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idea packet

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NASCAR Pasta Challenge

NASCAR PASTA CHALLENGE: The Science Behind NASCAR Racing

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The Science Behind NASCAR Racing

Overview

Originally, the inspiration for the project idea came from a PBS Design Squad episode. Students were asked to design and build a car from different types of pasta and submit their design for Top Builder. This led to the idea of combining the science behind NASCAR racing and a Project-Based STEM unit in support of physical science concepts of motion, speed, distance, time, velocity, and acceleration.

The majority of the students were highly motivated and engaged throughout the entire project. Of special note, were the female students who were at first skeptical about the assignment and did not first see how it would be of interest to them. As the assignment unfolded, they became fascinated by the world of NASCAR racing during the research phase of the project. They were surprised by the number of women involved in several aspects of the sport. The project was appealing to students because of the different skills and levels of expertise required to complete the assignment. The final product showcased not only the efforts among teams, but also individual talents and abilities adding to the feeling of "ownership" and pride in the final outcome.

Cross-Curricular Integration and Application

Curriculum: Physical Science, Mathematics, Language Arts, and Technology (STEAM)

Standards: SC.912.P.12.1, SC.912.P.12.2, SC.6.P.13.3, MAFS.912.A-CED.1.4, MAFS.912.F-IF.3.7, MAFS.912.N-Q.1.1, MAFS.912.N-Q.1.3, MAFS.912.N-VM.1.3, LAFS.8.SL.2.5, LAFS.68.RST.1.1, LAFS.8.SL.1.2, LAFS.68.RST.3.8

The Project:

The project's goal is for students to learn how the Physical Science concepts of forces and motion relate to a real-world application such as stock car racing. Students will first be taught how to determine what forces act on a vehicle and subsequently calculate the components of speed, distance, time, velocity, and acceleration by applying the formulas learned during instruction. Then they will conduct research on the history of the sport using numerous and varied resources. By watching video footage of past races and the NASCAR webpage, students will learn of the risks, safety concerns, types of tracks, and stock car design considerations. Each team will be responsible for preparing a presentation on a particular aspect of NASCAR racing. Finally, they will design, build, and test their model cars in the NASCAR "Pasta Challenge" event. Prizes for top three fastest vehicles will be awarded.

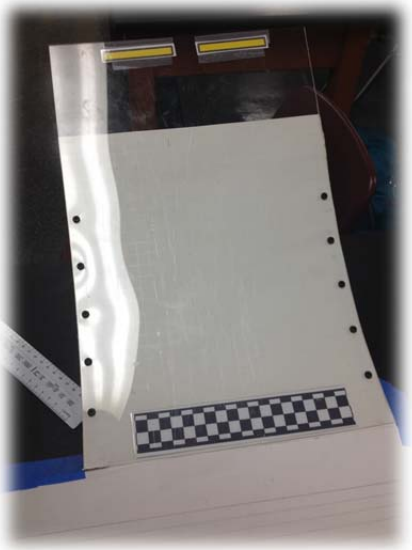
Benefit for Students and Overall Value:

This project provides students with an opportunity to learn complicated physical science concepts by relating them to a real-world application using an engaging and enticing approach. Students are also able to see the connections between other subjects so often taught in isolation. Lastly, by fostering communication and collaboration among students during the project, they learn how to better appreciate, identify, and value the strengths of others in order to ensure success for the team and still receive recognition for each individual's contribution.

What is the estimated cost for a teacher to adapt the project?

This project could easily be adapted for about $250.00-$350.00 depending on the level of detail/complexity and variety of materials provided for the students.

Suggested Materials:
Various types of pasta, glue guns, liquid glue, tape, card stock, Life Savers candy (for wheels), ramp, stop-watches, meter-sticks, graphing paper, calculators, poster boards, open space to set up ramp, prizes, and certificates. A ramp is highly recommended and the dimensions of the cars should be taken into consideration. For our activity, we had one made.



Additional Resources that would enrich the experience for students:
Computer, printer, Internet access, Edmodo, presentation software, Media Center access, research guide and resource sites, field trip to Homestead NASCAR track, and a representative from NASCAR as guest speaker.

Teacher Support Materials

Included in this packet are various resources that we felt would be beneficial in constructing your own version of the NASCAR Pasta Challenge. We truly hope that you will embrace the concept and take up the Challenge!

STUDENT RESEARCH

We divided the class into five teams and each was allowed to pick a category at random. The main reason for the distinction was to avoid repetition and keep student interest levels high. No one wants to sit through 5-6 presentations of the same content. The questions we developed served as a springboard for their research and the minimum requirement for each topic. If students elected to include more information they had to seek approval first. The final product could be one of several choices: a poster, PowerPoint, Prezi or other form of multimedia presentation.

The format is on the next page.

