STE(A)M Trunk 6 Day Project

Name of Project: Animal/Plant Cell Game Design

Theme	Plant and Animal Cells
Essential Question(s)/Brief Description	What are the major components of an animal or plant cell? How do I accurately design and represent the components of an animal or plant cell? Students will design the game, board, and pieces for their own animal/plant cell game.
STEAM Focus Science Technology Engineering Arts and/or Math	Science, Technology, Engineering and Math
Badge(s) Earned	*Feedback Loop* The learner frequently seeks appropriate feedback throughout the learning experience in order to properly gauge the development of new knowledge, skills, products, or outcomes. 1A: SEEK: The learner actively and openly seeks feedback from peers, mentors, and others. 1B: ANALYZE: The learner is able to open-mindedly, effectively, and critically analyze received feedback to determine its usefulness to the given task. 1C: ACT: The learner is able to apply feedback to further develop personal knowledge, skills, products or outcomes.

Program Fit: Directed, guided or independent stages. Alternatively is this a beginning/middle/end phase challenge?	This project will have a variety of stages in which the students will work independently, in pairs or groups, or under adult direction.

Standard(s)	**S5L3. Students will diagram and label parts of various cells (plant, animal, single-celled, multi-celled)**
	   b) Identify parts of a plant cell (membrane, wall, cytoplasm, nucleus, chloroplasts) and of an animal cell (membrane, cytoplasm, and nucleus) and determine the function of the parts.
	   c) Explain how cells in multi-celled organisms are similar and different in structure and function to single-celled organisms.

Connections to (a) prior learning, (b) everyday life, (c) other content areas**.**	A. This project will reference what the students have learned in previous science units, particularly the lessons on cells and the standards listed above.
	
	B. Enduring Understandings:
	   a) Animal and plant cells are structured differently.
	   b) Organisms can be single-celled or multi-celled.
	   c) Some organisms' cells vary greatly in appearance and perform very different roles.
	   d) Some organisms are made of a collection of similar cells that benefit from cooperating.

Assessment How will students demonstrate that they have mastered the objective(s) and can answer the Essential Question(s) for this lesson?	Throughout the build process students will take responsibility for following written and verbal instructions. There will multiple opportunities for students to give and receive feedback to each other as well as receive feedback from teacher(s).

Resources / Connections

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Will you need the STEAM Truck?	Yes	Yes	Yes	Yes	Yes	Yes
Will you need the STEAM Trailer?	No	No	No	No	No	No
List all tools and equipment needed. Please note if you are removing anything from the container, trailer or truck.	markers, scissors, board games	markers, scissors board games	paper, pencils, laptops, possibly3D printer & laser cutter	whiteboard, paper, pencils, laptops, possibly3D printer & laser cutter	two colors of sticky notes, paper, pencils, laptops, possibly3D printer & laser cutter	two colors of sticky notes, paper, pencils, laptops, possibly3D printer & laser cutter
Safety Plan and mitigation. Please note any safety concerns and how they will be addressed.	Day 1 is relatively low-risk. Students will use minimal tools and will be encouraged to be safe and respectful with supplies.	Day 2 is relatively low-risk. Students will use minimal tools and will be encouraged to be safe and respectful with supplies.	Teacher will review laser cutter procedures and appropriate safety measures. Adults will supervise students when using the laser cutter.	Adults will supervise students when using the laser cutter.	Adults will supervise students when using the laser cutter.	Adults will supervise students when using the laser cutter.

Materials/Resources/ Technology List all materials needed by teacher and students. Attach all handouts, schematics, Power Points etc.	life cycle cards, board game, butcher paper, Play-Doh, tape	life cycle cards, board game, butcher paper, Play-Doh, tape	life cycle cards, board game, butcher paper, Play-Doh, tape	Any supplies listed in the students' Bills of Materials created on Days 2 &3 of the project.	Any supplies listed in the students' Bills of Materials created on Days 2 &3 of the project.	Any supplies listed in the students' Bills of Materials created on Days 2 &3 of the project.

