might I instruct students in the way most efficient for them to learn and refine the skill?
- How might I answer questions and support students in different stages of development?
- How might I differientate instruction to meet the needs of all students in the classroom?
- How might I encourage students to reflect on what they are learning?
- How might I encourage students to reflect on how they are learning?

Work Flow Design

- How will I introduce the skill?
- How will I connect to students' prior knowledge?
- How will I instruct on the skill?
- How will I check for student understanding?
- How will I engage students with a challenge to work on once they have completed the initial activity?
- Will students work individually or in groups?
- How will I organize the students' work area?
- What tools and materials will the students need?
- Where will tools and materials be located?
- When will students access tools? How will students access tools? How will I monitor tool use?
- When will students access materials? How will students access materials? How will I monitor material use?

Maker Unit Design Tools: Introduction to the Challenge Mode

The Challenge mode of this maker education framework is designed to give students the opportunity to use the new skills they have built in order to solve a problem in a creative way. By using new skills to solve a problem, students will further develop their confidence in themselves as creative problem solvers and they will build mastery in the specific skills they learned during the unit.

Activities should be open-ended and student-driven, in order to maximize the students' ownership over their own learning. This activity should build upon the technical skills the students have built over the course of the unit. By making this activity challenge-based, students will find purpose in the application of their new skills and will draw motivation to solve the problem.

A recommended flow for a Challenge activity is as follows:

- Launch challenge
- Connect to prior knowledge (from this unit and before)
- Describe workflow & materials control
- Facilitate transitions in the process of learning
- Help overcome stuck points
- Check on progress
- Facilitate sharing

Teacher's posture

When facilitating a Challenge activity, the teacher is mostly a helpful guide, launching the challenge with a specific prompt, facilitating the use of tools and materials, supporting the use of new skills and helping students continue to progress toward a solution or end goal.

Teachers should allow students to generate their own ideas and their own solutions to issues and manage their own team dynamics. By facilitating the students through process steps (without focusing on a particular end product), the teacher can help students progress (and ease frustration) while minimizing his or her influence over the students' thinking and creativity.

Students' posture

When participating in a Challenge activity, the students should be the primary driver of generating ideas, solving problems, experimenting and overcoming stuck points. Students should be encouraged to take ownership over their solutions, and seek help first from peers before turning to the teacher.

By creating a truly student-centered (but teacher-facilitated) learning experience, students will build their confidence in their newly acquired skill while developing their identities as creative problem solvers. The application of this new skill to solve a problem or meet a challenge will serve as the culmination of the process of learning for this unit.

Challenge Mode: Planning Considerations

Learning Objective Design

- What are the affective learning objectives for this activity?
- What are the skill-based learning objectives for this activity?
- What are the cognitive learning objectives for this activity?
- When will I introduce the cognitive learning objectives in the work flow?
- What are the possible "stuck points" in this activity?
- When do I anticipate students will struggle with technical or conceptual aspects of the activity?
- How might I facilitate students overcoming those "stuck points?"
- What questions might I ask students to help them overcome those "stuck points?"

Pedagogical Design

- What is the prompt for this Challenge activity? Give the students an open-ended challenge to solve.
- How might I preserve opportunities for variability in the lesson? When and how are students given the opportunity to express themselves, generate new ideas and solutions, and pursue their own solutions?
- How might I scaffold students directing their own progress and learning?
- What forms of assessment might I use?
- How might I encourage student participation?
- How might I encourage students to help each other?
- How might I encourage students seeking other resources before seeking help from me?
- How might I answer questions and support students in different stages of development?
- How might I differientate instruction to meet the needs of all students in the classroom?
- How might I structure a process of giving and accepting feedback to encourage iteration?
- How might I encourage students to reflect on what they are learning?
- How might I encourage students to reflect on how they are learning?

Work Flow Design

- How will I launch the challenge?
- How will I connect to students' prior knowledge?
- How will students generate possible solutions to the challenge?
- How will students move from their ideas to tangible solutions?
- How will students progress towards completion of the challenge?
- How will I check on student progress?
- When will I introduce the cogntive learning objectives?
- How will students get feedback on their solutions?
- How will students iterate on their solution to improve it?
- Will students work individually or in groups?
- How will I organize the students' work area?
- What tools and materials will the students need?
- Where will tools and materials be located?
- When will students access tools? How will students access tools? How will I monitor tool use?
- When will students access materials? How will students access materials? How will I monitor material use?