THE NASCAR PASTA CHALLENGE

RACE CAR SPONSORSHIP

- **Why is it necessary for racers to have sponsors?**
- **Who are some of the best known sponsors?**
- **How much money is involved?**
- **How are designs on the cars determined?**

SAFETY MEASURES & PRECAUTIONS

- **What are the safety regulations enforced in NASCAR racing?**
- **Are there requirements for the drivers?**
- **What are the requirements for the race cars?**
- **Is there special equipment involved?**
- **Why are "pit" stops necessary?**

TOP 5 RACE CAR DRIVERS

- **Who are the top 5 race car drivers of all time?**
- **What makes their accomplishments so amazing?**
- **How long have they been racing?**
- **How did they get into racing as a sport/career?**
- **Do they have any "formal" training (race car school)?**
- **What are the roles of women in relation to the sport?**

HISTORY OF NASCAR RACING

- **What are the origins of car racing?**
- **When did it become an official sport?**
- **Where did the first races take place?**
- **Where do races take place now?**
- **What tracks are the most challenging or dangerous?**
- **How often do the races take place?**

THE SCIENCE BEHIND NASCAR RACING

- **What does the car's design have to do with Science?**
- **What are the forces (of physics) that determine a car's performance (drag, momentum, friction, grip, time, etc. – see Science of NASCAR Videos)**
- **How does a car's design determine how well it will perform on the track?**
- **What is the purpose of the "cage" where driver's sit?**
- **What instruments can be found inside the car to assist the driver during the race?**

EXAMPLE OF AN OUTLINE FORMAT

TOPIC: RACE CAR SPONSORSHIP

- **Why is it necessary for racers to have sponsors?**
- **Who are some of the best known sponsors?**
- **How much money is involved?**
- **How are designs on the cars determined?**

I. Introduction: What is sponsorship and how does it work?

_____
_____
_____

II. Body

Main Point: Why is it necessary to have sponsors?
Examples/Details/Explanations:

a. _____
b. _____
c. _____
d. _____

Main Point: Who are some of the most well-known sponsors?
Examples/Details/Explanations:

a. _____
b. _____
c. _____
d. _____

Main Point: How much money is involved?
Examples/Details/Explanations:

a. _____
b. _____
c. _____
d. _____

Main Point: How are the designs on the cars determined?
Examples/Details/Explanations:
a. _____
b. _____
c. _____
d. _____

Main Point:
Examples/Details/Explanations:
a. _____
b. _____
c. _____
d. _____

III. Conclusion

_____

_____

_____

_____

Name: _____ Date: _____

NASCAR Pasta Challenge! – Part 1

Ask Questions: **What do you need to know before you can start?**

1) What are you building?

2) What does it need to be able to do?

3) What materials can we use?

4) Are there any constraints?

Imagine *your own* ideas: **Be sure to list ALL of the materials (including how many) you will need for each part**:

Base –

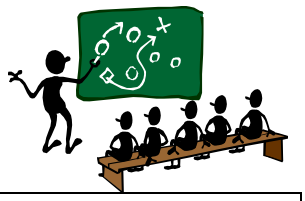
Wheels –

Axle –

Sides –

Roof –

Draw a picture of what YOU would like your car to look like. (Label parts as needed)



STOP Take a few minutes to listen to each person's design ideas.

Team Member Name	What I LIKE about their design (BE SPECIFIC)

STOP

PLAN

Plan your *Team* Design: **Be sure to list ALL of the materials (including how many) you will need for each part**:

Base:

Wheels:

Axle:

Sides:

Roof:

Draw a picture of what YOUR TEAM would like your car to look like. (Label parts as needed)

Name: _____ Date: _____

CREATE

NASCAR Pasta Challenge! – Part 2

Create your Design: **Now it's time to build your car! Gather all of your materials and be sure that everyone gets a turn to help build!**

How did the **building process** go?

What went well?

What did not go as well as planned?

1) Did you make any adjustments to your original design along the way? *Explain in detail.*

_____

_____

_____

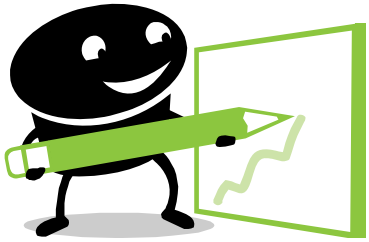
_____

_____

Test your Design: **Now it's time to test your design! Show your work below:**

Trial Run #	**How far did it go?** (measure in feet)
1	
2	
3	
AVERAGE (add the distance of all 3 trials and divide by 3)	

Communicate your Results: **Now it's time to communicate your results with other teams and receive feedback!**



COMMUNICATE

1) Are you happy with how far your car went? _____

2) What went well?

3) What did not go as well as planned?

4) What do you think you could do to make your car better?

_____

_____

_____

_____

_____

STOP **Complete questions #5-7 AFTER your oral presentation.**

5) What feedback was provided by your audience?

