Engaging STEM Students During a Pandemic

Orangeburg-Calhoun Technical College
TRANSPORTATION, DISTRIBUTION AND LOGISTICS
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ADVANCED MANUFACTURING TECHNOLOGIES

My name is Debra Jones and I am the PI on an NSF grant awarded in 2018 to Orangeburg-Calhoun Technical College in Orangeburg, SC. Along with the Co-PI, Richard Murphy, we want to welcome you to a most unusual Hi-TEC conference.

About OCtech

Opened in 1968

Located in Orangeburg, SC

Member of the American Association of Community Colleges

Accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC)

A Predominately Black Institution

Orangeburg-Calhoun Technical College is located in the Lowcountry of South Carolina. The school is a Predominantly Black Institution of about 2300 students.

The NSF-ATE Grant

Transportation, Distribution, and Logistics
- The backbone of the supply chain
- Planning, management and movement of people and goods
- Facilitate the operation of the supply chain

Mechatronics
- Electronics, mechanics, robotics, and information systems
- Manufacture goods in the supply chain
- Guarantee the smooth operation of the supply chain

"Multidisciplinary Simulation: Educating Advanced Manufacturing and Transportation, Distribution, and Logistics Technicians for a 21st Century Workplace"
Funded by The National Science Foundation's Advanced Technological Education Program

We call our project Simul-ATE for short because the goal of this project is to prepare technicians for a 21st century workplace by exposing them to a multi-disciplinary work environment. The goal is to simulate the workplace where they will interact with employees from other areas in the company.

The project involves 2 areas, TDL and Advanced Manufacturing. Students will "cross train" between the technologies in both areas.

This project is somewhat unique in that it exposes students to other areas of the college. Students can see where their job fit into the big picture, the Supply Chain. This should prepare them for some of the decisions that they may make while on the job

Overview

Advanced manufacturing doesn't happen in a vacuum

There are business processes running behind the scenes

Supply Chain and Operations Management
- Planning, execution and control

Shipping and Receiving
- Receiving raw materials and shipping finished goods

The purpose of the grant is to expand STEM education into other areas of the college, as well as expose STEM students to other disciplines. The goal is to educate a more well-rounded employee who has the skills and knowledge to contribute more than technical knowledge. Employers expect employees to be able to offer suggestions for improving processes. They also need employees with good communication and teamwork skills.

This project is unique in that it exposes the student to more than TDL and Advanced Manufacturing. The student will learn that manufacturing is a part of a larger supply chain.

Logistics/Supply Chain Technologies
  Oracle NetSuite
  Geographic Information Systems (GIS)
Advanced manufacturing technologies
  Mechatronics
  Robotics
  Graphic design
  Precision manufacturing

Advanced Manufacturing students will be able to collaborate with students in other areas: business management and logistics. Students in Business and TDL will collaborate with students in Advanced Manufacturing.

Business management
Quality management
Product development

Everyone involved in this project will learn how their work affects each other, and how they fit into the enterprise that employs them

The goal is to produce a workforce that understands how the decisions they make impact other areas of the business that employs them.

Transfer Opportunities

Coastal Carolina University

Savannah State

University of South Carolina - Upstate

Students from our programs have the opportunity to transfer to a 4-year college or university through articulation agreements that were signed as part of the grant project.

Industry Partners

This is list of our industry partners.
Amazon Distribution
Zeus Industrial Products
Continental Tire
Starbucks
Showa Denko
The Okonite Company
Universal Trade Solutions
GKN Aerospace
Devro
Husqvarna
DAK Americas
SI Group (formerly Albemarle Chemicals)
Food Lion Distribution

Outreach
(pre-pandemic)

