



a FIELD TRIP WITHOUT BUSES

Connecting Your Students to Scientists Through a Virtual Visit

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What do scientists do? How do scientists work? Where do scientists work? Students often ask these and other questions about scientists and the nature of their work. As indicated by Alec Bodzin and Mike Gehringer (2001), it is important for “teachers to find ways for their students to see scientists as individuals in a variety of settings and roles” (p. 36). Zip-Trips are web- and broadcast-delivered electronic field trips that include online videos, lesson plans, and a live, 45-minute interactive program consisting of four core components: in-studio audience, live interaction with scientists, prerecorded segments, and integrated activities for in-studio, web, and broadcast audiences.

Three live, interactive zipTrips are offered each school year: “We’re All Animals” (sixth grade) in September, “Disease Detectives” (seventh grade) in November, and “It’s a Gene Thing” (eighth grade) in February. The supplemental materials can be accessed at any time by registering on the website (www.purdue.edu/ziptrips). Also, if classes are unable to participate in the real-time broadcasts, teachers and students can watch an archived web stream any time during the school year.

Purdue zipTrips have three main goals: to provide opportunities for students to interact with university researchers as career role models, to help students experience firsthand the nature of the job of scientists and the education pathways to their careers, and to enhance students' interests and perceptions of life science research, scientists, and career opportunities. Scientists featured in zipTrips were selected to portray a wide array of scientific fields and vary in gender, age, and ethnicity.

Although there are three zipTrips programs ("We're All Animals" for the sixth grade, "Disease Detectives" for the seventh grade, and an eighth-grade program covering genetics), this article focuses only on the sixth-grade program, which provides participants with the opportunity to interact with and see the work of three life scientists: a veterinarian, an equine researcher, and an anatomist.

Current offerings for the sixth-grade program

A day in the life of a veterinarian: In the first segment of the show, Professor Lori Corriveau, a veterinarian and researcher in Purdue University's School of Veterinary Medicine, talks about her typical day as a veterinarian and discusses the nature of her work, why she decided to become a veterinarian, and the societal relevance of her practice and research work. The conversation with Professor Corriveau broadcasts live, but the segment also includes a preproduced video showing footage of a "day in the life" of the veterinarian as she treats different animals.

Visit the horse treadmill lab: This segment features a live connection between the production studio and the Equine Research Laboratory at Purdue School of Veterinary Medicine, where Professor Laurent Couëtîl, an equine researcher, uses a horse to help demonstrate how scientists employ scientific inquiry and technology. With Whitey (the horse) on a supersized treadmill (see Figure 1), Professor Couëtîl explains how scientists use treadmill technology to diagnose and treat injured animals, train veterinary practitioners, and engage in research to develop new treatments and prevention regimens for equine injuries. Using a heart-rate monitor attached to Whitey, Professor Couëtîl monitors the horse's heart rate as it runs on the treadmill. Students observe how the horse's heart rate increases with an increase in exercise. Professor Couëtîl then invites the in-studio, web, and broadcast audiences to measure their own heart rate and observe how it varies with activity level by measuring their pulse rate on their necks before and after jumping in place for 30 seconds.

Meet an anatomist: Professor Lisa Hilliard, an anatomist and university researcher, teaches students about the nature of the job of an anatomist, as well as similarities and differences between humans and animals "on the inside." She also discusses her typical workday and passion for research and teaching. A preproduced video helps students to better understand the career of an anatomist by showing Professor Hillard's office, lab, and students. After the video, Professor Hilliard uses a model of a dog's hind leg to teach the audience about the concepts of extension and flexion. Students then

FIGURE 1 Live demonstration of the equine treadmill



PHOTOS COURTESY OF THE AUTHOR

FIGURE 2 Learning objectives for sixth-grade electronic field trip

Learning objectives: After participating in the Purdue zipTrip “We’re All Animals,” students will be able to:	Targeted science standard
<ul style="list-style-type: none"> Summarize and explain the process scientists use to make a scientific inquiry. 	Scientific inquiry
<ul style="list-style-type: none"> Identify places scientists work and give examples of different types of scientists. 	Scientific enterprise
<ul style="list-style-type: none"> Recognize the importance of technology usage in science. 	Scientific enterprise
<ul style="list-style-type: none"> Compare and contrast animal and human body systems such as digestive and skeletal systems. 	Human identity

have the opportunity to personalize these concepts by standing up and flexing their own legs while locating the muscle responsible for moving their bones.