_____

_____

_____

6) Do you think this feedback will be useful? _____

7) What additional improvements will you consider?

Name: _____ Date: _____

NASCAR Pasta Challenge! – Part 3

Improve your Design: **Now it's time to make improvements on your design.**

Draw a picture of what <u>IMPROVEMENTS</u> YOUR TEAM **would like to make to your car. (Label parts as needed)**

After you have made your IMPROVEMENTS, it's time to RETEST!

Complete the Data Table below. **Show your work below:**

IMPROVEMENT Trial Run #	**How far did it go?** (measure in feet)
1	
2	
3	
AVERAGE (add the distance of all 3 trials and divide by 3)	

Discussion: Complete in paragraph form, making sure to answer all parts, a through e.

a. Did your improvements work?
b. How do you know? (use data)
c. What was the most challenging aspect of this project?
d. What was the most rewarding aspect of this project?
e. If you were to do this again, what would you do differently?

_____

_____

_____

_____

_____

_____

_____

_____

_____

**If time allows, I challenge you to create some kind of safety device in your car that would allow a raw egg to remain unbroken if your car were to suddenly hit a wall at the 4 ft line. Draw your design below and then build and test it. Good luck! (Report results on a separate piece of paper.)

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Alternative Approaches and Lesson Ideas

Stock Car Pasta Project:
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB4QFjAAahUKEwiyjc2T4-DGAhXFz4AKHTyyAWs&url=https%3A%2F%2Fpiperpages.wikispaces.com%2Ffile%2Fview%2FStock%2BCar%2BProject.doc&ei=OTqoVfKMLMWfgwS85IbYBg&usg=AFQjCNGLLwihRZmVXVWh7rKz9H4D1RPhcg&bvm=bv.97949915,d.eXY

Pasta Car Racers:
http://www.nps.org/sites/default/files/page/2011/10/pasta_car_rubric_and_worksheet_55756.pdf

Background Information & Web Resources

PBS Design Squad
http://pbskids.org/designsquad/topbuilder/2/

NASCAR's Acceleration Nation
http://teachers.egfi-k12.org/nascar-acceleration-nation/

NASCAR Nation: A Brief History of NASCAR
http://nascarnation.us/page/a-brief-history-of-nascar

NIE – 100 Years of Racing
http://www.nieworld.com/special/racing/default.htm

NASCAR's Earliest Days Forever Connected to Bootlegging
http://www.nascar.com/en_us/news-media/articles/2012/11/01/moonshine-mystique.html

Science 360 Video Collection – The Science of Speed
http://science360.gov/series/science-speed/a933ab9b-198b-442a-aceb-200747f1ec54

Nascar's Screech and Slam? It's All Aerodynamics
http://www.nytimes.com/2008/02/12/science/12tier.html?pagewanted=all&_r=1&

NASCAR's Success: More Women Drivers, female fans
http://fox4kc.com/2013/04/20/nascars-success-more-women-drivers-female-fans/#ooid=ZsNGwzYjpfBxvbj7vjn0mnST3OUOETuG

Top 5 Moments in NASCAR History - YouTube
https://youtu.be/uDOTZeBnvQo

NASCAR Stock Car - Pictures
https://www.google.com/webhp?sourceid=chrome-instant&ion=1&espv=2&es_th=1&ie=UTF-8#q=nascar%20car%20images

CLIP ART RESOURCES for a great bulletin board
https://www.teacherspayteachers.com

- **Bulletin Board Boarder – Racing Theme**

  https://www.teacherspayteachers.com/Product/Bulletin-Board-Border-Racing-Theme-257783

- **Charlotte's Clips**

  https://www.teacherspayteachers.com/Product/Race-Car-Clip-art-from-Charlottes-Clips-1066788

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APPLY FOR AN IMPACT II ADAPTER GRANT!

M-DCPS teachers, media specialists, counselors or assistant principals may request funds to implement an IMPACT II idea, teaching strategy or project from the Idea EXPO workshops and/or curriculum ideas profiled annually in the ***Ideas with IMPACT*** catalogs from 1990 to the current year, 2015-16. Most catalogs can be viewed at The Education Fund website at www.educationfund.org under the heading, "Publications."

- Open to all K-12 M-DCPS teachers, counselors, media specialists
- Quick and easy reporting requirements
- Grants range from $150 - $400
- Grant recipients recognized at an Awards Reception

To apply, you must contact the teacher who developed the idea before submitting your application. Contact can be made by attending a workshop given by the disseminator, communicating via email or telephone, by visiting the disseminator in their classroom, or by having the disseminator visit your classroom.

Project funds are to be spent within the current school year or an extension may be requested. An expense report with receipts is required by May 2, 2016.

APPLICATION DEADLINE:
December 11, 2015

Apply online at www.educationfund.org

For more information, contact:
Edwina Lau, Program Director
305.558.4544, ext. 113
elau@educationfund.org

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