On site
Summer camps
Field trips
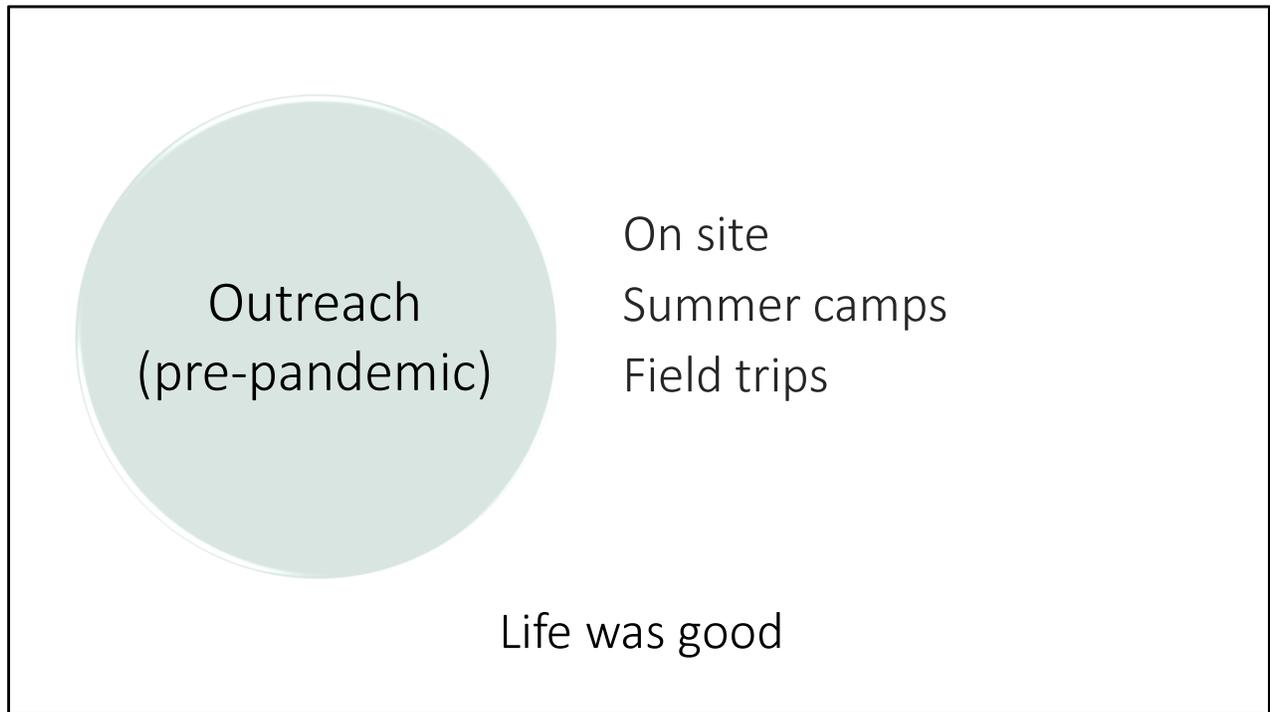
Life was good