At the end of each scientist’s segment, participants are encouraged to send in their questions; teachers, students, and others viewing from home with internet access can e-mail questions during the live broadcast. Typically, the program host reads some of the e-mailed questions to the scientists at the end of each live segment. All e-mailed questions are compiled later, answered by scientists, and organized into frequently asked questions (FAQ), which are posted on the website for schools to review after the program.

Participating in zipTrips

Each zipTrip is typically announced via e-mail and

postcards, the program website, and announcements at state science teachers’ conventions. Three zipTrips are offered each school year for sixth, seventh, and eighth grades with a focus on comparative biology concepts including human and animal body systems, disease research, and genetics. The content and topics are modified each year based on student/teacher feedback, timeliness, and changing science standards. The first step to participation is for teachers to visit the website and peruse the content to determine if the program suits their curriculum. The content of each field trip is based on the Indiana Academic Standards for science, the National Science Education Standards, feedback from an external advisory board of middle school teachers from four different school districts, and input from Purdue scientists (see Figure 2). Figure

FIGURE 3 Checklist for participating in zipTrips

- Peruse the program website to determine if the program content suits your curriculum.
- Register at the secure website (www.purdue.edu/ziptrips) to gain access to show information and resources.
- Work with the technology specialist at your school to select your participation technology: broadcast/cable television, IP videoconferencing, or web streaming.
- Locate an appropriate room in your school for participation in zipTrips. This room should be large enough to accommodate student activity and have access to cable or broadcast television or an internet connection.
- Review the supplementary materials available on the website and develop your strategy for integrating zipTrips into your classroom.
- Participate in the live zipTrips with your students at the scheduled date and time.
- Log in to the website to view the archived show and the answers to students’ questions that were not answered during the live zipTrips program.

FIGURE 4

Pre- and postassessment of the impact of zipTrips on students' interest in science and science careers

Teachers can ask students to indicate the extent to which they agree or disagree with the following statements:
Science is interesting.
Science is fun.
Scientists can be female.
Scientists use a lot of tools.
Science affects everyone, including me.
Science is an important subject.
Every day I use things that have been made possible by science.
I like learning about science.
I think I could be a scientist.
Science can help make our lives better.
People just like me can become scientists.

3 provides a checklist to guide teachers' participation in the program. A total of 256 teachers from 14 states registered for the 2010 sixth-grade program. ZipTrips are offered to students and teachers at no cost.

Classroom assessment activities

Teachers can examine the impact of zipTrips on their students by choosing one or a combination of the following three informal assessment options:

- *Assessing the impact of the program on students' interest in science and science careers:* To determine the impact of the program on students' perceptions of science, teachers can ask students before and after participating in zipTrips to indicate the extent to which they agree with the statements listed in Figure 4, which we adapted from Jarvis and Pell (2002). Response categories for each statement could be "yes/no" options or categories that range from "strongly disagree" to "strongly agree." After the field trip, teachers can work with students to tally the pre- and postparticipation responses to examine changes in students' perceptions. Teachers can also ask students to reflect on how their interest in science and

FIGURE 5

Checklist for scoring students' drawings of scientists

Possible elements of students' drawings	Present (1)	Absent (0)
<i>Negative or stereotypical descriptions of scientists</i>		
Scientist wearing a lab coat	1	0
Scientist wearing eyeglasses	1	0
Presence of facial hair	1	0
Inclusion of research symbols	1	0
Inclusion of knowledge symbols	1	0
Scientist using technology	1	0
Scientist is male only	1	0
Scientists is Caucasian only	1	0
Scientist is middle aged/elderly	1	0
Presence of mythic stereotypes (e.g., Frankenstein creatures or mad/crazed scientists)	1	0
Secrecy	1	0
Scientist working in lab	1	0
Positive descriptions of scientist	1	0
Scientist wearing regular clothing	1	0
Scientist smiling	1	0

FIGURE 6 Pre- and post-DAST from the same student

Pre-zipTrips Draw-a-Scientist



Post-zipTrips Draw-a-Scientist



scientists has changed and to identify the elements of the program that influenced those changes.

