**2017 STEM 4033 Final Project**

**Scientific Inquiry and Engineering Design Curriculum Development Assignment (100 pts.)**

**Directions:** This assignment will be completed individually and is due at the conclusion of your scheduled final examination time and no later than 5:00pm on Tuesday, December 12. The completed assignment should be submitted as one document in both as a Word document and a .pdf sent as an e-mail attachment to your instructor.

**Task:** You develop a STEM scientific inquiry lesson for upper level elementary school students. The scientific inquiry lesson should include the following sections of a STEM lesson:

* **Title:** Unique title that hints at the task to follow
* **Literacy Connection:** Identify a literacy connection for the lesson
* **Grade Level:** 3rd – 6th grade (you choose)
* **STEM Standards:** Integrated from all STEM standards
* **Big Ideas:** What big ideas will be delivered through completion of the lesson?
* **Essential Question:** What question or questions will the student be able to answer after completing the STEM scientific inquiry challenge?
* **Scenario:** Write an engaging scenario that will capture the attention and possibly intrigue the students. Fictional scenarios are entirely appropriate. A good scenario will place the students into the story or challenge.
* **Challenge:** In specific terms, identify exactly what the student teams are required to do to fully answer the STEM inquiry challenge (i.e., *conduct research and then build a space debris capture device that is capable of adapting to changing circumstances to capture varying types of space debris efficiently*).
* Keep in mind that in scientific inquiry, the teacher establishes parameters and procedures for inquiry. Students are provided with a hands-on problem to investigate as well as the procedures and materials necessary to complete the investigation. Students discover relationships between variables or generalize from data collected, which in essence leads to the discovery of expected outcomes.
* **Tools, Materials, and Resources:** Identify all of the tools and resources that will be available to the students as they attempt to solve the challenge. Try to keep the list small, students need to know that in the work world, unlimited supplies are rarely available and there are benefits to solving problems as efficiently as possible.
* **Content Information:** Provide extensive content the ties the standards and the challenge together.
* **Parameters/Constraints:** Describe the borders or parameters that will keep the students going in the correct directions.
* **Deliverables:** Describe exactly what the students will be expected to submit for grading.
* **Teacher guidelines:** Describe to the teacher how this STEM scientific inquiry lesson activity will be carried out, what lessons the students will be expected to discover, how these discoveries relate back to the standards, and how the teacher should introduce the variables that will cause the students to prepare for varying circumstances (i.e., *various sizes and masses of space debris in the example above*). How the student solutions will be tested and guidelines for developing any testing apparatus.
* **Evaluation:** You should include an assessment rubric, worksheets, journals and anything else needed to assess the students including point values directly related to the content standards.
* **Engineering Journal:** You should include a design journal and handouts that scaffold the inquiry process.
* **Student Sheets:** Develop student version of the lesson and any appropriate worksheets or journal sheets.

Hints to Get Started

* After looking at STEM standards, consider a design problem that could be used to deliver the content from the standards.
* Consider variables that would naturally occur when attempting to solve such a problem and how students might use scientific inquiry to examine these variables.
* Use those variables to cause the students to prepare for different circumstances. For example, if you were asking the students to build the strongest tower possible, you could tell them that during testing, the load might come from the top, the side, the bottom, or some other angle. This would cause them to build a tower that should be ready for varying circumstances during testing.

How You Will Be Evaluated

* The submissions will be evaluated based on the degree to which they:
	+ Meet the lesson guidelines outlined above
	+ Are engaging for elementary students
	+ Deliver scientific inquiry and appropriate standards
	+ Hold the potential for expansion in a STEM class
	+ Are appropriate in a STEM environment
	+ Creativity: No one has done this before (no towers, bridges, egg drops, balloon cars, etc.)

**Scientific Inquiry and Engineering Design Curriculum Development Assignment Grading**

Student:

Lesson Guidelines

* Title: Unique title that hints at the task to follow
* Literacy Connection: literacy connection for the lesson
* Grade Level: 3rd – 5th grade
* STEM Standards
* Big Ideas
* Essential Question
* Scenario
* Challenge - identify exactly what the student teams are required to do
	+ Scientific inquiry require the teacher to establish parameters and procedures for inquiry
	+ Students are provided with a hands-on problem to investigate as well as the procedures and materials necessary to complete the investigation.
	+ Students discover relationships between variables or generalize from data collected, which in essence leads to the discovery of expected outcomes
* Tools, Materials, and Resources
* Content Information - extensive content that ties the standards and the challenge together
* Parameters/Constraints
* Deliverables
* Teacher guidelines:
	+ Description of how the STEM scientific inquiry lesson activity will be carried out
		- What lessons the students will be expected to discover and how these discoveries relate back to the standards
	+ How the variables will cause the students to prepare the solution/solutions
	+ How the solutions will be tested
	+ Guidelines for developing testing apparatuses.
* Evaluation - assessment rubric, worksheets, journals, etc.
* Engineering Journal - design journal and handouts that scaffold the inquiry process
* Student Sheets - student version and appropriate worksheets or handouts
* Engaging for elementary students
* Delivers scientific inquiry and appropriate standards
* Holds the potential for expansion in a STEM class
* Is appropriate for learning in a STEM environment
* Creativity – original idea

Comments: Final Project: /100