Maker Skill Sprint Cycle: Earth's Four Seasons

Use this tool to plan a skill sprint cycle. Determine up front what the focus will be for the cycle and then plan a series of skill sprints to support students' development of affective, skill-based and cognitive objectives. At the end of the cycle, plan a culminating activity in which students to apply their new knowledge and skills to solve an open-ended challenge.

What is the overarching theme for this skill sprint cycle? Take a look at the Organizing Themes section of the Maker-Based Instruction Resource Guide.

Theme: To understand Earth's four seasons through sketching and physical modeling

Materials: Paper; pencils; assorted styrofoam, yarn, sticks, etc.

Skills: Sketching, physical modeling

How does this skill sprint cycle align with learning objectives for your students?

Affective Learning Objectives:

Students are engaged in their learning.
Students reflect on their progress.
Students seek and receive feedback and work to improve.

Skill Learning Objectives:

Students gain confidence in a new skill.
Students gain competency in a new skill.

Cognitive Learning Objectives:

Students understand the how the Earth's axis and its position in relation to the sun lead to four seasons.

Skill Sprint 1

SKETCHING

Explore:
Video

Skill Building:
Group discussion and peer assessment

Challenge:
Sketching a sphere with a shadow

Skill Sprint 2

BUILDING PHYSICAL MODELS

Explore:
Video

Skill Building:
What needs to be included in a model

Challenge:
Building a physical model of Earth with a visible axis

Skill Sprint 3

Skill Sprint 4

Skill Sprint Cycle Challenge

MODELING THE FOUR SEASONS

Students will individually sketch a diagram of the four seasons, labeling the Earth and its axis in four different positions around the sun. Students will demonstrate where the sun illuminates the Earth by shading. After sketching individually, students will discuss in their small groups and compare their sketches.

Students will collaboratively create a physical model of the four seasons using assorted materials. Students will then assess their peers' models using "I like...," "I wish...," and "I wonder..."

Maker Skill Sprint Cycle: Volume of 3-dimensional shapes.

Use this tool to plan a skill sprint cycle. Determine up front what the focus will be for the cycle and then plan a series of skill sprints to support students' development of affective, skill-based and cognitive objectives. At the end of the cycle, plan a culminating activity in which students to apply their new knowledge and skills to solve an open-ended challenge.

What is the overarching theme for this skill sprint cycle? Take a look at the Organizing Themes section of the Maker-Based Instruction Resource Guide.

Tools: Crafting tools, alphabet blocks, laptops, tablets, and graphic design software.

Skills: Teamwork, Graphic designing, Brainstorming, Modeling, and Measuring.

How does this skill sprint cycle align with learning objectives for your students?

Affective Learning Objectives:

Students are engaged in their learning.
Students direct their own learning.
Students seek and receive feedback and work to improve. Students demonstrate the ability to persevere and overcome when they are stuck.
Students successfully collaborate with others.

Skill Learning Objectives:

Students gain confidence in finding Volume of 3-dimensional shapes.
Students gain competency in finding Volume of 3-dimensional shapes.

Cognitive Learning Objectives:

Students apply their knowledge of volume to solve real-world problems regarding volume of 3-dimensional shapes.

Skill Sprint 1

EXPLORE: Students will be given chance to collect a series of terms (technical vocabulary) as part of their deconstruction.

SKILL BUILD: Students will watch a one minute clip of a video about volume and the differences between 2dimensional and 3dimensional shapes.

CHALLENGE: After watching a video clip about Volume, the students will use the alphabet block and create 3-dimensional shapes and solve for Volume using the blocks.
****

Skill Sprint 2

EXPLORE: Students will build rectangular prisms using alphabet blocks in order to solve for volume. Students will use their laptops to research ways in which volume can be used in the real world.

SKILL BUILD: Students will watch a video clip on solving Volume of a 3-dimensional shape.

CHALLENGE: Students will explore Volume using Geogebra https://www.geogebra.org/m/dp6ghmvv Volume: Intuitive Introduction.

Skill Sprint 3

EXPLORE: Using the alphabet blocks, students will continue to solve for Volume by modeling different rectangular prisms.

SKILL BUILD: Using their models, the students will be able to design a rectangular prism online on Tinker Cad.

CHALLENGE: Students will use Tinker Cad to design rectangular prisms online while solving for Volume with a partner.