Outreach is a significant part of the project. Before the pandemic, outreach was done in person. Really easy for hands-on technical education, so life was good. The next ten slides show some pictures from our 2019 summer camp.
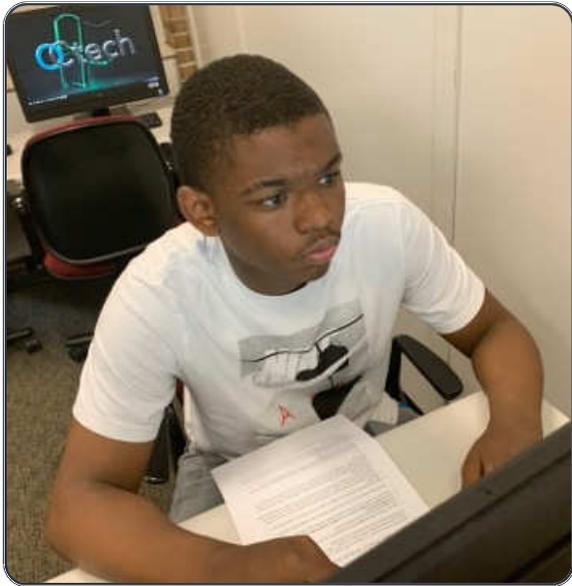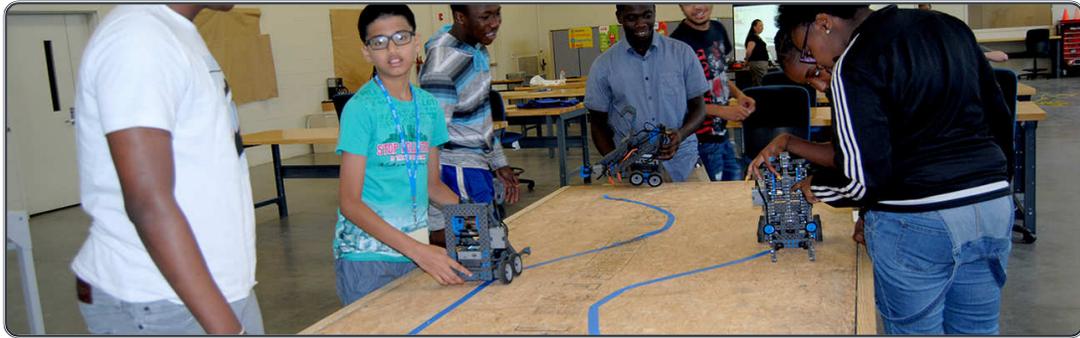
Supply chain management

Geographic Information Systems (ArcGIS)

Warehouse and Distribution

Transportation, distribution, and logistics

Automated Guided
Vehicles
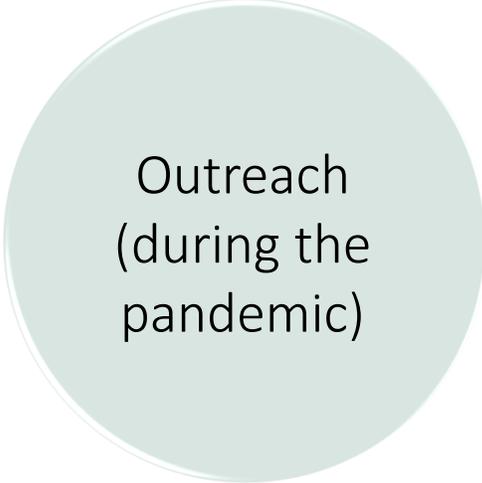
Robotics

Advanced manufacturing

Mechatronics

3D Printing/Product Design

CNC Plasma Cutting

Outreach (during the pandemic)
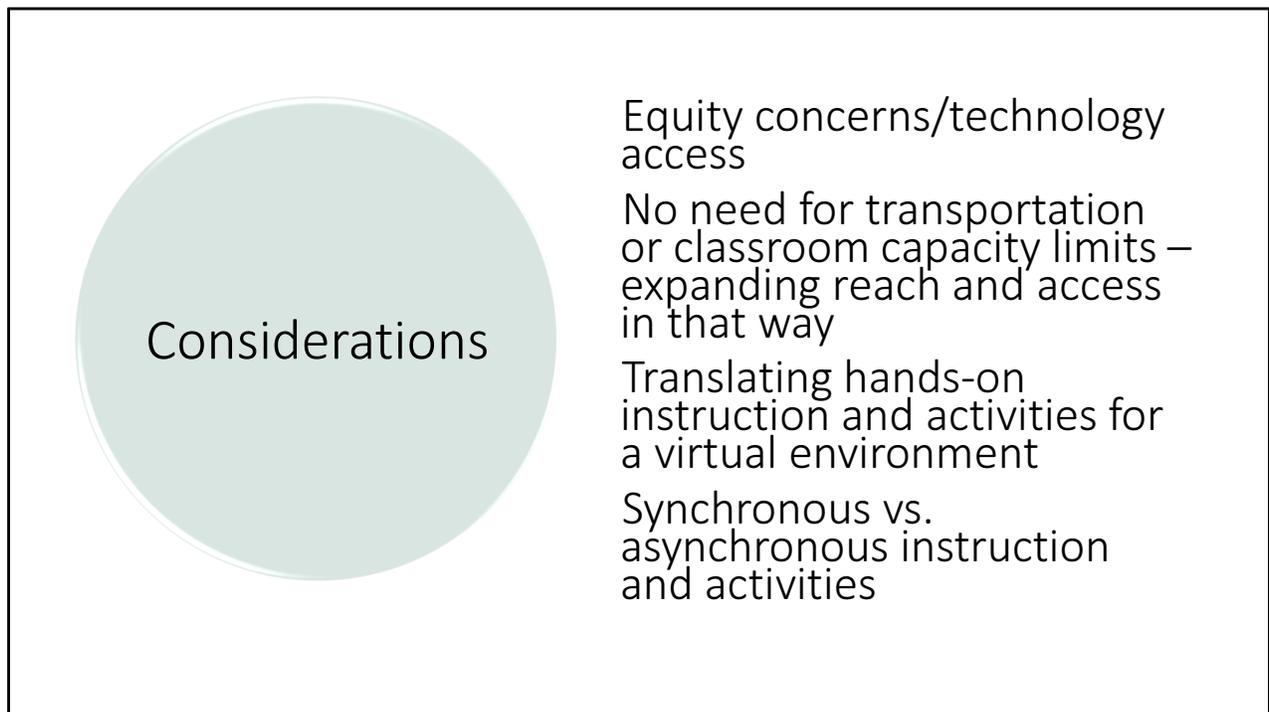
- Virtual; just like an online class
- Creativity is key
- Translate what we are doing in the classroom
- Leverage our existing technology and online resources

