**STAGE 1: PLANNING**

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| **YOUR TARGET: Standard, Goals & Outcomes**Teacher: Michelle Stencil Grade/Subject: 1st Grade Science**TARGET: Unpack Your Standard**Part 1: My Standards, Goals and Outcomes

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| ***Academic Standards:*** **STATE YOUR STANDARD** |
| 1-LS-1 Use Materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow and meet their needs. K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.W.2.6. 6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1),(K-2-ETS1-3).Visual Arts Content Standards: 2.5 Create a representational sculpture based on people, animals, or buildings.*\*Highlight the main idea/knowledge (what) \*Underline the skills/verbs (how)* |

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| **Big Questions (Questions to frame student learning)*** What are different animal and plant parts and what are their functions?
* How can animal and plant characteristics help humans survive?
* How can I apply my knowledge of different animal and plant parts to design a solution to a human problem?
 | **Knowledge (Concepts to be understood and applied)*** All organisms have external parts
* Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move, and find food, water and air.
* Animals and Plants have parts that are needed for growth and survival
* The shape and stability of structures of natural and designed objects are related to their function
 | **Skills (what you will explicitly teach)*** How the engineering design process unfolds (Ask, Imagine, Plan, Create, Test/Improve)
* Different animal parts and their functions
* How to apply animal and plant characteristics to human problems
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| **Student Learning Goal**: **STATE YOUR GOAL FOR THE STUDENTS TO SHARE** |
| Students will be able to design a solution to a human problem by applying animal and plant adaptations that have helped them survive and grow.**Driving Question:** What solution can you design to help humans grow and survive, using the concepts of Biomimicry?**Targets/Checkpoints:** 1. Graphic organizers will be collected on day 1 to see students’ understanding of the different inventions they researched that utilized biomimicry.
2. After students select and sketch their invention to create, they and their partner will meet with the teacher to go over the design process and potential drawbacks that they should be aware of before they begin building.
3. The final checkpoint for understanding will include their 3D model of their invention, a short write up explaining their invention and their oral presentation of their invention to their peers.

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| ***Student Social-emotional Goal (LEARNER BEHAVIOR):*** |
| Students will demonstrate appropriate listening skills (i.e. keeping their hands and feet to themselves, raising their hand to speak, having their eyes on the speaker and voices off unless asked to participate). Students will demonstrate appropriate interpersonal skills when working with a partner or in groups (i.e. using respectful sentence stems, such as, ‘I agree or I disagree because…” “Can you explain more…?”, sharing materials with their partner, and encouraging their partner through kind and constructive language). |
| **Barriers to learning (LEARNER): (level of literacy; language proficiency levels; funds of knowledge; attention span)** |
| Three of my students are considered ELL, which means that proficiency in English could present a barrier for their learning, specifically with the content vocabulary and comprehending any reading we do related to the topic. In addition, one of my students has Autism and another has ADHD/ other learning disabilities. Both of these students have IEPs, which means that accommodations will be needed for them to remove any barriers for learning, including attention span.  |
| **Common Misconceptions (LEARNER & TARGET): (Subject-matter specific; Related to academic standard; Knowledge gaps; Student confusion; multiple meanings; cultural differences; misunderstand)** |
| Students might not understand that different external parts of animals and plants have functions related to their survival. Discussions that directly make the connection between animal/plant parts and how they enhance survival would be necessary for them to understand their functions. In addition, students might be confused as to how to apply these parts to humans. Examples might need to be given to demonstrate what is expected of them. |

Part 2: My Class |
| **My Classroom Composite: (TEACHER & LEARNER) Whole group (Broad needs of students; observable patterns & trends; language and literacy subgroups; digital/technology fluency; emotional regulation)**My class is comprised of 23 students (13 boys and 10 girls). Three of my students are extremely bright and school is easy for them. The majority of my students speak good English (6) and have passed the CELDT test, while 3 are still ELL learners. Two students are on an IEP. One of these students is at grade level, but has a diagnosis of Autism (mild). The other student has ADHD and learning disabilities. |
| **Accommodations/Adaptations/Intervention (Teacher, Learner, Instruction, Management)** **English Language Learners:** Three students are considered ELL students and have not passed their CELDT test to reclassify. Pre-teaching new concepts to these three students before teaching the concept to the class as a whole might be of benefit to these students who struggle with learning new concepts. In addition, technical vocabulary found in topics such as science, are harder to acquire. Key vocabulary such as “organisms,” and “external parts” should also be pre-taught to these students and should have visual cues to accompany their definitions. **Students with Attention Difficulties:** Students with attention issues might benefit from more kinesthetic learning accommodations, such as sitting in a rocking chair, or squeezing a stress ball during portions of the lesson where there is more sitting and listening. Secondly, brain breaks could be used for the whole class and would specifically benefit these students. Brain break ideas include a GoNoodle song, jumping jacks, taking a walk around the classroom and so on. Lastly, these students might have to be taught this concept in parts, and not all at once. Pulling these students for 5-10 minute intervals and doing mini-lessons to teach this concepts might help maximize the attention they can give and ensure their participation for the brief time they are engaging in direct instruction.  |

