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A Mixed Reality Alternative

to Performance Testing

By Michael Carbenia, John Foster & Eamonn Powers



Career and technical education (CTE) is all about competency! Competence can be broken down into individual components: attributes, knowledge and skills. An attribute is a trait, quality or characteristic — something that an individual already has. Typically, attributes are not tested, so it makes sense to remove that piece from the discussion. Knowledge is focused on a theoretical or practical understanding of the way something works. Cognitive ability is measured as CTE teachers deliver written tests about context, theory or the steps involved in a process.

The CTE community can also relate competence to credentialing. A credential can be defined as a license, certification, certificate, digital badge or any number of other forms of recognition bestowed on an individual by an authorized third party. Many of these credentials rely solely on knowledge related to competence of a particular job or task.

Skills-based performance testing is the gold standard.

While CTE focuses on competence of performance, only a very small handful of states require it. What's more, performance-based credentialing also lags behind. So, if CTE is all about competence, and competence is best measured by performance, why is it that so few states and credentialing providers utilize it?

Challenges

A credential involving performance requires additional human and capital resources. A performance test is more expensive to administer because it utilizes materials. It requires human capital for both set up and coordination of subject matter expert evaluators.

Over the years, other methods of performance have been implemented. In some cases, these alternative measures have become as widely accepted as the cognitive measurement described earlier. In some instances, this acceptance has been forced by a greater need, and many times the acceptance has been largely informed by research. The COVID-19 global pandemic that began very early in 2020 will likely spur additional alternative measures to be considered as learners and educators are

more likely to be engaged in social distancing protocols.

A few examples

Prior to the mid-1980s, there was no federal license for commercial drivers crossing state lines, nor were there any nationally consistent requirements to verify one's ability to understand road signs or ensure safe operation of the vehicle transporting goods. Once the federal government implemented the commercial driver's license (CDL) program, there was an immediate, strong demand. Members of the existing workforce, as well as those looking for a career in the transportation industry, wanted to become certified and they needed the training to do so.

Career and technical education programs answered the call. They knew licensing would require a performance test — a road test. And, so, in order to promote the highest quality programs, CTE had to find a cost effective and practical method for training learners to work with a large truck. The options were, real trucks or simulators. Simulators were selected to mimic the cab of a truck, with on screen film clips that appear as mirrors would in the real world. In this example, simulation was a cost-effective method for development of a performance skill.

Simulations are important to the military because of cost and scalability, like in the other examples, but they are also important for safety reasons. Through educator collaboration projects across the country, CTE teachers have assessed simulated parachute landing, bomb diffusing, Humvee desert driving, use of heavy assault weapons and drone aviation.

Pilot training organizations within the airline, corporate and military sectors have long used advanced full-motion flight simulators as a means to train and assess candidates. On the other hand, training methods for inspection, troubleshooting and repair are still largely based around practical experience on live aircraft and formative knowledge testing. Working on live aircraft is desirable in many ways, but it is also prohibitive for a number of reasons, including ease of access, class size constraints, and costs associated with an incorrect performance.

Original equipment manufacturers (OEMs) and professional aviation training organizations were among the earliest adopters of both virtual training environments and simulated performance assessments for aircraft maintenance and repair. Flight Safety International offers an advanced troubleshooting program as a capstone experience at many of their global

training locations. This program features a comprehensive aircraft simulation and performance measures based on real-world considerations (e.g., component cost, time to perform work, and accuracy of decision making) within specific repair scenarios.

The path forward

Programs will continue to improve not only simulation fidelity but also the ability to capture meaningful performance data from specific learner interactions.

Look through the lenses of evolution surrounding memory and technology and the impact on the CTE world, and it seems obvious that these two worlds have collided. One could argue that the same acceleration has taken place with CTE equipment, particularly machine learning, and now training resources are taking giant leaps.

Machine learning and training resources for CTE are taking giant leaps. These surges build on the use of augmented reality (AR) and virtual reality (VR) for hands-on training applications. Companies like zSpace have expanded their hardware to meet growing demand for increased memory and processing power, to support increasingly sophisticated simulation platforms.

There is a solid rationale for simulations as an alternative to in-person performance

Perspective on the speed of evolution

The iPad didn't exist 10 years ago. Oculus VR was only launched in 2012 (acquired by Facebook in 2014). For additional evidence, compare the storage capacity of the Apple iPod. The first-generation iPod contained five or 10 gigabytes of storage — approximately 2000 songs — at its launch in 2001. The latest generation, the iPod Touch, offers 256 gigabytes of storage.



testing and several use cases in related technical fields — based on the fact that hardware and software technology are increasingly available — but an important question remains:

How do we effectively simulate content, especially CTE content?

zSpace and NOCTI began to explore solutions a few years ago. At zSpace, mixed reality content is curated by individuals who know and understand the needs of the CTE community. Similarly, NOCTI establishes industry standards and the certifications that measure an individual's competence against standards — working with CTE practitioners for many years.

Capitalizing on extensive experience in CTE, the companies began researching performance components of various NOCTI credentials to see which would provide the best experience for CTE learners. The idea was to blend the world of credentials and technology to provide a prototype that could present an alternative to in-person performance testing.

In 2019, more than 30 NOCTI industry credentials were identified that aligned to the mixed reality content offered through zSpace.

In addition to the credential alignment work, NOCTI provided national performance standards in welding so that students could have an immersive experience in a mixed reality setting. The partnership produced mixed reality equivalents for all tasks required in a traditional performance assessment. While it is recognized that a performance exam conducted virtually will not have the same impact as an in-person assessment, it takes a step above a written content assessment and offers advantages such as cost, safety, scalability and experimentation.

When the collaborative project began, neither firm had any indication of the global pandemic that would unfold. CTE facilities shuttered for months on end, and CTE learners moved to 100% remote learning structures. Perhaps the environment under which the nation is currently operating (at this writing) will be the tipping point for an ever-increasing sophistication, and use, of simulation and AR/VR. Platforms like zSpace working with industry experts like NOCTI have made it possible for CTE students to experience CTE content in a remote, blended or face-to-face learning environment. Through the use of this technology, a stu-

dent at home can practice disassembling and assembling an engine, suspension, brakes, transmission or air conditioning systems. Furthermore, the instructors are able to use teleconferencing software to review the students' work and provide actionable feedback.

It was originally envisioned that this mixed reality performance alternative could act as an intermediate step in the technical credentialing landscape for CTE — by providing an additional measure of skill development that falls somewhere between teacher demonstration and guided practice. The current reality may have a great deal to do with the speed of implementation, as will employer recognition of these sorts of alternatives, but these tools are more than a novelty. Mixed reality will likely become part of the CTE landscape for the foreseeable future. ■

Michael Carbenia is executive director at zSpace. Email him at mcarbenia@zspace.com.

John Foster is president/CEO at NOCTI. Email him at john.foster@nocti.org.

Eamonn Powers is director of programs at FlightSafety International. Email him at francis.powers@flightsafety.com.