During the pandemic, we had to find another way to fulfill the outreach promise that we made. We realized that we couldn't afford to lose an entire year of outreach, so we hoped that the move to virtual would capture a lot of the summer campers who normally attend our camps.

We also hoped to increase our outreach to kids who might not be able to attend activities on campus, or never had the opportunity because of the cost.

Considerations

Equity concerns/technology access

No need for transportation or classroom capacity limits – expanding reach and access in that way

Translating hands-on instruction and activities for a virtual environment

Synchronous vs. asynchronous instruction and activities

Equity concerns/technology access:
- We serve a largely rural area where access to high-speed internet is impossible for many students.
- Many of our prospective campers come from low-income households that may not have a computer.
- Local school districts issue laptops and hotspots for kids to use during the school year, but that equipment was returned to the schools at the end of the school year.

No need for transportation or classroom capacity limits – expanding reach and access in that way
- Previous (traditional) camps have been limited to 25 campers because of classroom capacity and available materials.

Translating hands-on instruction and activities for a virtual environment:
- For robotics, we typically use VEX robots which could not be distributed to students off-campus.
- Software: we could not expect the campers to download and install software.
- LMS: we needed a place to house the activities so that campers would have access, and the school did not want to create accounts in our LMS for non-

students.

Synchronous vs. asynchronous instruction and activities:
- Both might be hard due to lack of internet access.

Working through
the issues

Technology survey

Partner with public
schools to provide
technology

Partner with
industry to secure
software

- In the camp application, we asked about technology needs.
- Then, we contacted local schools where these kids attend and asked them to provide laptops and hotspots to kids who needed technology. Our local school district has computers and hotspots that they issue to kids during the regular school year, and they were willing to issue them out for the virtual camp.
- Then, we contacted companies that provide online access to the software that we wanted to include in our activities. We wanted free, web-based software so that the kids wouldn't have to download software, and so that cost would not be an obstacle.

