**STEM 4033 STEM Quick Challenge Assignment (50 pts.)**

**What is a quick challenge?**

* A quick challenge introduces students to one learning concept or idea from the standards. This concept will generally be presented again in a larger design challenge. The quick challenge is used to introduce the idea and ‘hook’ the students.
* For example:
  + If I were planning to teach a lesson related to STL Standard #18 Transportation Technology and K-2 Benchmark B (*Vehicles move people or goods from one place to another in water, air or space, and on land*), I might use the following quick challenge at the beginning of class to introduce the idea:
    - *Students will work as a member of a small team and use a 6” square of aluminum foil to build a boat that will hold the most pennies. The vessel will be placed in a bucket of water and pennies will be added until the vessel sinks. Such an activity can be used to introduce the concepts of balance, stability, buoyancy, cargo, etc.*
    - Such a *quick challenge* would be followed by an information session where Standard #18 will be expanded upon and other STEM content added. Then the lesson might conclude with a larger design challenge (i.e., carve a sailboat from Styrofoam that can be powered down a water-filled rain gutter with a box fan). This larger sailboat design lesson will:
      * Expand upon the knowledge and experience gained in the original *quick challenge* and add new features from related STEM standards (i.e., propulsion, time, distance, rate, graphing, etc.).

**What does a quick challenge look like?**

* *Quick challenges* should last no longer than 15-20 minutes from start to finish. They should also:
  + Use simple and common materials;
  + Require students to construct something using a curtailed version of the design loop.
  + Focus on one piece of information from content standards/benchmarks.
  + Fit into a larger design challenge or lesson that will follow.

**Assignment:**

* Work individually to develop a *quick challenge* for one idea/concept for a given learning standard.
* Deliverables:
  + Standard: Identify one of the math or science standards outlined below.
  + Quick Challenge: Develop a quick challenge that will introduce a concept related to the standard. This may include a simple written design brief for the student, or written instruction that the teacher will present orally.
  + Methodology: Describe the method by which the teacher will implement the quick challenge (materials needed—keep it simple, testing procedure, concepts to reinforce)
  + Student Feedback: *Quick challenges* are typically ungraded assignments, but develop some method by which students can be provided with feedback concerning their performance.
  + Content Outline: Outline the major concepts or content that would ideally be delivered following the quick challenge (just an outline, no need for including all content information at this point).
  + Larger STEM Challenge: Identify a larger STEM design challenge that could follow and expand upon this quick challenge (just 1-2 sentences describing the larger STEM challenge that could follow).
  + A paper copy of all materials (two or three pages maximum).
* During the next class period you will submit your *quick challenge* to another student (printed paper copy) and they will attempt to solve the *quick challenge*—you will play the role of the “teacher” and they will play the role of the “student.” The “student” will not only attempt to complete the quick challenge, but they will also provide you with feedback concerning the appropriateness of the *quick challenge*.
* After your first delivery, you will have the opportunity to hone/perfect your *quick challenge* and then submit it for assessment before the due date as an e-mail attachment.

**Quick Challenge Checklist**

**Directions:**

The quick challenge should clearly and concisely include the following components. Using your best judgment, provide the author with feedback.

|  |  |  |
| --- | --- | --- |
|  | Yes | No |
| QC is clearly tied to a standard and it is identified |  |  |
| The QC concept could be expanded upon later (students completing larger problem) |  |  |
| The QC would likely “hook” the student or capture his/her attention |  |  |
| QC could be completed by grade-level students in 10-15 minutes |  |  |
| QC uses simple and common materials |  |  |
| QC uses a curtailed design loop methodology |  |  |
| Author includes instructions (oral or written) that could be easily followed |  |  |
| Author outlines some major concepts that could be delivered after the QC is complete |  |  |
| Author identifies a larger STEM challenge that could follow |  |  |
| As a reviewer, I am inclined to steal this idea and use in my future classes |  |  |

Required Detailed Comments:

1. I really liked this about the QC:
2. The following areas need improvement:

|  |  |
| --- | --- |
| **Science** | **Math** |
| **Kindergarten** | |
| *PS.6.K.1*  Demonstrate spatial relationships, including but not limited to   * over * under * left * right   *PS.6.K.2*  Demonstrate various ways that objects can move, including but not limited to   * straight * zig-zag * back and forth * round and round * fast and slow   *PS.6.K.3*  Demonstrate the effects of the *force of gravity* on objects | *CCSS.MATH.CONTENT.K.MD.B.3*  Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.  *CCSS.MATH.CONTENT.K.CC.C.6*  Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.  *CCSS.MATH.CONTENT.K.OA.A.1*  Represent addition and subtraction with objects, fingers, mental images, drawings1, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. |
| **1st Grade** | |
| *PS.7.1.5*  Demonstrate methods of producing static *electricity* (e.g., balloons, shuffling across carpet)  *PS.7.1.6*  Classify materials as magnetic or nonmagnetic  *PS.7.1.7*  Investigate the properties of magnets:   * attraction * repulsion   *ESS.10.3.1*  Demonstrate how the planets orbit the sun  *ESS.10.3.2*  Demonstrate the orbit of Earth and its moon around the sun  *ESS.10.3.3*  Relate Earth’s rotation to the day/night cycle | *CCSS.MATH.CONTENT.1.NBT.B.2*  Understand that the two digits of a two-digit number represent amounts of tens and ones.  *CCSS.MATH.CONTENT.1.MD.A.1*  Order three objects by length; compare the lengths of two objects indirectly by using a third object.  *CCSS.MATH.CONTENT.1.MD.C.4*  Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.  *CCSS.MATH.CONTENT.1.G.A.1*  Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes. |
| **2nd Grade** | |
| *ESS.8.2.8*  Demonstrate and apply knowledge of Earth’s structure and properties using appropriate safety procedures, equipment, and technology   * Predict weather based on cloud type | *CCSS.MATH.CONTENT.2.MD.A.1*  Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.  *CCSS.MATH.CONTENT.2.MD.A.2*  Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.  *CCSS.MATH.CONTENT.2.MD.C.7*  Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.  *CCSS.MATH.CONTENT.2.G.A.1*  Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces.1 Identify triangles, quadrilaterals, pentagons, hexagons, and cubes. |
| **3rd Grade** | |
| *PS.6.3.1*  Identify characteristics of wave motion:   * *amplitude* * *frequency*   *PS.6.3.2*  Investigate the relationship between sound and wave motion  *PS.6.3.3*  Determine the impact of the following *variables* on pitch:   * length * *mass* * tension * state of *matter* | *CCSS.MATH.CONTENT.3.NF.A.3.A*  Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.  *CCSS.MATH.CONTENT.3.NF.A.3.B*  Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3. Explain why the fractions are equivalent, e.g., by using a visual fraction model.  *CCSS.MATH.CONTENT.3.MD.B.3*  Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.  *CCSS.MATH.CONTENT.3.MD.D.8*  Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters. |
| **4th Grade** | |
| *PS.6.4.1*  Investigate the relationship between force and direction  *PS.6.4.2*  Investigate the relationship between *force* and *mass* | *CCSS.MATH.CONTENT.4.MD.A.1*  Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.  *CCSS.MATH.CONTENT.4.MD.C.5.A*  An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.  *CCSS.MATH.CONTENT.4.G.A.3*  Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. |