Lesson Update and CRT Addendum	
Lesson/Activity Title: Buzz Lightyear: Putting It All Together	**ID: 11-732**
Product Number:	**Grade: MS**
URL for Lesson: https://www.nasa.gov/pdf/387966main_Putting_It_All_Together.pdf	
Subject: Newton's Laws, energy, photosynthesis, cellular respiration	
Summary: Students design and build a Rube Goldberg machine to put a marble in a cup. In addition to the obvious lesson in physics, teachers can use this lesson to teach biological cascade processes (photosynthesis/cell respiration). While the step-by-step procedure of the machines is helpful for giving students a hands-on analog of various processes, the teacher should make it a point to contrast the purposeful overcomplexity of the Rube Goldberg machine with the efficient processes in the natural world.	
Materials for Lesson: Lesson has detailed materials list for each activity.	

Review and Recommendations	
ALIGNMENT TO STANDARDS	
NGSS	**MS-PS1-5, MS-PS2-1, MS-PS2-2, MS-PS3-1, MS-PS3-5, MS-LS1-6, MS-LS1-7, MS-ETS1-1, MS-ETS1-2, MS-ETS1-3**
Common Core State Standards in Mathematics	
CULTURAL RESPONSIVE TEACHING (CRT) RECOMMENDATIONS	
5E Lesson/Description	
1. Engage	**Show the following videos:** **Student designed with very common materials, includes the number of tries it took to "get it right".** **https://www.youtube.com/watch?v=dFWHbRApS3c** **Opening credits for "Elementary"** **https://www.youtube.com/watch?v=C7JT3iMzS4k**
2. Explore	**This activity should be a part of a larger lesson. If this is for a physics or physical science class, begin with this and then "name" the laws the students have discovered on their own. Or after showing students the steps of photosynthesis and cellular respiration, they can create analogs of the processes with a small addendum to this activity.**

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3. Explain	**Some time should be taken to dispel the idea that something is science if it is terribly complicated. Rube Goldberg was an artist that was making a comment on inventions and inventors at a time of incredible scientific innovation. In truth, engineers and scientists seek out the most efficient solutions. Biological processes and systems can often seem terribly complex which is a product both of the multivariate conditions in which they must operate and the evolutionary mechanisms from which they spring.**
4. Expand/Enhance	**This activity is, of itself, an expansion or enhancement of a broader lesson.** **For a greater mathematics component students can be tasked with graphing data related to variables in the different machines created.**
5. Evaluate	**With specific guidelines given, the evaluation should be relatively straightforward. Does the finished product have the requisite number of steps, etc.?**

Additional Resources: Included in the 5E steps above.