Platforms used

Zoom
Schoology
Self-CAD
ArcGIS
VEXcode VR
Code.org
YouTube
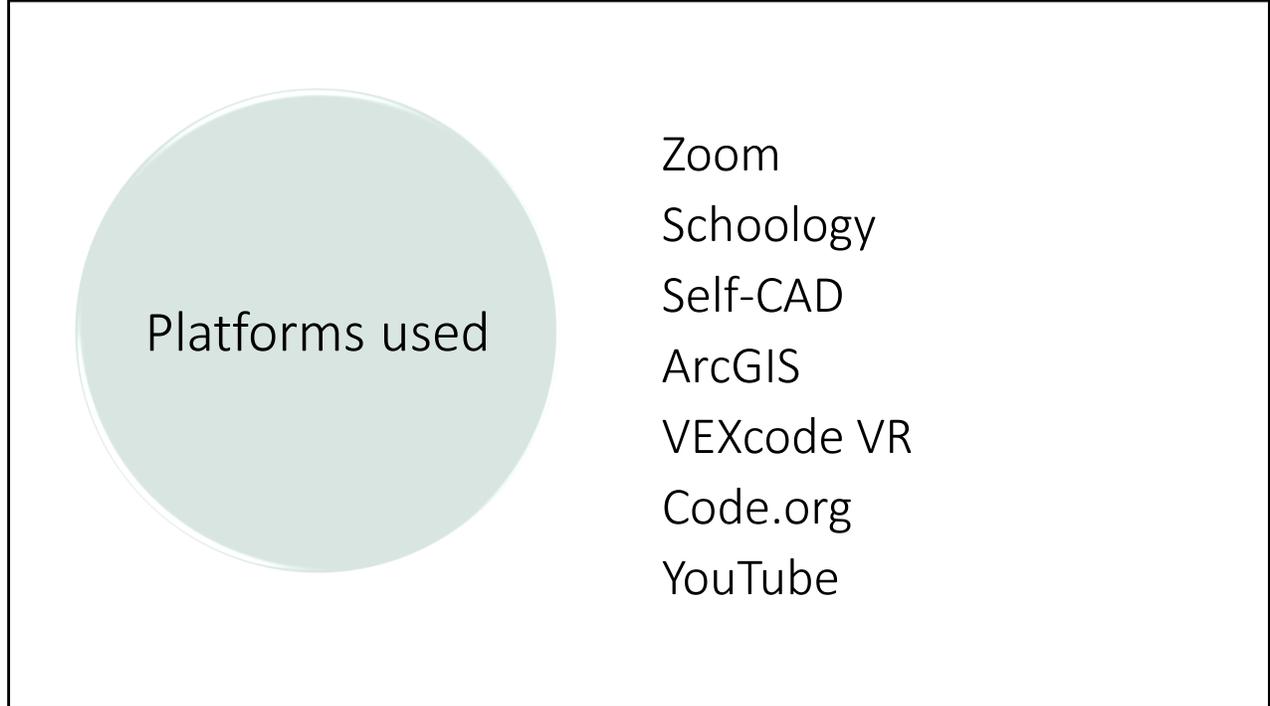
Tools/platforms used:
- Zoom to deliver the camp
- Schoology for the LMS; the school was reluctant to allow use of our regular LMS, D2L
- Self-CAD for the CAD activities
- ArcGIS online for GIS activities
- VEXcode VR for robotics
- Code.org for programming
- YouTube for videos
- Wheel of Names for daily drawings for "door prizes." Kids had to be present to win.

Lessons learned

Issues with video access

A few technology problems with school-issued computers

Great reviews from the kids

Easily adapted for other outreach

- This was very doable and the camp received good reviews from the kids. We were also able to provide a summer camp experience for many kids who have not been able to attend our camps due to cost.
- The school-issued computers could not play YouTube videos because the school blocks them.
- A small number of kids had issues with the school-issued computers. We did a technology run-through on the Friday before but some kids couldn't attend. I would do that earlier in the week and ask schools to issue computers at least a week ahead so that we can head off any technology issues.
- Repurposing content for other engagement opportunities:
  - We can use what we developed to do half-day workshops.
  - We can also expand it for future camps.
  - Expand this kind of programming beyond summertime
    - Opportunities to do fall and spring camps during school breaks, as well as workshops and field studies. We did a Spring virtual camp this year.
  - We can also adapt for different age groups.

Thank you!

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Here is our contact information. If you have any questions or if we can be of help with your project, don't hesitate to reach out. Thank you and enjoy the conference.