How Transit Agencies Use Simulator Technology

Using simulator technology to boost operator engagement

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The transit driver workforce is aging. You need to draw in younger applicants, and train applicants of all ages more effectively and more quickly. But transit driver applicant pools remain small and skew older (in many areas, the median age for a new driver is 50 years old). Wash-out rates are high, and so is churn.

This isn't just a matter of getting "butts in seats"—transit drivers are an important element of public safety, making the right decision in a split second to protect their passengers, other motorists, unwary pedestrians, and the general public.

Meanwhile, we've entered an age where operating a mass transit vehicle is more challenging than ever. Streets are increasingly congested. Transit drivers must share the road with everything from rent-by-the-minute electric scooters and devoted cyclists to distracted drivers, distracted pedestrians, and motorists who rely too much on the latest advanced driver assistance systems (ADAS). Modern transit driving has become as challenging as piloting an airplane—with the added stresses of customer service, passenger management, and conflict resolution.

This calls for a level of training much more akin to what we offer combat pilots, emergency vehicle operators, and law enforcement. These fields rely on extremely **active**, highly engaging training systems that help trainees more quickly and completely integrate knowledge and skills acquisition while developing the emotional discipline, situational awareness, and on-the-spot judgment it takes to survive and thrive in some of the most challenging environments imaginable.

PASSIVE VS. ACTIVE LEARNING

- "passive learning" methods **give information**—examples include lectures, PowerPoint, videos, multiple-choice quizzes, etc.
- "active learning" methods **elicit performance**—examples include open-ended essay questions, solo and collaborative projects, presentations, role-playing, hands-on activities, computer-based simulations, etc.)
    - This is a continuum, with extremely **passive** methods at one end (e.g., lecture and PowerPoint), **more active** methods in the middle (e.g., watch a video and discuss, work through rote driving exercises on the course), and extremely **active** methods at the other end (e.g., immersive simulations followed by de-briefing review and iteration)

Unfortunately, most existing transit driver training systems and programs rely on **passive** or less-active learning methods. These include lecture sessions (aka "death by PowerPoint") and closed-course skills sessions (i.e., "bending metal out in the parking lot").

FAAC's **Engagement Training Method** is an ***active-learning*** approach that uses simulator technology and advanced after-action analysis to **increase the intensity** of your existing training program while **reducing the stress**—resulting in **greater trainee engagement**.

"In theory, they have more time to make a decision because they're not traveling at the speed of a jet—but generally speaking, [transit operators] encounter ten times as many things each mile as a commercial pilot would."

Todd Cheever, Director of Safety and Training for NICE (Nassau Inter-County Express)

THE HALLMARKS OF ACTIVE LEARNING:

- Students are asked to **integrate** new information with their preexisting knowledge
- Students are encouraged to **generate** connections, questions, and solutions
- Students are obliged to repeatedly **retrieve** and apply those findings

The Argument for Active Learning in Transit Driver Training

We already know that, in general, passive learning methods are less effective than active learning methods. Just one example: In a 2014 meta-analysis reviewing 225 studies of educational methods, Freeman (et al.) found that in classes with at least a small element of active learning, "average examination scores improved by about 6%." Meanwhile, students in "classes with traditional lecturing were 1.5 times more likely to fail than were students in classes with active learning." They concluded that building a class on a foundation of passive learning "increases failure rates by 55%."[1]

But the problem isn't just that passive methods contribute to high wash-out rates. There are also features common to the "passive classroom" that undermine the development of sound **judgment**. This is especially concerning when training safety-sensitive employees, like mass transit workers.

For example, in a less-active setting, students are usually praised for correct answers, while errors are largely ignored or dismissed. This seems reasonable: After all, our focus is on teaching people how to do something the right way; no one wants to dwell on their mistakes.