Skill Sprint 4

Students use alphabet blocks to build models that represent volume and surface area. Students will be able to explain the linear sequence for solving for Volume of 3-dimensional shapes.

Students begin by sorting technical vocabulary into different categories relevant to them. Students will be given a chance to add terms they believe expand the different categories they have created. They will use these terms during the joint and independent construction.

By understanding the differences between Volume and Surface Area, students will be able to effectively explain the processes for finding each, given alphabet blocks that represent rectangular prisms.

Skill Sprint Cycle Challenge

Maker Skill Sprint Cycle: Design Your Own

Use this tool to plan a skill sprint cycle. Determine up front what the focus will be for the cycle and then plan a series of skill sprints to support students' development of affective, skill-based and cognitive objectives. At the end of the cycle, plan a culminating activity in which students to apply their new knowledge and skills to solve an open-ended challenge.

What is the overarching theme for this skill sprint cycle? Take a look at the Organizing Themes section of the Maker-Based Instruction Resource Guide.

tools: 3D printer laptops tables

Materials: disgin software playdough pens chalk markers pencils paper

Skills: teamwork sketching brainstorming designing modeling

How does this skill sprint cycle align with learning objectives for your students?

Affective Learning Objectives:

Students seek and receive feedback and work to improve

Students successfully collaborate with

Students are mindful of and can communicate their learning.

Skill Learning Objectives:

Students can apply the use of the new material to a variety of challenges.

Students can apply the use of the new tool to a variety of challenges.
Students gained confidence in the new skill.

Cognitive Learning Objectives:

DNA replication
protein synthesis
aplication of content to solve problems based on mutations in DNA sequence

Skill Sprint 1

explore : exploring sketching video you tube

Skill building: Sketching process of DNA replication

Challenge 1: final sketching of DNA replication usinng chalk markers on lab tables

Skill Sprint 2

Explore: stop motion video application

Skill Building: Build a model of someting you already know

Challenge 2: Building a model of the steps of
protein synthesis with playdough (gallery walk after models are complete) and input into stop motion animation app – final stop motion videos will be uploaded to class website to be shared for review preparation of individual writing prompt.

Skill Sprint 3

Explore: students will explore thingisverse and tinkercad for digital modeling

Skill building: Students will designt and model a random object in the classroom on tinkercad

Challenge 3: use tinkercad online website
to build the digital models of protein synthesis sequence using
stop motion videos as review - students will be group based on academic and ELL levels.
Each group will be assigned one sequence of protein synthesis to digitally model.

Skill Sprint 4

Explore: exploration of 3D printing videos you tube

Skill building: whole group teacher led 3D printing of simple object from skill 3

challenge 4:3d printing the digital
model of DNA replication process – each group will 3D print their assigned protein synthesis
sequence from their digital models.

Skill Sprint Cycle Challenge

Maker Skill Sprint Cycle: Design Your Own

Use this tool to plan a skill sprint cycle. Determine up front what the focus will be for the cycle and then plan a series of skill sprints to support students' development of affective, skill-based and cognitive objectives. At the end of the cycle, plan a culminating activity in which students to apply their new knowledge and skills to solve an open-ended challenge.

What is the overarching theme for this skill sprint cycle? Take a look at the Organizing Themes section of the Maker-Based Instruction Resource Guide.

The overarching theme for this skill sprint cycle is to learn how to sketch, design and model a roller coaster.

How does this skill sprint cycle align with learning objectives for your students?

Affective Learning Objectives:

Students engage in their learning and seek and receive feedback

Students improve their design and demonstrate resilience

Skill Learning Objectives:

Students will learn a new skill to solve a problem

Cognitive Learning Objectives:

Newton's 3 laws of motion, balanced and unbalanced Forces and inertia

Skill Sprint 1

Explore: Students will explore sketching YouTube video

Skill Building: Sketching an idea for the roller coaster

Challenge 1: Final Sketching of roller Coaster

Skill Sprint 2

Skill Building: Students will work in a group to develop a design

Challenge 2: Gather Materials necessary to Develop the final design. Design must include at least one loop, one funnel, and one declining ramp in order to measure speed

Skill Sprint 3

Skill Building: Studnets will build a roller coaster using supplied materials

Challenge 3: Build a 3-D model of the Roller coaster

Skill Sprint 4

Test roller coaster, identify errors, Redesign & Retest

Challenge 4: Students will use The final design of The roller coaster To perform activities Such as measuring Speed

Skill Sprint Cycle Challenge