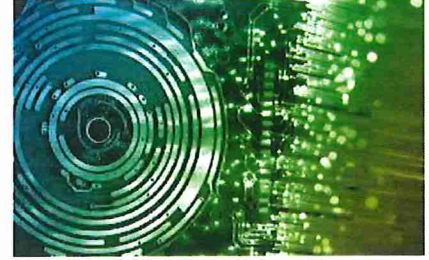
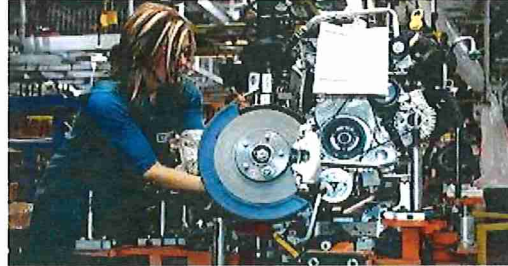

Amp It Up! Engineering/Technology and Industry Lesson Extension



Teacher Name(s):	Nickerson Cammett & Aemi Herrera
School and District:	Lynn
Course:	Anatomy/Biology & Chemistry

Abstract: In 200 words or less, please provide a summary of the goal for the lesson extension and its relationship between industry and academic topic.

Medtronic is a global leader in production and sale of catheters for medical purposes. In the context of design and application, many considerations have to be made in relation to human anatomy and the materials necessary for application. The purpose of this extension lesson is to engage students in problem solving and incorporate concepts learned from their content classes of biology and chemistry. The classroom activity will be inquiry based, consisting of a design challenge for students to build a working model of a catheter to remove an item from a pvc model of an artery.

Engineering/Technology Link:

1. How did you *introduce* engineering/ technology concepts or the company/industry focus in your course? Check the appropriate box(es) or choose Other.

- Defined terms (science, engineering, technology)
- Described the engineering design process
- Engineering design challenge related to industry
- Overview of the company
- Challenge based on 'industry specific' area of focus (manufacturing process, quality control, measurement, development, teamwork etc.)
- Other: _____

Level of Inquiry: Which of the following best describes the level of inquiry (adapted from Bell 2005) you used for this lesson/unit? Check the appropriate level.

- Structured inquiry:* Instructor provides question and procedure. Students determine the results based on given procedures.

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- Guided inquiry:* Instructor provides question. Students design procedure and determine the results.
- Open inquiry:* Students investigate their own research question. Students design procedures and implement the procedure on their own.

Lesson Extension Plan:

Title/Topic: Catheter Design
Time (minutes): 1hr 30min (1 long block or 2 class periods of 45min)
Company Name and brief Description: Medtronic
Overview of the Lesson: Student driven inquiry activity in the creation of a working catheter model incorporating background biology and chemistry concepts.
Standard(s)/Unit Goal(s) to be addressed in this lesson: HS-LS1-2 – Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-PS2-6 – Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
Essential Question(s) addressed in this lesson: What arteries or veins are passed through to reach the heart? What is the process and properties of plaque What impact does molecular structure have to do with the strength or flexibility of a substance?
Objectives (academic and/or engineering/technology, career): Students will be modeling the design and production of a model as experienced by an engineer.
Link to Industry (how the lesson connects to the industry visited): Students will be designing and creating a model of a catheter.
What students should know and be able to do before starting this lesson: Basic heart anatomy and circulatory system, types of bonding, basic concepts of polymer and organic chemistry.

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Instructional Materials/Resources/Tools :
Student handout provided by instructor, role cards (as needed), supplied materials to create catheter (i.e. straws of various diameter, string, fishing line, differing tapes, etc.), and pvc artery model.
Lesson Delivery
Lesson Opening: Present information regarding Medtronic. Review prior knowledge of structure and function of circulatory system. Review of lipids and arterial plaques. Introduce the design challenge.
During the Lesson (activities/labs/challenges):
Catheter Design Challenge
Lesson Closing – Students present their findings and discuss challenges that they experienced within the context of the activity.
Assessment
Student Assessment: Student performance checklist for self-assessment.
Delivery Assessment: Self-assigned team roles during design challenge (in order to ensure full participation).

Additional resources and assessments: Attachments should include handouts, readings (with references), lab write-ups, rubrics, exams/quizzes, and/or other similar materials.

Name: _____ Date: _____ Group #: _____

Catheter Design Challenge

Background:

Design and create model of a catheter that will fit through a pvc modeled artery and be able to retrieve an object or place an object within it.

Problem:

Like real arteries, the pvc pipe model includes angled sections and differing diameters. The catheter has to be of adequate length, strength, and have the ability to remove or place an item.

Directions:

Within your groups choose your roles from those of:

Manager/facilitator: _____

Speaker/presenter: _____

Reflector/strategy analyst: _____

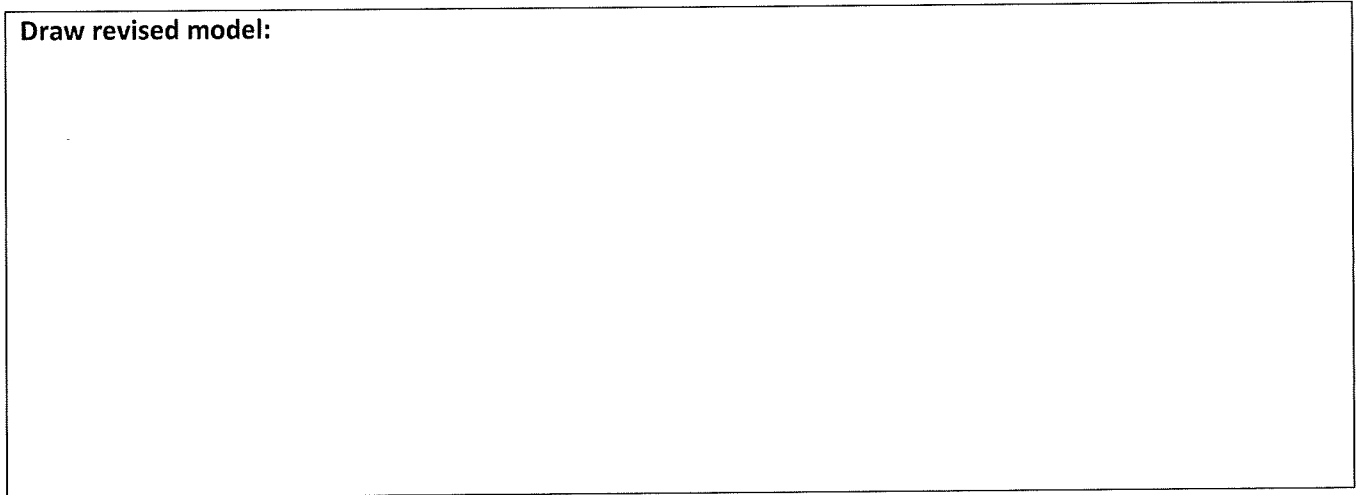
Recorder: _____

Draw a proposed model prior to construction:

Sometimes in the course of design and construction of a product, revisions are implemented in the creation of a model. In the creation of your team's model, were there some changes that needed to be made in order to accomplish the desired goal? If yes, briefly describe below:

Name: _____ Date: _____ Group #: _____

Draw revised model:



Questions:

What were some issues that were encountered by the team?

What were some key characteristics of the chosen materials in this challenge?

Were some of the chosen materials more helpful or versatile in the activity than others? Why?