There are fundamental biological reasons that we hate making mistakes: All primates have a very deep physical aversion to errors. Researchers have identified consistent, measurable electrical activity patterns that surge across the primate brain directly following an error. These "error-related negativity" (ERN) patterns are generally understood to be indicative of experiencing unpleasant emotions—and are, in fact, processed in the same region of the brain that processes physical pain. ERN patterns become even more pronounced as individuals experience increasing amounts of stress.[2, 3] The more we pressure ourselves to "get it right," the more it hurts to mess it up.

With this in mind, it's hardly surprising that we distance ourselves from mistakes whenever possible—it's a reflex to pull away from an error, no different than jerking your hand away from a hot skillet.

In a passive setting—which make it very easy to distance yourself—students disassociate from the errors illustrated in lectures, lessons, and videos. The student frames the example as:

"That's a mistake **they** made!"
rather than
"That's a mistake **I could** make."

When that student then goes to the closed course and successfully practices the related operating skills in a controlled environment, we inadvertently reinforce the idea that **someone else** (the operator shown in the video or described in lecture) made a terrible mistake—but ***I*** know what I'm doing.

In other words, passive teaching methods disengage the trainee's critical judgment and distance them from the learning exercise. These passive methods result in a worst-case scenario: An operator who hasn't tested themselves under real-world conditions and thus overestimates their abilities. (A phenomenon known as the **Dunning-Kruger effect** [4].)

Active learning systems are more successful than passive systems, in part, because they tend to take an opposite approach: Errors are directly addressed and discussed. Simulation-based **Engagement Training** takes this further by taking the trainee to a low-stress environment (one without the social pressure of a classroom full of fellow trainees) and giving them "permission to fail." In the sim, the trainer brings the operator-in-training into scenarios where errors are likely so that these errors can be "owned" by the trainee and explicitly addressed by the trainer.

"It's very natural. A lot of people, especially among seasoned drivers, have a high degree of confidence regarding the way they drive. … They may not see the habits they've formed. … The picture-in-picture replay review is quite powerful because there can be times when so much of the focus is on what's going on through the windshield while they're operating … that individuals may not even notice what they're actually doing."

Russell Nikiforuk, Manager for Operator and Technical Training at Coast Mountain Bus Company

THE THREE ELEMENTS OF ENGAGEMENT TRAINING:

- **Knowledge** – Develop a working familiarity with applicable concepts, rules, and regulations.
  Methods: lectures, reading, PowerPoint and other classroom presentations
- **Skills** – Build the "muscle memory" to consistently complete tasks and maneuvers behind the wheel.
  Methods: closed-course driving, behind-the-wheel, and over-the-road training
- **Judgment**—Practice the quick and confident integration of **knowledge** ("Is this within guidelines?"), **skills** ("Can I safely perform this maneuver?"), and **circumstances** (weather conditions, traffic behavior, vehicle condition, etc.) to determine and execute the best and safest course of action in the moment.
  Methods: immersive simulation

When we create a safe, active environment for them to make real mistakes, transit drivers much more quickly (and thoroughly) develop situational awareness and integrate their **knowledge** and **skills** with critical **judgment**.

Engagement Training Gets Results

The New York City Fire Department (FDNY) had long sought to address EMT driver safety by expanding their existing training regimen. This program was rooted in more passive teaching methods (primarily lecture and closed-course driving). They steadily increased training hours—ultimately ballooning their 32-hour program by more than 60 percent. But even with a 52.5-hour course spanning seven days of lecture and 18 range exercises, collision rates remained unchanged.

