**Explore Problem Planning Template**

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| **Unit Title:**  **Momentum** | **Lesson #: 3** | | | | | |
| **Daily Objective:** | SWBAT Explore and explain 3 methods for reducing the impact force applied to a moving object | | | | | |
| **Key Understanding** | What is the perfect articulation of the concept you’re working on today?  KP1: Impact force is minimized by decreasing velocity  KP2: Impact force is minimized by increasing total time of impact  KP3: Impact force is minimized by increasing total area of impact | | | | | |
| **Framing** | How will you introduce the problem to the class?  *Today your goal is to design a container that will protect an egg, when dropped from extreme heights You must be able to explain how and why each component of your container contributes to your strategy of reducing impact force*  What are the assumptions, information, or constraints you want to highlight?  *There are multiple strategies that you can use, all of which will help keep your egg safe. As you consider that your goal is to reduce Force, and Force is the product of mass and acceleration, you should be considering what methods you have to accomplish this.*  What is the end goal?  *Goal is to be able to articulate how each of the 3 strategies contributes to reducing impact force, and how they manifest in every day scenarios.*  What direction will you give students for work time?  *Be creative, and before you build, consider how each component of your container actually contributes to your stated strategy, and if you cannot come up with a good answer, either change the component, or change the strategy.* | | | | | |
| **Using Correct Student Work to Drive Discussion** | Correct Student Work   * Give 2 – 3 examples of correct methods students may use to solve this problem that you will highlight during Show Call * Below each example, list potential questions you could ask to foster discussion | | | | | |
| Correct Sample Work 1: | | | | | |
| Students design a container that deliberate pads the egg so that on impact it slides through the padding, and increases the time of the applied force | | | | | |
| Question to begin discussion of work: | | | | | |
| What does padding do on a scientific sense- why does padding make it “hit less hard” | | | | | |
| Anticipated Answer 1 | Anticipated Answer 2 | | | Anticipated Answer 3 | |
| Because it’s soft | Because it slows it down | | |  | |
| Follow-up Question | Follow-up Question | | | Follow-up Question | |
| What does softness actually change about how it hits the ground. | In with or without padding it does from moving fast to not moving at all. What then is the difference between how padding stops it. | | |  | |
| **Using Correct Student Work to Drive Discussion (Continued…)** | Sample Work 2 | | | | | |
| Students design a container that deliberately falls more slowly that other containers | | | | | |
| Question to Begin Discussion of Work | | | | | |
| What did reducing velocity do in a scientific sense? Why does that make it hit less hard? | | | | | |
| Anticipated Answer 1 | | Anticipated Answer 2 | | | Anticipated Answer 3 |
| Because its slower | | If has less velocity, then the it requires less force to go from moving to stopped, bc acceleration will be lower | | |  |
| Follow-up Question | | Follow-up Question | | | Follow-up Question |
| How does slower equal, not as much force | | If less acceleration equals less force, shouldn’t less mass also equal less force? | | |  |
| **Using Student Errors to Drive Discussion** | Anticipated Student Errors   * List 2 – 3 potential errors students could make while working to solve this problem. Keep in mind that student errors should lead students to the key understanding * Below each example, list questions you could ask to help push their understanding | | | | | |
| Ex 1  Designing a container that doesn’t fall in the way they intend it to | Ex 2  Thinking that more padding automatically means safer, without thought to how/why | | Ex 3 | | |
| Questions:  How can you tweak your design to make it fall the way you planned? | Questions:  Does it matter where the padding goes, does the shape of the container contribute at all? | | Questions: | | |
| **Stamp the Key Understanding** | How will you have students stamp the key understanding once it has been articulated?  Impact force is minimized by decreasing velocity  Impact force is minimized by increasing total time of impact  Impact force is minimized by increasing total area of impact | | | | | |
| **Apply the Key Understanding** | What 1-2 questions will you ask or have students solve to quickly apply the key understanding and check for understanding?  What does a car airbag make crashes safer?  Why is it more dangerous if you crash your car on the freeway than on a regular street? | | | | | |