

Drive fast, go left...print parts?
3D Printing Finding a Home in
NASCAR

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LESSON PLAN

study guides

This study guide was created by the Global Sport Institute at Arizona State University. <https://globalsport.asu.edu>

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3D Printing Finding a Home in NASCAR – Lesson Plan
<https://globalsportmatters.com/watch/2018/09/06/3d-printing-finding-home-nascar/>

Black print: Instructions for the teacher

Blue print: Spoken instructions from teacher to participants

1. Documentary and Worksheet Questions (13-16 minutes)

- a. While watching this 9-minute documentary, write down answers to the following questions. You'll also have a few minutes after it's over to finish your answers.
- b. Provide individual worksheets and start the documentary.

1. When did 3D printing enter NASCAR?

In the last decade, specifically the last 5-6 years.

2. What is the difference between traditional manufacturing and additive manufacturing?

Traditional manufacturing is subtractive. It starts with one large piece and cuts things away. Additive manufacturing, like 3D printing, you start with nothing and slowly build that part up.

3. What part of the car is 3D printing being used for currently?

3D printing is primarily used for parts for testing and experimentation in controlled environments. Actual racing is unpredictable and is a harsh environment. Most of the parts used externally are for testing, such wind tunnel and track tests which measure aerodynamics.

Some small parts are used in the interior of a car where they are not in a harsh environment. For example, a dashboard attachment.

4. What do the speakers say about the size of what can be printed?

Typically these parts are size limited and are about 12 inches by 12 inches.

5. Can you use 3D printing for safety related parts? Why or why not?

No. The materials are not suited for it, especially given the extreme racing conditions.

6. How is 3D printing beneficial?

Quickly test and change parts. The quick testing provides data and numbers for the major engineering that would be needed to build a permanent piece on a car for actual racing.

7. What are the speakers' thoughts and attitudes about the future of 3D printing in NASCAR?

It is believed its role in NASCAR will increase as technical advances will allow. In addition, when cost effective, 3D printing can be used. It is also thought the half of the car could potentially be made from 3D printing in the future. Raceday elements of 3D printing could be incorporated with technological advances in the materials used and the speed of printing. 3D printing may be a few years away for race day.

8. What's the biggest limitation of 3D printing?

Speed, size and cost. In addition, the materials are also a limitation, especially when it comes to size.

9. What is the racing environment like in NASCAR?

The racing environment is very harsh, it is side by side racing, and the temperatures are high, making 3D printing not reliable.

10. How fast can you create something with 3D printing?

A few hours for a small part and a few days for a large part.

2. Discussion Questions (5-15 minutes)

This discussion can be done in a full group or broken down into small groups.

- Option to have student write answers down first
- These questions are to incite deeper thought and analysis. Have the students discuss the following questions:

1. Based on what you learned from the documentary, what other fields or industries do you think could benefit from 3D printing? What could they print, and how would it help?
2. How could 3D printing benefit a sport other than NASCAR? How could it help improve safety, performance, comfort, etc.? Include ideas about 2-3 existing

pieces of equipment that 3D printing could improve, and 1-2 new pieces of equipment that don't currently exist.

3. You may have noticed that there were only men in this video. NASCAR is a male dominated sport. However, unlike many sports there aren't height or weight requirements. In fact, seats and pedals are custom made to fit the driver. Given that size isn't a limitation or deterrent, why do you think there are only a few women in NASCAR, both behind the wheel and in the pit?
4. Furthermore, why do you think there are few women in engineering, or the STEM field in general? What barriers do you think women might face?

(STEM: Science, Technology, Engineering, and Mathematics)

3. **Worksheet Discussion Activities** (15 - 35 minutes - can eliminate 1 if needed for time)

This discussion can be done in a full group or broken down into small groups.

1. Think of an activity, hobby, or skill you have. What are some ways that technology has helped it develop over time? List 3-4 technological advancements with a short description for how each one has helped the activity/hobby/skill develop.
2. If you could create an object with 3D printing to use in your everyday life, what would it be? Think about your routines - what would make them easier? Chores, fixing things around the home, making food, driving, your job, etc.
 - a. Name the object you would create.
 - b. Describe what it would look like.
 - c. Describe what it would do.
 - d. Explain how it would make something easier or better in your everyday life.

3. Regardless of whether you care about NASCAR or not, the topic of 3D printing likely seems totally different from the sport itself. However, the documentary shows that they are integrated. What is a scientific topic or practice that is integrated into one of your interests/hobbies? How might you be able to help people get intrigued by your interest/hobby by showing them the science that is part of it? For example, playing a stringed instrument (e.g. guitar, piano) involves the physics of vibration and sound waves, so if someone never played an instrument but liked physics, they might be intrigued to learn about the physics involved in music.
 - a. What is the interest/hobby?
 - b. How is a scientific topic or practice part of it?
 - c. Write 2-3 sentences you would say to someone who enjoys science to get them intrigued by your interest/hobby.

4. **Conclusion** (3-5 minutes)

- What do you think the future of NASCAR and 3D printing will look like?
- What fact from the documentary did you find most interesting?
- How might greater awareness about the topics we learned and talked about improve the world?