Star Wars Physics

The source of this lesson is one that I came up with during the early part of the semester. It is a Star Wars based Physics lesson in which we will be looking at three main goals. The first is to understand how to find the angle of triangle (both 30 degrees and 45 degrees) by using the Pythagorean Theorem to find “R”. The second objective is to calculate the Force (F) of a small car being raced down a ramp at both 30 and 45 degrees. This will include using the physics formula that deals with Newton’s first law of motion. The Formula is F = m times a. the students will do this by racing a car down a ramp ten times then calculate the average or mean giving us the acceleration average then students will be able to calculate the force of the car striking a small red cup at the bottom of a ramp. The students will then take measurements of the distance the cup is moves to find the angel that allows for the greatest force. The final task will be the students converting grams to Newton’s using the math process grams/1000 then multiplying it by the Earth’s gravitational constant 9.8m/s^2.

The concept statement is: “The students will be able to calculate force and other physics concepts, using the materials and formulas given, correctly. “

Specific objectives:

1. The students will be able to calculate force using the equation provided as well as calculate Newton’s and acceleration.
2. The students will be able to create a full body diagram of the actions taking place in this experiment
3. The students will properly apply and demonstrate Newton’s 3 laws of motion during this experiment
4. The students will be able to find the “mean” of the total number of times raced
5. The students will be able to use tangent to calculate the angle the cars are racing down
6. The students will be able to use Pythagorean Theorem (a^2 + b^2 = c^2) to find the hypotenuse of a triangle.
7. The students will be able to calculate the acceleration of the cars raced
8. The students will be able to calculate the gravitational pull using Newton’s gravitational constant.

Materials used

1. 6 metal ramps about 2 feet long
2. 6 rubber racing tracts
3. 6 various Star Wars hot wheels cars
4. 6 stop watches
5. 6 small basic arithmetic calculators
6. One small digital scale to calculate grams
7. 6 protractors
8. 6 post it note pads
9. 30 work sheets
10. 30 pencils
11. 6 red plastic cups with hole cut into the side
12. One roll of scotch tap

Safety considerations:

There are no safety considerations other than possibility of someone slipping on a car that fell on the ground when we race them down the tract. To prevent that from happening I will assign a student to make sure the car does not leave the table.

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| Lesson Plan | What I Will Do | What Student Will Do | Questions To Ask |
| Engagement  Time: 10 minutes | 1. I will put my Jedi robe on and tell the students that they are my young padawns (students) for this lesson. I will explain that I will be teaching them about the force. | They will listen | If they understand what I mean about the force. |
| Exploration  Time: 5-7 minutes | I will present a power point presentation that will go over the concepts we will be using as well as the history of the theorem and the idea of philosophy in ancient Greece. | The students will watch the power point presentation | 1. Who has heard of Greece? 2. Who knows about Sir Isaac Newton? 3. Who knows what force is? 4. Does the class know how to calculate force? |
| Explanation  Time: 10 minutes per angle  2 angles 20 minutes | 1. I will show the students how to calculate Newton’s and how to find Force. 2. I will explain the gravitation constant 3. I will explain “average or mean” to them | Students will calculate the mass in Newton’s of their race cars.  The students will race the cars down the ramp 10 times and record there answer  The students will find the averages of both the acceleration and distance traveled by the red cup/ | 1. What is the weight in Newton’s of their cars? 2. What is the acceleration of the cars and the force calculated? 3. What is the average or the mean of the distance the red cup traveled and the average or mean of the acceleration? |
| Elaboration  Time: 8 minutes | I will explain the concept of force in everyday events such as pushing and pulling something. And its uses in everyday life. | Will listen to this part of the lecture and ask questions on anything they did not understand | 1. What is force? 2. What is average or mean? 3. What is the gravitation constant? 4. Why do we need to know about force? 5. Why do we convert things into Newton’s? |
| Evaluation  Time:5 minutes | I will pick up the worksheets the students work on while running this experiment. | Students can continue to ask questions and pick up the materials used. | Continue to ask questions. |

State Science Standards

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| Standard: Motion and forces | Description of standard |
| M.F.1.2 | A = v/t  Aavg = Δv/Δt |
| MF.1.P.7 | Draw a free body diagram of all forces acting upon an object |
| MF.1.P.8 | Calculate the applied forces represented in a free body diagram |
| MF.1.P.9 | Apply Newton’s first law of motion to show balanced and unbalanced forces |
| MF.1.P.10 | Apply Newton’s second law of motion to show balance to solve motion problems that involve constant forces F= ma |
| MF.1.P.11 | Apply Newton’s third law of motion to explain action-reaction pairs |
| MF.2.P.1 | Calculate the resultant vector of a moving object |
| MF.3.P.8 | Apply Newton’s universal law of gravitation to find the gravitational force between two masses  Fg = G m1m2/r^2…. G = 6.673 x 10 ^-11 |