CMST SCOLLARCITY "**First tool"** Lesson Plan using your first choice of modeling software**,** (Due Tuesday, August 3rd).

Submit as hard copy AND electronically through ANGEL

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Grade level(s)/Subject taught: **Science 7/8**
Objectives: (Remember…*How will the modeling tool help the student better learn the objective?)* - Students will be able to calculate momentum using mass and velocity of an object. - Students will demonstrate the conservation of momentum using the provided model.

Items to include in your **first tool** lesson plan:

For the math teacher:

1. *Write* the Mathematical Concept or "key idea" that your first modeling tool will be used to teach: (e.g. Students use mathematical modeling/ multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships)

and/or…

For the Science teacher:

1b. *Write* the Science Concept or "key idea" that your first modeling tool will be used to teach: (e.g. Organisms maintain a dynamic equilibrium that sustains life).

1. Calculation of momentum using mass and velocity. 2. Conservation of momentum in a collision of two objects. 3. The relationship of momentum to Newton's Laws of Motion.

For you **first tool** lesson, please describe how you plan on using the desired modeling software package with your students (Stella, AS, GSP, or IP). You might describe what a visitor might see walking into your classroom during this lesson. You might also describe the role of the student during the entire lesson and your role as the teacher. Please try to be specific as possible. Also, construct a tentative rubric that you might use with your students. ** see example page 5

"...a rich **one-page, typed, single-spaced**, description or a *vision* of your best thinking…"

Prompts:

1. How will you assess the prior knowledge of the student?
2. How will you begin the lesson?
3. What are the teacher and students doing every 5-10 minutes? (Teacher Actions and Student Actions
4. How will you assess the learning for the lesson?
5. How will IP, Stella, Agent Sheets, GSP, etc as per rubrics in this packet be integrated into my teaching? (i.e. you may want to discuss a problem or describe how you might use the chosen modeling package in your plan. How does the model/tool help the concept(s) to be taught)?

Using __Interactive Physics_, I plan on having my students…
(software / modeling package(s)

use a model that I have previously developed and loaded onto their computers to explore the concept of momentum. Prior to the computer lab we will first have completed a lesson on Newton's Laws of Motion. At the opening of this lesson we will first watch a Bill Nye video that deals with momentum and more specifically the conservation of momentum. During the video students will be answering questions about momentum that are specifically covered during the video.

These questions along with class discussion will be used to assist students in developing a flow chart that will define momentum, show how momentum is calculated, and finally defines the concept of conservation of momentum. Students will then be given several hypothetical situations involving two cars in a collision. These will include variations of the mass and velocities of both cars. They will then hypothesize possible outcomes of these collisions focusing on what will happen to the momentum of both cars before and after the crash.

We will then discuss, as a class, what each student believes will happen in the hypothetical situations which have been presented. Students will then move to their computers where they will input the mass and velocity data from the first hypothetical car crash. Students will verify the momentum of both cars before the crash. They will then be able to verify the momentum of the vehicles after they have crashed. Students will continue to input data from each of the hypothetical situations and then crash the vehicles. The students will track the data they are collecting using a table that will include mass, velocity, before crash momentum and after crash momentum. Students will then be allowed to experiment with their own sets of velocities and masses to see if they find results that differ from the given problems.

In several classes with more advanced students I will then proceed to demonstrate how the model was created using interactive physics. We will, as a class, walk through the creation of this simple model and then students will be allowed to create their own momentum simulation model. After they have created the model they will switch positions with another student and test their models.

We will end this lesson with a group discussion. The discussion will focus on possible real life uses of this type of model. Who may want to collect this type of data? Who may benefit from the collection of this type of data? Would this type of modeling ever be useful or beneficial for the students? I hope to bring this discussion not only to the educational benefits but also possible safety or forensic uses of this type of modeling.

Assessment for this lesson will be based upon each of the activities students participate

in during the lesson. These will include at a minimum their response to video questions, predictions made before data collection, data collection and interpretation, model creation (advanced classes), and participation in the final class discussion. The following rubric will be the bases for student grades:

Target	Acceptable	Unacceptable
All video questions answered correctly	One video question answered incorrectly	More than one video question incorrect
All predictions accurate	Majority of predictions are accurate	Majority of predictions are inaccurate show no comprehension of concept
All data collected and accurately placed in chart.	One set of data missing from the chart or incorrectly placed in chart	More than one set of inaccurate or incorrectly placed data.
(advanced class) Model is visually interesting and accurate	Model is accurate but with basic graphics	Model uses basic graphics and does not function correctly.
Students shares ideas about real life uses of this program with a group. Actively participates in discussion.	Students is unable to make real life connections but still attempts to participate in group discussion	Student makes no effort to participate in group discussion.