- *Assessing the influence of the program on students' perceptions of scientists:* Teachers can examine the program's impact on students' perceptions of scientists using the Draw-a-Scientist Test (DAST) developed by David Wade Chambers (1983). Chambers identified seven common stereotypes used by students to depict and describe scientists in drawings. Building on this work, Kevin Finson and colleagues developed a checklist that includes eight additional items (Finson, Beaver, and Cramond 1995) that could be used to quickly analyze students' drawings for the presence or absence of common stereotypes. The presence of any particular stereotypical view (e.g., wearing a lab coat, eyeglasses, male only, Caucasian only, etc.) is coded "1," and its absence is coded "0." Given the checklist (see Figure 5), students can score their own pre- and post-zipTrip drawings and compare their drawings for the presence and absence of stereotypes of scientists. Teachers can then initiate classroom conversations about the field-trip experience by asking students to identify the aspects of the program that impacted their post-participation drawings. Alternatively, teachers can ask students to volunteer to discuss their pre- and post-zipTrip drawings and their thought processes while drawing the scientist. Figure 6 presents an ex-

ample of the pre- and post-DAST from a student who participated in zipTrips in the fall of 2009.

- *Assessing students' understanding of program content:* Teachers can assess the extent to which students understand the content of the field trip by providing students with an index card and asking them to write a paragraph describing what they gained or learned from the program and another paragraph describing what they did not understand about the program.

In addition to classroom assessment activities with students, teachers can also determine whether or not the zipTrip was a worthwhile experience by considering the questions in Figure 7.

Conclusion

Purdue zipTrips provide students and their teachers, particularly those in resource-limited, rural areas, with opportunities to see and interact with scientists and their exciting work, without leaving school. Our experience with zipTrips suggests that electronic field trips are effective platforms for fostering student-scientist interactions and can serve as viable alternatives for teachers who may lack the money, time, or personal resources to organize traditional field trips or classroom visits by scientists. For example, zipTrips were offered at no cost to the participating schools; most

FIGURE 7 Questions to help teachers reflect on the impact and worth of zipTrips

1. Did zipTrips positively impact my students' attitudes toward science?
2. Did zipTrips increase students' awareness of careers in the biological sciences?
3. Did zipTrips increase students' awareness that science can be used to solve everyday problems?
4. Did zipTrips show women and minorities as successful role models in science?
5. Did the experience stimulate student discussion?
6. Were my students engaged in the experience?
7. Did zipTrips provide experiences for students that were previously unavailable to them?
8. Were the website resources easily integrated into my curriculum?
9. Did the experience help me to teach the concepts more effectively?

schools were able to participate via their existing internet resources. The evaluation data we gathered from participants suggest that zipTrips are an effective and worthwhile experience for students. For example, after participating in zipTrips, students were significantly more likely to agree with the statement "I think I could be a scientist." While we do not claim that participating in a single zipTrips program will permanently change students' attitudes and perceptions of science and scientists, we believe that, for many students, the experience will have long-lasting impacts.

As Marina Milner-Bolotin (2007) stated, "All students, independent of their places of birth or residence, race, ethnicity, socioeconomic status or gender, should have an opportunity to meet real people involved in science" (p. 59). We invite teachers to visit the program website (www.purdue.edu/ziptrips) to view teacher resources, online videos, and samples of live zipTrips broadcasts, and to register for upcoming programs. Resources including teachers guides and lesson plans that extend the zipTrips experience are included with free registration. Rather than viewing the zipTrips program as an isolated activity, we hope to encourage and support teachers to use the provided resources to link zipTrips to their existing curricula. ■

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Resources

zipTrips—www.purdue.edu/ziptrips

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