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| **What vocabulary words demand attention & are related to our big idea?** | BiomimicrySolutionExternal PartsSurviveGrowProtectOrganism |
| [**Academic Language**](https://drive.google.com/file/d/0B4DAVBuy2CvWWmxJaG9FaHZlcTA/view?usp=sharing) | DesignMimic |
| **Sentence Frames:**[**Lessoneer**](https://lessoneer.com/standards) | **Emerging**: 1. I read that plants/animals…
2. Based on my experience, I think…
3. How does…work?

**Expanding:** 1. This problem is similar to…
2. A way of thinking about solving this problem is…
3. One way to visualize this problem is to…

**Bridging:** 1. After analyzing data from testing…I came to the conclusion that….
2. The solution to this problem is….
3. My visual represents a synthesis of …. and ….
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**(TEACHER, LEARNER, TARGET, ASSESSMENT, INSTRUCTION, MANAGEMENT),**

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| ENGAGEMENT (multiple means of engagement) | Students will play a discovery card guessing game to introduce the concept of biomimicry. They are shown examples of modern inventions and asked which plant or animal it reminds them of (ex. An airplane might elicit responses of bird wings or butterfly wings. A helmet might remind students of a turtle or crab shell.). After students play this guessing game, students are then told that human inventions have often mimicked plant and animal parts. They will then be given time to explore specific examples in more detail. Students should be asking themselves, “How do animal and plant parts help humans grow and survive?” |
| EXPLORATION(multiple means of action) | Students will gather in groups of four and go on an “invention walk.” These groups will be heterogenous so that ELL students or lower performing students can hear language models, see on task behavior and have students who can help them understand more challenging concepts. In addition, this invention walk is fast paced so that students with attention difficulties are constantly moving. Their group will travel to six stations set up in the room. They will have 5-7 minutes at each station. Each station will be centered around a different invention that was developed based on a plant or animal part. Students will either watch a video, read an article, look at images, or feel real materials related to each invention. Students will complete a graphic organizer as they go around to each station that asks them to complete an annotated drawing for each corresponding plant/animal part and invention. The graphic organizer is pictured below:Examples of inventions might include Gecko Climbing Feet, Kingfisher-Inspired Bullet Train, Armadillo Backpack, Survivor Locating Spider, Sunflower Helitrope Lighting, and a Tentacle-Inspired Prosthetic Arm. As the students are researching, the teacher will ask questions such as, “Which plant/animal part would help you…?” “What does this plant/animal part remind you of?” “What human problem was this invention trying to solve?” By asking students these discussion questions and seeing what they write on their graphic organizer, the teacher is informally checking for understanding.  |
| EXPLANATION(multiple means of expression) | Students will then gather together and share some of their findings. The teacher will ask questions such as, “How was this plant/animal part used in this invention?” “What could be an alternative plant/animal part to be used in this invention?”The concept of Biomimicry will now be introduced formally. Students will define Biomimicry in their science notebooks and then watch a video to see another representation of Biomimicry, along with alternate examples of Biomimicry inventions. This video will be shown to help reinforce the definition and concept of Biomimicry: <https://www.youtube.com/watch?v=4vq8ci4RTUs>To close this session, students will be asked to brainstorm problems in their family, community or school. The teacher will write these problems on the board for students to reference. Students will then be told that their challenge for the rest of the week is to choose one of these problems and design a solution to it using the idea of Biomimicry. Questions for students to consider include:1. What is a problem in my school, community or family?
2. What plant or animal part could be used to solve this problem? How?
3. What are alternative plant or animal parts that could be used to solve the same problem?
4. What are the drawbacks or benefits of each proposed solution?
5. Can you design/imagine this solution?

