SIMLOG

Over 100,000 Students Trained for Success with Heavy Equipment Simulation

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Setting the Stage (1)

For over two decades, the construction industry has had a workforce problem, especially for skilled trades.

- older people retire

- young people choose other kinds of work

- the need for heavy equipment operators is especially acute

Setting the Stage (2)

The two major reasons for the worker shortage in the construction industry, according to the NCCER's "Workforce Development Research Report" (June 2025):

- inability to attract and then develop younger generations

- lack of training programs

Setting the Stage (3)

What to do?

It's time for innovative solutions, including

- new *and* expanded CTE programs, often established with industry collaboration

- *training simulation* for those CTE programs, with a focus on Heavy Equipment Operations (HEO)

The Key to Better Learning

… is better teaching!

For *training simulation*, that means

► sufficiently realistic simulation *graphics* (what you see and hear)

► sufficiently realistic simulation *physics* (how things move)

► the right instructional design

SIMLOG

The Standard in Cost-Effective Simulation for Training Heavy Equipment Operators

In the beginning (1934)

Photo # NH 80772   Waco XJW-1, assigned to USS Macon, circa 1934-35

Why Simulation: then

Help pilots trained by the US Army to fly during the *day*, to learn to fly at *night* using instruments.

(You're all alone.)

Today

Why Simulation: now

Help pilots who *know* how to fly planes, learn the specifics of a *particular make and model,* in order to deal with emergencies in the air.

(There's an Instructor's Station behind you.)

The Primary Objective for *Heavy Equipment* Training Simulation

Get ready in the *simulated* world for work in the *real* world at the controls of (real) heavy equipment.

→ develop *entry level* (new operator) "core" skills

Simlog Credentials

Over 100,000 students trained since 1999:

► 700 CTE programs in North America

► customers in 73 countries around the world

► 4,500 software licenses sold

► "Personal Simulators" for 17 different kinds of heavy equipment

Sample Products

Forklift

Reach Lift Truck

Stand Up Counterbalanced Lift Truck

Skid Steer Loader

Backhoe Loader

Hydraulic Excavator

Bulldozer

Mobile Crane

Wheel Loader

Off-Highway Truck

Keys to Success: Topics

▶ simulator controls

▶ displays

▶ motion

▶ instructor supervision

▶ "gamification"

▶ student-to-student "collaboration"

▶ technology "updating"

There's a "Sweet Spot"

Too *much* software/hardware complexity

► you're paying for functionality *not* suited to CTE programs

► costs are higher to purchase *and* maintain because there are often *recurring* annual fees (not with Simlog)

Not *enough* software/hardware complexity

► no skills development →no training "transfer" to the real world

Keys to Success: Topics

► **controls**

► displays

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About Controls (1)

Two OEM examples for Skid Steer Loader

Bobcat

Caterpillar

About Controls (2)

► OEM controls are always product-specific, so what you have for skid steer loader is not what you'd need for bulldozer, excavator, etc.

→ simulating different kinds of equipment means different OEM controls

► OEM controls are expensive: they were designed for *real* heavy equipment, over many years

What's Important

► quality that's "industrial strength"

► functionality that's *multi-purpose*, to maximize cost-effectiveness

Later, when students start to work, that's when they'll learn OEM-specifics, i.e. at the controls of their employer's equipment.

Keys to Success: Topics

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► **displays**

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VR Headset vs. Multiple Displays

What to Consider

	VR Headsets	Big Screen Displays
Field of View	Very limited → turn your head to see up/down, left/right	Look forwards and *also* see up/down, left/right
Motion Sickness	Often, especially when you turn your head *quickly*	Never
Instructor Sees What the Trainee Sees	No, so you need a separate display for the Instructor	Always
Reliability/robustness	Fragile: each student adjusts (manipulates) the VR Headset	Nothing to worry about (displays untouched, they are extremely reliable)
Cost	Always high (for quality visuals)	Variable: low for just one small display, high for many big displays

Keys to Success: Topics

- ► controls

- ► displays

- ► **motion**

- ► instructor supervision

- ► "gamification"

- ► student-to-student "collaboration"

- ► technology "updating"

About Motion (1)

Actuators in the corners of the platform to create

► pitching forwards/backwards

► rolling side-to-side

► up/down

About Motion (2)

- costly

- typically moves *just* the operator "seat", so *not* the front displays → motion is not "immersive"

- motion cues *must be perfect*, otherwise what you see and hear =/= movement → another kind of motion sickness (so instructors turn off motion)

- provides little (or no) *extra* training help, especially for new operators

A Better Idea: *Vection*

- motion that you "feel" based on what you *see*

- the visual presentation must "fill up" your (forward-looking) field of view (180 degrees side-to-side, 40 degrees up/down)

- avoids all motion sickness

Keys to Success: Topics

► controls

► displays

► motion

► **instructor supervision**

► "gamification"

► student-to-student "collaboration"

► technology "updating"

About Instructor Supervision (1)

Staff do not always have heavy equipment operating experience. But even when they do, *one* instructor can never be supervising just *one* student.

