CASE STUDY:
TRANSFORMING CTE LEARNING THROUGH MIXED REALITY

By Michael Carbenia

Challenge:

St. Lucie Public Schools serve a melting pot of approximately 38,000 students on Florida's east coast. Due in part to a mobile population, we are faced, constantly, with the challenge of ensuring that career and technical education (CTE) meets the diverse needs of all students. Additional-ly, St. Lucie Public Schools' administrators and staff wanted to find a product or curriculum to allow students of all intellectual capacity to experience a wide variety of programming. To make the challenge even a bit more complicated, we had to contend with satisfying each of 17 distinct career clusters, across 62 programs countywide, and in nine kinder-garten through eighth-grade school centers. What technology tool was available today that would best meet our needs and made the best sense financially?

Solution:

We found our answer in a mixed reality tool called zSpace. zSpace combines elements of virtual reality (VR) and augment-

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ed reality (AR), on an all-in-one computer, to create lifelike, mixed reality experiences that are immersive and interactive for students across multiple grade levels and subjects. Used in a lab environment, two to three students share a zSpace station. While one student lifts, turns or takes apart virtual objects using an interactive stylus, another student makes observations and records data. Students wear custom tracking glasses so they can all see the images floating above the screen and collaborate on the assignment.

Rather than focusing on rolling this out at the high-school level exclusively, the CTE staff in St. Lucie believed that engaging younger learners would provide a better chance at motivating and retaining students. We focused intensely on elementary schools that represented our average demographic, and later transitioned (seamlessly!) the tools and program into the high school Allied Health program. Locally, we conducted a Skills Gap study of our Treasure Coast communities. The results echoed our need to focus on employability skills and building these in our younger generations (Gehant, 2017).

From the 2017 Treasure Coast Skills Gap Study, we also discovered that our local employers were concerned with the rapid growth of technology as a society. There is a recognized need for individuals who are comfortable with technology

and all of its various forms. Survey respondents illuminated an interesting point: The aging workforce, which could once fix an automobile with just their bare hands and tools, must now become part-time computer science gurus because of the high-tech computers being used to run modern-day automotive vehicles. St. Lucie Public Schools viewed this as an opportunity to educate younger students and parents that the automotive industry, just like many other industries, is not the same as that in which our fathers and grandfathers worked. These jobs are becoming inherently more technical and require a different level of expertise and flexibility in thinking.

zSpace was implemented first at Manatee K–8 School and Oak Hammock K–8, where the cool technology tool was rolled out in three CTE programs: Pre-Veterinary; a technology class for third-, fifth- and eighth-graders; and in a maker space for third-, fourth- and fifth-graders. Each school serves a different population, and we felt the results would provide tangible benefit for the development of a countywide model.

Implementation at the high-school level encompassed 10 zSpace machines set up within the district's Allied Health programs. There, students have the ability to earn a number of industry certifications, including certified medical administra-

tive assistant, certified nursing assistant, certified first responder and certified echocardiogram technician; they also receive receive on-the-job training through cooperative partnerships with local businesses and organizations. This is great for the students, but logistically, it can be trying for our school centers to coordinate the sheer number of externships required. Enter zSpace, which provided us a platform for students to dissect, explore and manipulate the human body (using the visible body tool) in the way that we could not financially or fundamentally provide our students within the school district.

Results:

All three primary models found success, but results varied so widely, it was difficult to compare. In the Pre-Veterinary program, St. Lucie Public Schools saw a growth in enrollment and retention. Students benefitted from the real-world, albeit virtual experience. We cannot buy human or animal cadavers for those grade levels, but the virtual dissection applications allowed them to have that experience. One group of students dissected a starfish: They deconstructed it in real time and then broke off into groups for reconstruction. The support of mixed reality enabled them to demonstrate that level of understanding.

In the maker space classes, the overall student engagement and creativity was amazing. Students would design their projects in zSpace and then build them with toothpicks and paper and anything they could find. They were tinkering and, as a result, moved from the realm of "consumers" to that of "creators."

We combined zSpace curriculum with some popular educational technology platforms — such as Kahoot!, Quizzizz and Socrative — to create dynamic formative assessments. Not only were our students deconstructing and creating but were provided opportunity to synthesize the information, and to push themselves to meet the level of rigor that we strive for in our classrooms.

In St. Lucie, we value maker spaces as those areas in which our students feel safe to practice failure; to push themselves and not have to worry about grades or the end results; to intentionally break things so they understand how the world is connected. We used a number of programs in the zSpace library to accomplish this task. One such program, Franklin's Lab, grants students access to a rich simulated environment in which to build circuits using wires, resistors, LEDs, motors and electricity. Students can identify broken components or switches that prevent the light from turning on or the motor from turning the mousetrap. After students completed their mock-up in zSpace, they were then allowed to put together the real thing in the classroom.

Another great zSpace option is Newton's Park, built around the theories of Sir Isaac Newton. Students could focus on stopping and reversing time, as they learn gravity and physics theory like time, force and energy. The district's location in proximity to the "Space Coast" made this an especially appropriate feature for St. Lucie Public Schools, with the opportunity presented to explore the force of gravity on other planets and how that might alter results. For all students, the environment was a comfortable and a familiar one; they took quickly to the touch screen and stylus, and thrived on the ability to put their hands on something to do it.

In addition, this kind of learning eliminates barriers for students with disabilities. A student with dyslexia might strug-gle when tasked with a book: "Read from left to right." They may not be able to do it. Mixed reality can help transcend that struggle, and that of another student without the fine motor skills to use a scalpel.

Mixed reality tools like zSpace increase students' ability to collaborate. We arranged for students to work in groups of two or three, and within each group we assigned them different roles. zSpace comes with a set of "driver's glasses;" the student who is the driver sits in the center with the stylus and the zSpace machines operate from the reflectors of the driver's glasses. The other students can then use

traditional 3D glasses and visualize the environment as if through the driver's lens. This presented a unique opportunity for students to begin developing the employability skills the skills gap analysis (2017) demonstrated needs a larger investment of time and resources.

In the high schools of St. Lucie Public, to earn EKG certification the Allied Health program students must understand the different arrhythmia that come with a heartbeat. That's difficult to simulate. With the zSpace stylus, students can feel the pulse of the arrhythmia as they explore the human heart in 3D. Our

students enjoyed using the visible body to explore the sheer number of biological systems to be found within. Mixed reality allowed our teachers to set up various classroom stations: one each for the endocrine system, circulatory system, and digestive system, all in the same class. It allowed the teacher more flexibility to circulate the room and provide direct feedback, without having to worry about switching screens or monitoring student work.

St. Lucie Public Schools made an early commitment to the implementation of mixed reality. We didn't want to live in theory. We wanted to live in action. And

we learned through our initial struggles. It wasn't all successful from the outset, but the process was a lot of fun and we are seeing remarkable benefits in our CTE and other programs. ■

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REFERENCE

Gehant, P. (2017). Treasure coast skills gap study. Retrieved from http://youredc. com/files/studies_reports/SKillsGap_ Report-2017-02-07.pdf.