By having students brainstorm possible solutions for these questions, it is another informal check to see who has grasped the concept of Biomimicry well enough to now apply it. |
| ELABORATION(Multiple means of expression and the 4 C’s) | Students will then enter into the engineering design process. **Collaboration:** They, with a partner, will decide upon a problem that interests them (from the brainstorming list made the day prior) and ask themselves how they can solve it. By picking a problem that is present in their family, school or community, they are connecting with their daily lives. **Critical Thinking:** Then, they will brainstorm by sketching proposed solutions to the problem with different plant/animal parts. They will evaluate the advantages and drawbacks to each solution through research and communication with their partner. At this point, students will have a check in meeting with the teacher to share their initial design idea and get feedback about how to best construct this solution.**Creativity:** When they decide on the best solution, they will plan out this solution in more detail by drawing it and writing a paragraph that explains how their solution will work. Lastly, they will get the opportunity to construct a physical model of their solution. They can use real materials to design their model or technology to create a 3D virtual model.Vocabulary such as Biomimicry, external parts, protect, grow, survive and solution will be introduced with visuals and hand motions. Students will be challenged to use this vocabulary in their writing. Sentence stems such as, “The solution to this problem is…” will be provided and modeled for them to use this vocabulary in their writing. |
| EVALUATION (Multiple Means of Representation( and the 4 C’s) | Students will be evaluated informally throughout the entire process through questions about different inventions and how they have used plant/animal parts as their inspiration. Students will be more formally evaluated with their physical model and design description of a solution they thought of for a problem in their family, school or community.**Communication:** They will have to orally present their solution (can use media and visuals) and defend their proposed solution to their peers, along with submitting a short paragraph describing their biomimicry invention. Students will have to pick three inventions from their peers to complete an annotated drawing of and explain how the invention works. By clearly articulating which plant or animal part is used and how, they will show their understanding of biomimicry. Additionally, students will be asked to self-reflect on their project, effort and teamwork using the rubric below. We will go through this one criteria at a time as a class to ensure student understanding.Below is the rubric that will be used to grade each design and presentation:

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|  | 3:  | 2:  | 1:  |
| **Identified a human problem** | 3: Clearly stated a problem in their community, family or school. | 2: May have identified a problem but did not clearly state the problem or connect it to their family, school or community. | 1: Did not clearly identify a problem in their community, family or school. |
| **Crafted a solution from a plant or animal part** | 3: Expertly crafted a solution to the problem and explained which animal or plant part they based their solution off of. | 2: May have crafted a solution to the problem but did not clearly state which animal or plant part their solution was inspired from. | 1: Did not create a solution using a plant or animal part. |
| **Made a media model or physical replica of the invention** | 3: Creatively and thoroughly made a media model or physical replica of the solution. | 2: May have made a media model or physical replica of the solution but did not complete these representations. | 1: Did not create a media model or physical replica (only submitted a sketch of the solution from the brainstorming phase). |
| **Includes a written paragraph explaining proposed solution** | 3: A 5 sentence paragraph with a topic sentence (claim) and supporting sentences (evidence and reasoning) is submitted to explain their solution. Writing is neat, with correct punctuation and spelling. | 2: A paragraph is submitted to explain the proposed solution but may be lacking detail and may include spelling or punctuation errors.  | 1: A paragraph is not submitted to justify their work (only submitted the annotated drawing with labels from the brainstorming phase). |
| **Worked collaboratively with partner** | 3: Student and partner put in equal work. Gave kind and constructive feedback. | 2: Student put in slightly less work than their peer. Might have needed reminders to use kind and constructive words. | 1: Student did not contribute to their group project, being neither helpful or respectful. |

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**(\*Questions of Inquiry: Open-ended)**

**STAGE 2: TEACHING**

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| ***DAILY AGENDA: WHAT WILL YOU USE TO MANAGE DAILY INSTRUCTION*****WHAT IS YOUR LEARNING MAP SEQUENCE FOR DAY 1?** For day 1, students will go through the Engagement, and Exploration stage fully. They will begin to work through the Explanation stage. Essentially, they will be introduced to the concept of biomimicry and explore different real- life examples of how biomimicry has been used to solve a human problem. They will complete a graphic organizer that sums up their findings about these inventions and their plant/animal part inspirations. This will give them the necessary background information they need to continue through the rest of the 5 Es throughout the week. It should also get them wondering what they could use plant/animal parts to solve. **WHAT MATERIALS WILL YOU USE?** * Visuals of different human inventions (plane, helmet) for the initial guessing game
* Articles, visuals, sensory materials for each of the 6 inventions on their “invention walk”
* Graphic organizer sheet, colored pencils

**HOW WILL YOU ASSESS STUDENT LEARNING?** Students learning will be assessed informally on day one. While students are on their “invention walk” the teacher will observe each group and ask questions such as “Which plant/animal part would help you…?” “What does this plant/animal part remind you of?” “What human problem was this invention trying to solve?” By asking these questions, the teacher can evaluate which students are grasping the concept of biomimicry and which students might need more assistance in understanding this concept before they can apply it.  |