Lesson Plans for Mrs. Ostrowski

Standards:

**Middle School Engineering Design**

By the time students reach middle school they should have had numerous experiences in engineering design. The goal for middle school students is to define problems more precisely, to conduct a more thorough process of choosing the best solution, and to optimize the final design.

**Defining the problem** with “precision” involves thinking more deeply than is expected in elementary school about the needs a problem is intended to address, or the goals a design is intended to reach. How will the end user decide whether or not the design is successful? Also at this level students are expected to consider not only the end user, but also the broader society and the environment. Every technological change is likely to have both intended and unintended effects. It is up to the designer to try to anticipate the effects it may have, and to behave responsibly in developing a new or improved technology. These considerations may take the form of either criteria or constraints on possible solutions.

**Developing possible solutions** does not explicitly address generating design ideas because students were expected to develop the capability in elementary school. The focus in middle school is on a two stage process of evaluating the different ideas that have been proposed by using a systematic method, such as a tradeoff matrix, to determine which solutions are most promising, and by testing different solutions, and then combining the best ideas into a new solution that may be better than any of the preliminary ideas.

**Improving designs** at the middle school level involves an iterative process in which students test the best design, analyze the results, modify the design accordingly, and then re-test and modify the design again. Students may go through this cycle two, three, or more times in order to reach the optimal (best possible) result.

Connections with other science disciplines help students develop these capabilities in various contexts. For example, in the life sciences students apply their engineering design capabilities to evaluate plans for maintaining biodiversity and ecosystem services (MS-LS2-5). In the physical sciences students define and solve problems involving a number of core ideas, including chemical processes that release or absorb energy (MS-PS1-6), Newton’s Third Law of Motion (MS-PS2-1), and energy transfer (MS-PS3-3). In the Earth and space sciences students apply their engineering design capabilities to problems related the impacts of humans on Earth systems (MS-ESS3-3).

By the end of eighth grade students are expected to achieve all four performance expectations (MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, and MS-ETS1-4) related to a single problem in order to understand the interrelated processes of engineering design. These include defining a problem by precisely specifying criteria and constraints for solutions as well as potential impacts on society and the natural environment, systematically evaluating alternative solutions, analyzing data from tests of different solutions and combining the best ideas into an improved solution, and developing a model and iteratively testing and improving it to reach an optimal solution. While the performance expectations shown in MS. Engineering Design couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices that lead to the performance expectations.

(<https://ngss.nsta.org/middle-school-engineering-design.aspx>)

Objectives:

1. The students will be able to identify the parts of the scientific method.
2. The students will be able to apply to scientific method to lab activites.
3. The students will complete the scientific method in its correct order.
4. The students will be able to read and analyze data (written out and visually)

Differentiation: Whole group notes, small group labs and discussions, lab activites, one on one conference

Resources: Text book, IN, Notes/Foldable, Scientific Method packet, tablet, gizmo

Date: 10/3/18

1. Students will take a graphing and scientific method pre assessment.

Date: 10/4/18

1. Periods 2-4: Students will get their SM foldable and begin taking notes.
2. Periods 6-9: Read pages 72-79 in their text book and answer all the questions on page 79. Due tomorrow

Date: 10/5/18

1. Scientific method notes in foldable

Date: 10/9/18

1. Mrs. S will be in class to set up office 365 for the students.

Date: 10/10/18

1. 10/11/18-10/19/18
2. 1. Each day we will be practicing the various parts of the scientific method with a review packet. This will NOT be a graded assignment, HOWEVER, the same concepts are on our summative and they may use this on the summative.
   1. 10/11- Problem, Purpose and hypothesis
   2. 10/12-10/14- Lego procedure
   3. 10/16&10/17- Independent, dependent, control constants \*\*Most difficult to comprehend\*\*
   4. 10/18- Results & Graphing
   5. 10/19- Conclusion

Date: 10/22-10/23/18

1. The students will be using the scientific method notes to complete a candy bar lab. Due end of class Tuesday.

Date: 10/24/18

1. Grade the scientific method packet/review.

Date: 10/25-10/26

1. Scientific Method and Graphing Summative.