Learning Sequence

	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**	**Day 6**
Opening Session (Activating Strategy) This is your attention getter to engage students and provide an overview of the concept.	Teacher will give students a few minutes to play various board games to give students ideas about possible board games they might create.	Students bring in their favorite board games and take turns describing their board game and what components make it great. On sticky notes, a student scribe will record things that make a great game.	Guide students through a discussion of some potential challenges they may experience today and potential solutions to address those problems.	Students will play through their higher-fi prototypes to work out any hiccups that have not yet been resolved.	Students will set up their games along with the instructions.	Teacher will give students their group's pink sticky notes. Students will compare the pink sticky notes with their green sticky notes. Were they able to anticipate most of the problems? If not, what are their goals for the day?

| Work Session (Guided Teaching of New Content) Explore Tinker Design Build | **Explore** Students will view this video about creating your own board game. **Tinker** Teacher will lead a class discussion in order to create a list of students' favorite aspects of the games they played. Next, teacher will prepare the life cycle and board game cards (3-5 of each). In pairs, students will randomly draw both a life cycle card and a board game card. | **Explore** As a class, decide which factors actually make a game great, and add those sticky notes to the *Concept Quick Reference Sheet* created yesterday. **Tinker** Discuss the importance of making multiple iterations of a product. Have the students spend the next 25 minutes modifying their board game ideas they created yesterday and creating a lo-fi prototype. | **Explore** Students will play through their lo-fi prototypes to work out any hiccups. **Design & Tinker** Students will refine their games to develop a higher-fi prototype. They will also define the process for creating their board game board and pieces (Check out Thingiverse for printable game pieces). Students may add additional materials to their *Bill of Materials* based on this discussion. | **Build** Students will construct their final board games. Be sure that each group has assigned specific tasks to each group member to ensure the work gets done *(ex: one student will browse Thingiverse for useable game pieces; another will design the game cards; a third will draw out and paint the board, etc.)* | **Tinker** As a class, play each of the board games. Students who are not actively playing should observe and take notes on pink sticky notes. Their notes should include: areas that could be improved and if the cell information is accurate. . | **Design & Build** With the suggestions in mind, students will improve and modify their games and/or the instructions. |

Work Session (cont.)	Then, students will discuss how they could integrate the two cards and what the game would look like. (*Ex: "We think that meiosis + Connect Four would look like…. because….).* Students will share their ideas with the class. **Tinker/Design** Students will then select one life cycle card and one board game card and begin to sketch a mock-up of their board game design	**Tinker** Students should use the *Concept Quick Reference Sheet* to inform their design. Instruct students to come up with a *Bill of Materials* for all the supplies they would need to complete their board game. Have them consider all aspects of the build. They should also consider what tools they will/might need to ensure they are fully prepared. *Note: The teacher should ensure all materials from each student's Bill of Materials are available by Day 4.*	.	**Design** Students will write instructions for their games. *Teacher's Note: Students may benefit from a template about what the instructions should address (ex: How many people can play at once? What is the objective? How do you win? etc.).*	**Tinker** Students will play their own games. They will take notes addressing the topics mentioned above on green sticky notes.	

Closing Session Teacher seeks evidence of student understanding of this lesson's content.	As a wrap-up, and self and peer assessment, students will share their sketches to the class. The class will discuss the successes of each sketch and encourage growth in those areas. Make a *Concept Quick Reference Sheet* about the games' successes. Students will then document their progress and reflections in their journals. Remind students to bring in their favorite board games for the next day.	In their journals, students will make a Venn Diagram to compare and contrast aspects of their favorite games with their initial board game designs.	Students will reflect about today's build in their journals. Have them consider three things that what went well, two things that didn't, and one main thing they need to focus on tomorrow.	Students will review plan and animal cell parts. In their journals, students will label and discuss the function of each cell part.	Lead a group discussion about how students evaluated each other's games. Focus on teaching students how to give and accept constructive criticism.	In their journals, students will reflect on the process of receiving and using peer feedback. What three pieces of feedback did they receive and use?

Differentiation

Learning Styles Describe how each learning style is incorporated into the lesson.	**Visual:** Students will be given a general written outline this project's steps. There are also written tasks for various parts of the lesson. Teacher demonstrations will also support visual learners.
	Auditory: Teacher demonstrations, videos, and peer discussions will support auditory learners.
	Kinesthetic: By nature, the project caters to kinesthetic learners. Students will engage in hands-on activities throughout the lesson's tinker, design, and build processes.

Board Game and Life Cycle Cards
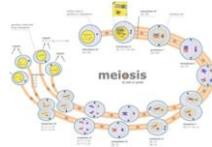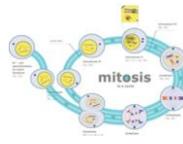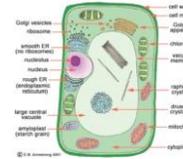
Meiosis	**Mitosis**	**Plant Cell**
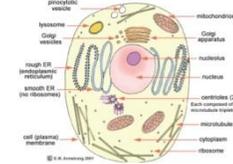
Animal Cell	**Chutes & Ladders**	**Connect Four**
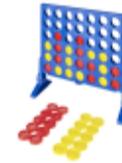
Sorry	**Candyland**	**Hi-Ho! Cherry-O**