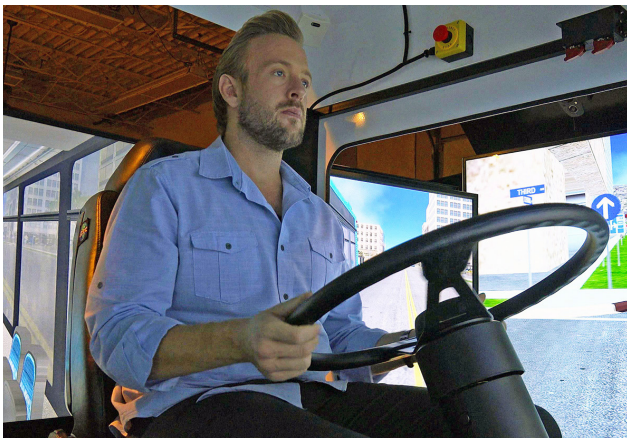
Then Rob Raheb—an FDNY EMS lieutenant, accident investigator, and certified EVOC trainer—implemented a simulation-supported Engagement Training pilot program specifically targeting “t-bone” intersection collisions. In just one year, this Engagement Training program reduced t-bone collisions by 50%. (For comparison, during that same period other collision and accident categories—ones not addressed in the pilot Engagement Training program—remained unchanged.)

Transit agencies have enjoyed similar results with their Engagement Training programs. For example, the LYNX Central Florida Regional Transportation Authority modified their program, and then saw an almost 70% decrease in accidents for operators trained on the simulator, and a 35% improvement in new-hire retention.

Applying Engagement Training Methods to Meet Staffing Shortage

For many transit agencies, sim-supported Engagement Training is proving to be the key to addressing staffing shortfalls. They do this by taking full advantage of simulator technology to **assess new drivers** and **increase training program throughput**.

New Driver Assessment at a Large Transit Agency



NICE is a large transit agency in Nassau County, New York, with more than 600 operators on 335 pieces of equipment, including articulated buses, 40-foot transit buses, and a variety of cut-away buses and paratransit vehicles. As is the case with most agencies nationwide, they struggle with a lack of qualified drivers and an aging workforce. Given the industry-wide push to bring in younger applicants, and the reality that the job currently attracts applications over 40, their new driver assessment program needs to serve two very different purposes: assessing the potential of a younger driver with absolutely no large vehicle experience and evaluating the personality and temperament of an older CDL holder who may have developed driving habits that are unsuitable to working transit routes.

According to Todd Cheever, NICE's Director of Safety and Training, "If they don't have a lot of experience behind the wheel of a big vehicle, the sim is a very, very good snapshot of what they'll be like behind the wheel." It's also an important tool for assessing their development as they work through the course. After a few classroom sessions, they'll develop a much deeper understanding of what it takes to operate a transit vehicle. But that can all fly out the window" as more factors fight for their attention. "They have the knowledge, but don't have the experience to remain cognizant." Seeing this in the sim early on allows the instructor to save time with more effective interventions.

With older operators, ones who have a CDL and experience with larger vehicles, "they certainly have the experience, but the problem is that this can lead to them becoming complacent. Since it comes naturally to them at the wheel, they don't always monitor what's going on around them. That's where they get into trouble."

Cheever points to himself as a perfect example of an operator whose wealth of experience can actually become a liability: “I have a tremendous amount of time on the road with a lot of different vehicles, but I can’t go into it thinking ‘Nothing will ever surprise me.’”

Trainers can use the simulator to build surprises into the scenarios as the operator advances through the assessment. “You can ramp it up to many different levels of experience, depending on the level of experience you have behind the wheel. That’s a tremendous benefit that comes with having a sim.”

Most valuable, sims like FAAC’s MB-1000 and MB-2000 include integrated full-capture audio/video review systems. After each training session, you can review the scenario with the trainee, where they’ll see “picture-in-picture” video of themselves driving alongside the simulated scenario they were navigating. This makes plain all of the nuances of their driving—how they were scanning mirrors and blind spots, holding the wheel, and so on—that can be invisible to a driver in the heat of the moment.

“Getting the big picture—learning to look everywhere, almost separating your head from your body—is probably the biggest issue you have, whether a junior operator or senior operator. ”

Increased Training Program Throughput

It’s not unusual for a transit agency to shift to an Engagement Training model and find that they’ve increased throughput by 10% to 30%. With the right investment in equipment, they might go on to increase their hiring rate by 50% or more.

This may seem counterintuitive. After all, simulation-supported Engagement Training adds several steps to your training program.

There are two factors that lead to increased throughput when adopting Engagement Training methods.