Staff should "step in" only when the simulation results indicate training problems

→ students should learn in a *self-managed* ("unsupervised") way

About Instructor Supervision (2)

How to promote simulator-based training "self-management"?

→ setups are easy to present (explain) use

→ there's a built-in *Instructional Video* to present the "what to do" for each Simulation Module

→ the simulated work is evaluated in a comprehensive way

Keys to Success: Topics

► controls

► displays

► motion

► instructor supervision

► **"gamification"**

► student-to-student "collaboration"

► technology "updating"

About "Gamification"

Key video gaming features:

- "play" by trial and error, because failure is risk-free (if you "die" → "start over")

- *speed* is everything

- learn bit by bit ("levels")

- focus on *winning*

Video Gaming =/= Operator Training

- learn bit by bit ("modules")

- of course you'll make mistakes (but they'll only have simulated consequences)

- focus on *deliberate practice:* change your focus as you train

The #1 training simulator "secret": it slows people down, to ensure that they learn to work *carefully*.

About Deliberate Practice

One example: Forklift "Slalom"

1. *No* collisions

2. Be more careful about pick up, transport, and put down

3. Speed up!

Simlog's Instructional Design

► Learn component skills *individually*, and then combine them → exercises become increasingly difficult, to make learning easier and faster.

► The simulated tasks "align" with real world tasks as defined by standardized "Practical Exams" from OSHA, NSC, NCCER, CSA, CACES, etc.

► Simulation results are *diagnostic* measurements (numbers), not "grades" (consolidated scores).

Key to Student Engagement: Targets

► establish target values ("benchmarks") based

- student profiles

- available simulator-based training time

- desired proficiency (at the simulator)

► students work to achieve those target values (and compete with each other along the way)

Keys to Success: Topics

► controls

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► **student-to-student "collaboration"**

► technology "updating"

One (Real World) Example

"Truck Spotting" (1)

The wheel loader operator *student* needs to learn to

- honk the horn to "get" the (empty) truck to stop backing up when the truck box is properly positioned under the wheel loader bucket

- honk the horn again to "get" the truck to drive away when the truck box is full

What the *Expert* Truck Operator Does (in the real world)

- the truck won't begin to back up until the wheel loader bucket is properly positioned

- if you honk the horn too *early*, the truck will continue to back up to position the truck box under the wheel loader bucket, and then stop

- if you *don't* honk the horn when the truck box is properly positioned under the wheel loader bucket, the truck will stop by itself

The Problem with Interacting *Students*

If your *truck operator student* doesn't "communicate" like an *expert*, your *wheel loader operator student* won't learn properly.

→ It becomes *impossible* to use simulation results to evaluate student proficiency!

(And your two *students* are just having fun.)

Simlog's Better Idea

Let *the simulation software* assume the role of the "communicating" expert.

Keys to Success: Topics

► controls

► displays

► motion   Myths vs. Facts

► instructor supervision

► "gamification"

► student-to-student "collaboration"

► **technology "updating"**

About Technology Updating (1)

- There are hardware elements (including VR Headsets) that require constant ("firmware") updating.

- Computers require all updates to Windows.

Warning: in both cases, you'll need to provide *permanent* Internet access.

About Technology Updating (2)

Simlog's better idea: training simulation that's "stand alone".

There is *no Internet access*, so

- there are no hardware elements that require updating

- your computer requires no updates to Windows

- user training results data is stored locally and not on the Cloud

Customer Spotlight: NorthWest Arkansas Community College

The Trails Program (1)

- *Heavy Equipment Operations for Trails* began in 2024 (part of the Trail Technician curriculum), with funding by the Walton Family Charitable Foundation

- program uses NCCER and NOCTI

- course provides students with practical skills required to operate heavy equipment for trail construction and maintenance

The Trails Program (2)

Curricular Outline (8 weeks)

► Weeks 1–2: introduction to simulator-based training with *Skid Steer Loader*

► Weeks 3-4: advanced simulator operation and skill benchmarking with *Backhoe Loader*, *Bulldozer*, *Hydraulic Excavator*, *Off-Highway Truck*

► Weeks 4-8: transition to real heavy equipment

► 7-13 students per class, ages 15-70

Personal Simulator Lab (1)

- Simulator lab consists of 2 multi-purpose Operator Chairs with Simlog's *Skid Steer Loader*, *Backhoe Loader*, *Hydraulic Excavator*, *Bulldozer*, and *Off-Highway Truck,* each with 3 + 1 "surround" displays

- The program maintains strong ties with local and regional trail-building and land-management organizations, including Trailblazers NWA, Rock Solid Trail Contracting, Progressive Trail Design, Springdale Tractor, and City of Bentonville Parks and Recreation.

Personal Simulator Lab (2)

What's Truly Important

► setups that are simple, so easy to use

► budget flexibility: options for simulator controls, displays (size, number, orientation), etc.

► simulation that is sufficiently realistic

► one-time purchasing (no *recurring* annual fees with Simlog)

► training that is *self-managed* (there is no "Instructor" station)