

MeTEOR Learning Modules

STEM MEA (Model Eliciting Activity)

Designing a Successful Plan





Don't let George Drown

Reflective Planning

Description/Summary of Lesson:

In this quick fun activity students will work to use the tools provided to rescue a George the Gummy worm and keep him from drowning. This is an exercise in understanding constraints, and failure points and reproducible results. Students are asked to list each step, creating a detailed step by step reproducible process that can be repeated by others.

Essential Questions:

- How do you approach simple design problems reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost?
- Why is perseverance importance during problem solving?
- Can you provide a step by step process that can be repeated by others?

Suggested Grade Level: Grades 4-5

Approximate Time: Two days (30 minute class period)

Teacher's Role: Demonstrator and Facilitator

Class Set-Up: Groups of two (or individual student) at a flat surface

Success Standards:

- Students can use tools to solve a problem.
- Students can define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or cost.
- Students can generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and the constraints of the problem.

Learning Purpose:

- Students will plan and conduct an investigation to solve a given problem.
- Students will make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

- Students will plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Vocabulary:

- Failure Points
- Hypothesis
- Constraints
- Reproducible Results
- Step-by-Step Process

Math Practices:

- MP 1: Make sense of problems and persevere in solving them.
- MP 3: Construct viable arguments and critique the reasoning of others.
- MP 4: Model with mathematics.
- MP 6: Attend to precision.

Depth of Knowledge:

- DOK Level 3: Strategic Thinking

Materials: (per group or individual)

- 1 Gummy Life Saver
- 1 Gummy Worm (George)
- 1 Plastic Disposable Cup
- 4 Paperclips

Summary of Tasks/Experiences

Spark Activity:

Tell the following story to students:

George enjoys fishing in his boat on the lake but he frequently forgets to put on his life preserver. He never learned to swim and disaster has struck. His boat has capsized! He was able to crawl on top of his boat but as luck would have it, his life preserver is under his boat. George needs your help to not only reach the life preserver but to put it on so he won't drown. You and your partner will each receive two paperclips. You may touch the boat, life preserver and George with only these paperclips. At no time may you injure George or his life preserver by stabbing with the paperclips. If you drop him, he has drowned and you must start over.



Lesson Descriptions:

Introduction

- This challenge will test the group's ability to work together in designing multiple plans until success is found.
- Teacher may want students to video their attempts.

Set Up:

The students will:

- take one gummy lifesaver and place it under the overturned cup.
- place the gummy worm (George) on top of the cup.
- manipulate the paperclips so that the life preserver is wrapped around George.
 - At no time can any hands touch the gummies or the cup. Paperclips only.

Day One

The students will:

- test their design and try to save George.
- adjust their approach if solution is not reached.
- repeat a successful “saving.”
- articulate what strategy was successful.
- write down each step, adjusting the list at each failure point.
- create a step-by-step process when success is found.

Day Two

- Different volunteer groups try to save George following only the step-by-step process created by groups from Day 1.
- Discuss how details and proper documentation of the process is critical in the scientific process.

Teacher facilitates class asking guiding questions as students work in groups:

- Did you get it on the first try?
- How did you change your approach?
- Did teamwork make a difference?
- Are you writing down everything you are doing? Are you being specific?

Student Engagement

Social/Emotional Engagement:

- Students show positive, respectful and supportive small group interpersonal relationships and skills that provide friendship.
- Students share materials and work load.
- Students are involved together respectfully in the learning process as teacher and tutors as they give feedback to one another.

Physical Engagement:

- Students are involved with face-to-face interaction of student team members.
- Students complete all processes of task as a group, each sharing in the responsibility.
- Positive group processing about their working relationships and response.

Cognitive Engagement

- Students monitor their own progress and thinking relative to their learning toward the Success Standards.
- Students support each other in clarification of the Success Standards, ensuring that each member of the group meets the standard.

Evidence of Learning

Checks for Understanding/Expected Outcomes:

- Students will save George by demonstrating how they put the gummy lifesaver over him without the use of hands or stabbing.
- Students will articulate how improvements were made in order to be successful.
- Students will complete an exit slip detailing the solution of how to save George.
- Students will be evaluated by the Rubric.

Teacher Notes

- There are several ways to be successful with this task, but most often students use their mouths.
- Have students list each movement, identifying which step becomes a modification of the one before (day one exit slip).
- Students should be able to list the constraints (no hands, no stabbing).
- Students should be able to list the failure points (dropped cup, dropped George).
- Day two will be very amusing as the volunteer groups cannot reproduce the success by following the step-by-step instructions.

- Day two exit slip: Why are reproducible results important in science? How has this activity shown you this importance? Results must be able to be repeated in order to be significant (example: create a medicine) and this activity shows that details matter when writing down specific steps.

**Don't Let George Down
Rubric**

Category	4	3	2	1
Problem Solving	Actively looks for and suggests solutions to problems.	Refines solutions suggested by others.	Does not suggest or refine solutions but is willing to try other's solutions.	Does not try to solve problems or help others solve problems. Lets others do the work.
Contributions	Routinely provides useful ideas. Leader.	Occasionally provides useful ideas. Strong team leader.	Rarely provides useful ideas. A satisfactory team member.	Provides no useful ideas or refuses to participate.
Attitude	Never is publicly critical of the project or others. Positive attitude.	Rarely is publicly critical of the project or others. Often has a positive attitude.	Occasionally is publicly critical of the project or others. Sometimes has a positive attitude.	Often is publicly critical of the project or others. Has a negative attitude.
Focus on the Task	Constantly stays focused on task.	Mostly stays focused on task.	Hardly stays focused on task.	Rarely stays focused on task.
Working with others	Almost always listens and shares with others.	Mostly listens and shares with others.	Occasionally listens and shares with others.	Rarely or never listens and shares with others.
Comprehension of Concepts	Demonstrates understanding of concepts.	Demonstrates understanding of most concepts.	Demonstrates understanding of a few concepts.	No demonstration of understanding of concepts.

Total _____/24 Points



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