The Minimally Invasive Surgical Challenge

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Scott High School, 10th grade Biology

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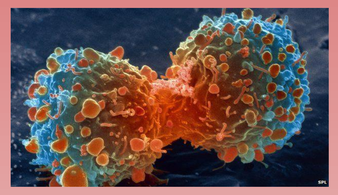
Unit Overview

Topic: Cell Cycle, Mitosis, Cancer



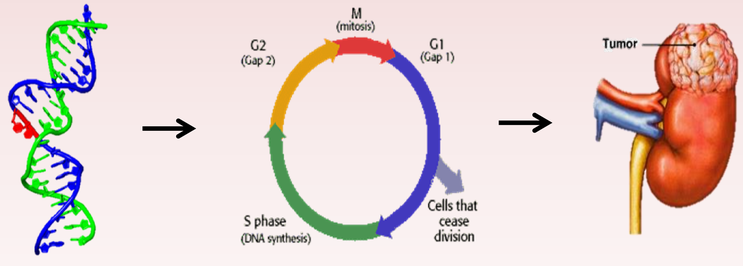
Standards: NGSS HS-LS1-4 -- From Molecules to Organisms: Structures and Processes. Use a model to illustrate the role of cellular division and differentiation in producing and maintaining complex organisms.

Activity Structure

Title: The Minimally Invasive Challenge

Guiding Questions:

1) Why does cancer form in the body? How does it affect function?
2) What features does the device need to remove the tumor?
3) What are some issues with treating a tumor surgically?
4) How will the device affect the surrounding tissue in the body?
5) How did your device perform? How big was the incision?
6) How did others' devices compare to your own?
7) What improvements could device use? How would you do it?



Objectives:

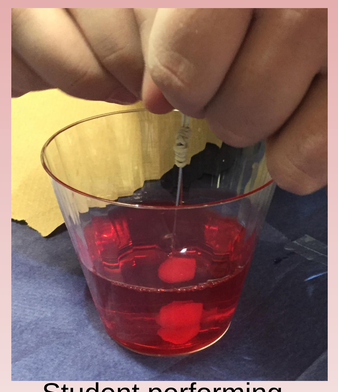
1) Describe how cancer develops and affects body function.
2) Identify three types of cancer and risks for developing cancer
3) Describe the issues associated with treating a tumor surgically
4) Design a device to remove a tumor (jelly bean) from the body (Jell-O) with the least damage.
5) Predict how the device will work in the body.
6) Record observations on the performance of the device.
7) Critique other student devices and defend their own device.
8) Propose improvements to their device for improved function.

Activity Implementation

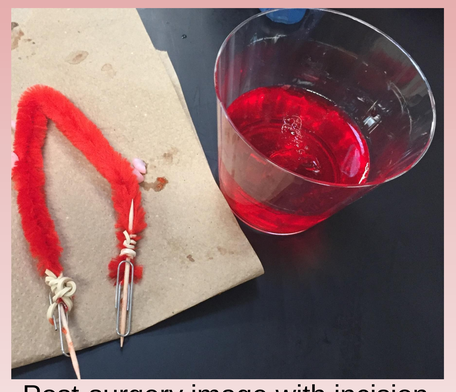
The activity was designed for a 70 minute class period and begins with an intro in cancer biology and treatment.
Students in groups of 4 were then tasked with designing a device that would remove a jelly bean "tumor" from a Jell-O "patient" given the following materials:

3 paper clips	1 pipe cleaner	1 rubber band
1 string	2 toothpicks	1 inch of tape

The team that removed the tumor in the shortest amount of time, with the smallest incision, won the challenge.

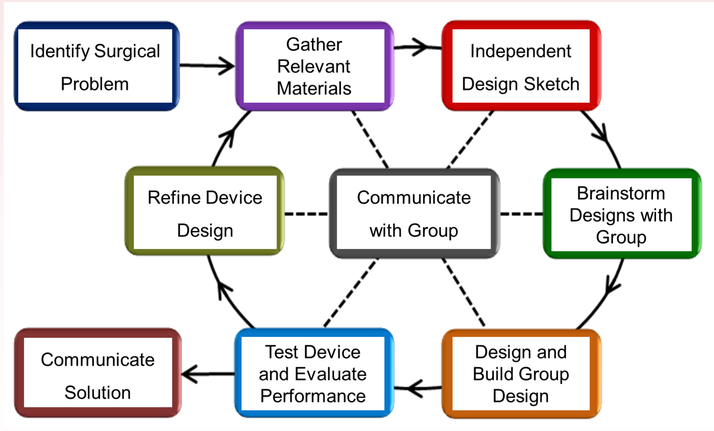


Student performing tumor removal surgery



Post-surgery image with incision for device assessment

Engineering Design Process

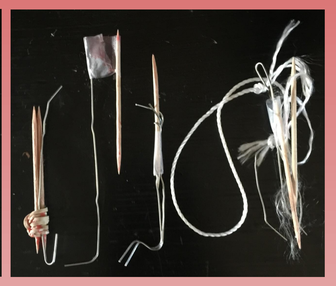


ACS: **A**pplication relates to surgery and healthcare, **C**areers in the medical, engineering, and healthcare field, **S**ocietal impact in making healthcare more effective and efficient.

Student Work

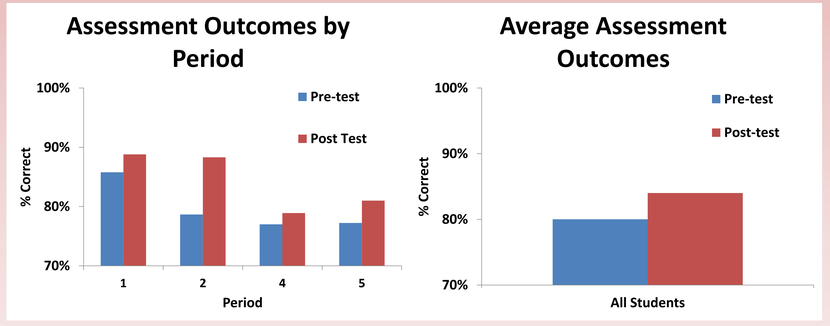
"Forceps" Designs

"Stabbing" Designs



"Hook" or "Lasso" Designs

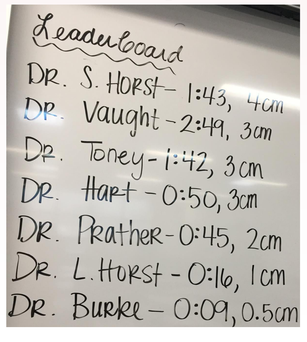
Assessment Results: Impact on Student Learning



Assessment indicates an improvement in test averages for all periods, with an increase from 79% to 84% for test averages.

Reflection and Conclusion

This activity went well as the task was simple enough to complete in one class period, but difficult enough to allow for creativity and a distribution of success by various groups.
A shortcoming of this activity was not being able to control the group dynamics to create a successful learning environment for all students. When some groups fell behind, they need guided instruction to stay on task.



In conclusion, this activity was a major success as it exposed students to the engineering design process through a fun competition that got everyone involved.