> “We encourage them to treat the sim as an addition to your existing training. That’s where you get the biggest benefit. You don’t want to reduce behind the wheel training or lecture. You want to use the simulator to get the kinks out before you get behind the wheel, in the first six weeks of onboarding, in the classroom, and learning techniques.”
>
> **Steve Berry, General Manager for Public Safety at St. Louis Metro**

As noted earlier, part of this increase in throughput comes as a result of reducing wash-out rates. Because more active learning methods consistently decrease failure rates, the same investment in training time results in more qualified drivers at the end of your program. Additionally, in some settings, adding a

simulation trainer will increase class capacity. A skilled—and disciplined—trainer can even adopt a more efficient “round-robin” approach, lecturing on a topic, and then splitting the group up so that one can practice in a simulator while the others use the cone course.

But most importantly, sim-based Engagement Training allows you to use driving time much more efficiently—packing the same amount of practical experience into a smaller slice of time while targeting specific problem areas with surgical precision.

“The time you spend in the sim is significantly reduced from the time you’re going to spend behind the wheel,” explains Steve Berry, General Manager for Public Safety at St. Louis Metro. “You’re not going to spend an hour behind the wheel of a simulator, but you will spend an hour behind the wheel of a bus.”

Berry has years of experience working with transit and simulation training. He’s found a major portion of those hours behind the wheel isn’t spent practicing the skill you’re targeting, but just getting the bus into position to practice that tricky right turn into a bus stop, or see how an operator handles their pivot points.

“Training simulations, on the other hand, run anywhere from 30 seconds to a couple minutes. I can do repeat motions in a matter of seconds in a simulator. So, if they’re having trouble with right turns, left turns, soft stops, hard stops—that’s where the advantage starts to come out on the side of training on the simulator. Simulators can be preset with a lot of those elements, making it much quicker for us to train on those specific spots. In just a minute or two, I can do a repeat three to five times in a sim. In a traditional bus, I’m not going to be able to do that.”

The key, in Berry’s experience, is to get the right trainer to operate your simulator. “The sim operator is key to the success of getting throughput like that. At least 50% of the output bonus keys to the trainer. This doesn’t mean just taking a successful driver and presuming they’ll be a good sim operator; sim operation is something different. It requires someone who is either educated in technology or has the temperament to go above and beyond to really learn how it works with this tool.”

Training Your Trainers to Accelerate Your Programs

Every city is unique; every community is different; every agency has its strengths and challenges.

FAAC has a long history of building simulation-based systems and solutions. Our sims are used by the military, transit, and first responders to develop situational awareness and on-the-spot judgment skills. These solutions have an established track record for helping people see what they wouldn't otherwise see in order to survive and thrive in challenging environments.

Any solution works best when it's individually tailored for the people and community who will be using it. That's why we have invested the time and effort in developing a core of trainers and consultants who are deeply committed to understanding your challenges and training your trainers to use these tools to their best advantage. Our team can help you integrate simulation into your existing program, or build an entirely new program that makes the best possible use of the latest simulation- and scenario-based technologies and teaching strategies.

Are you ready to take the next step? Contact us today:

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References

[1] “The data reported here indicate that active learning increases examination performance by just under half a SD [standard deviation] and that lecturing increases failure rates by 55%. ... These results indicate that average examination scores improved by about 6% in active learning sections and that students in classes with traditional lecturing were 1.5 times more likely to fail than were students in classes with active learning. https://www.pearsoned.com/research-active-learning-students/

[2] https://www.annualreviews.org/doi/10.1146/annurev-psych-010416-044022#_i34

[3] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3044650/

[4] In the field of psychology, the Dunning–Kruger effect is a cognitive bias in which people with low ability at a task overestimate their ability. It is related to the cognitive bias of illusory superiority and comes from the inability of people to recognize their lack of ability. Without the self-awareness of metacognition, people cannot objectively evaluate their competence or incompetence. https://en.wikipedia.org/wiki/Dunning%E2%80%93Kruger_effect

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