

**ADAPTIVE
LEARNING
ENVIRONMENTS:
ALEs for military &
industrial training**

March 28th, 2014

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**Comparing
training to formal
education
contexts**

“Formal” education ALEs vs. training ALEs

- Many “classroom” systems cover a **broad domain** with a wide mix of *declarative* and *procedural* knowledge.
 - Ask students to apply knowledge within the system
 - General expectation that could apply knowledge “out in the world” but unlikely to be tested directly (as of now)
- Training systems tend to be **heavily procedural**.
 - The procedure...is doing your job!
 - Point to teaching you to do something competently, quickly, safely *out in the world* (transfer of skills)
- May have greater emphasis on **efficiency, cost savings**

So, why use ALEs/ITSs for training in industry and the military?

Why not just train people out “in the world” or with real equipment?

Surely that would be best?

**Simulations for
teaching and
training: What are
they, why use
them?**

Simulate (verb)

From the OED online, sense 1d:

“To imitate the conditions or behaviour of (a situation or process) by means of a model.”

Simulation (noun)

From the OED online, sense 3:

“The technique of imitating the behaviour of some situation or process (whether economic, military, mechanical, etc.) by means of a suitably analogous situation or apparatus”

Simulate (verb)

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This is a key idea!

Simulation (noun)

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Learners can use simulations to engage with environments that are too expensive, dangerous, messy, distant, huge, slow, fast, unpredictable, uncontrollable, or complex to be practical to interact with “in real life”.

- “Learn by doing” in quasi-realistic contexts
- Learners can explore, make mistakes (safely), engage with many examples/tasks

In relation to an ITS for testing naval avionics (aircraft electronics) Alan Lesgold writes that:

“...our systems...involved artifacts experienced every day but aspects of those artifacts and system knowledge that seldom were experienced. On rare occasions of breakdown... the cost of that knowledge being missing is huge. On-the-job learning of these particular skills takes a long time, because opportunities to learn occur only when relatively rare work system infrastructure failures occur...”

(Lesgold, 2012, p. 289-290 *see reading list*)

**Two examples:
STEAMER and
Tactical
Language**

STEAMER (late 70's-early 80's)

- Goal of project was to **train engineers** who operate the **steam propulsion plants** on large ships (originally naval)
- Steam plants require a **very large number of procedures** for normal and abnormal operation
 - So many procedures, components that memorizing them is hard
 - Fixing problems may require inventing **novel solutions**
- Takes **many years to attain skills** on the job--Could an ITS make training better and faster?

Teaching an expert model

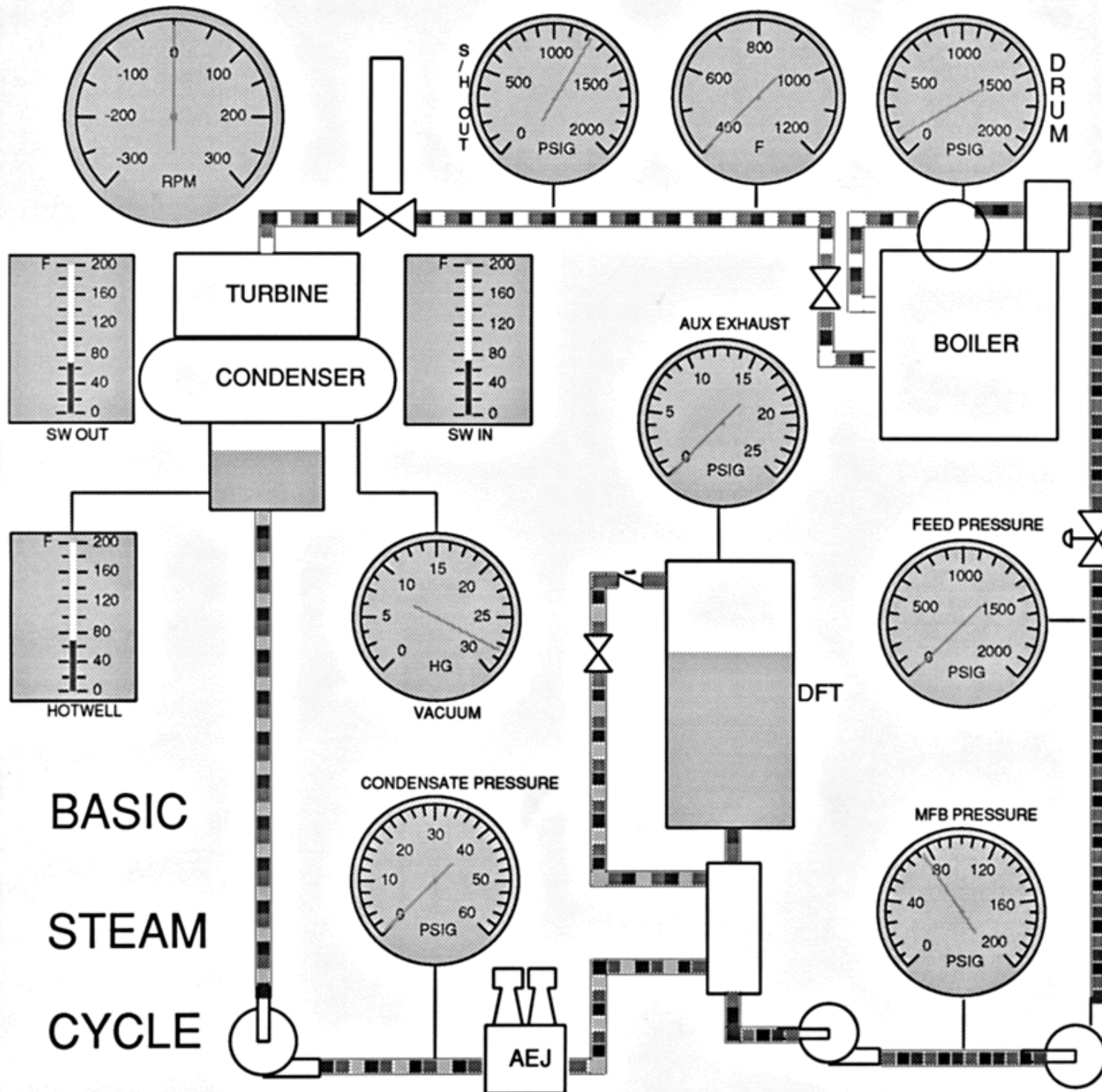
- **Researchers approached this training problem by targeting engineers' *mental model* of the steam plant**
 - Learn the functioning of the steam propulsion system, *as a system*, how components affect each other
 - Minimizes need to memorize set procedures in isolation
- Thus, **pedagogic goal** is for learners to acquire an accurate, **expert-like mental model** of this complex system, and use this in the world
 - Can use this to reason about states of the system, including creating novel procedures/solutions if needed

Interactive, inspectable simulation

Graphically displays “running” model of the plant based on underlying quantitative simulation

- Actions through **pointing and clicking** to change world state (e.g. Adjust a gauge onscreen)
- User sees **immediate consequences** (i.e. a form of *feedback* from system)
- Can “**step through**” **procedures** to better understand how individual actions are affecting the system (can't necessarily do this with real thing)

□ **Not command line: Early and influential GUI!**

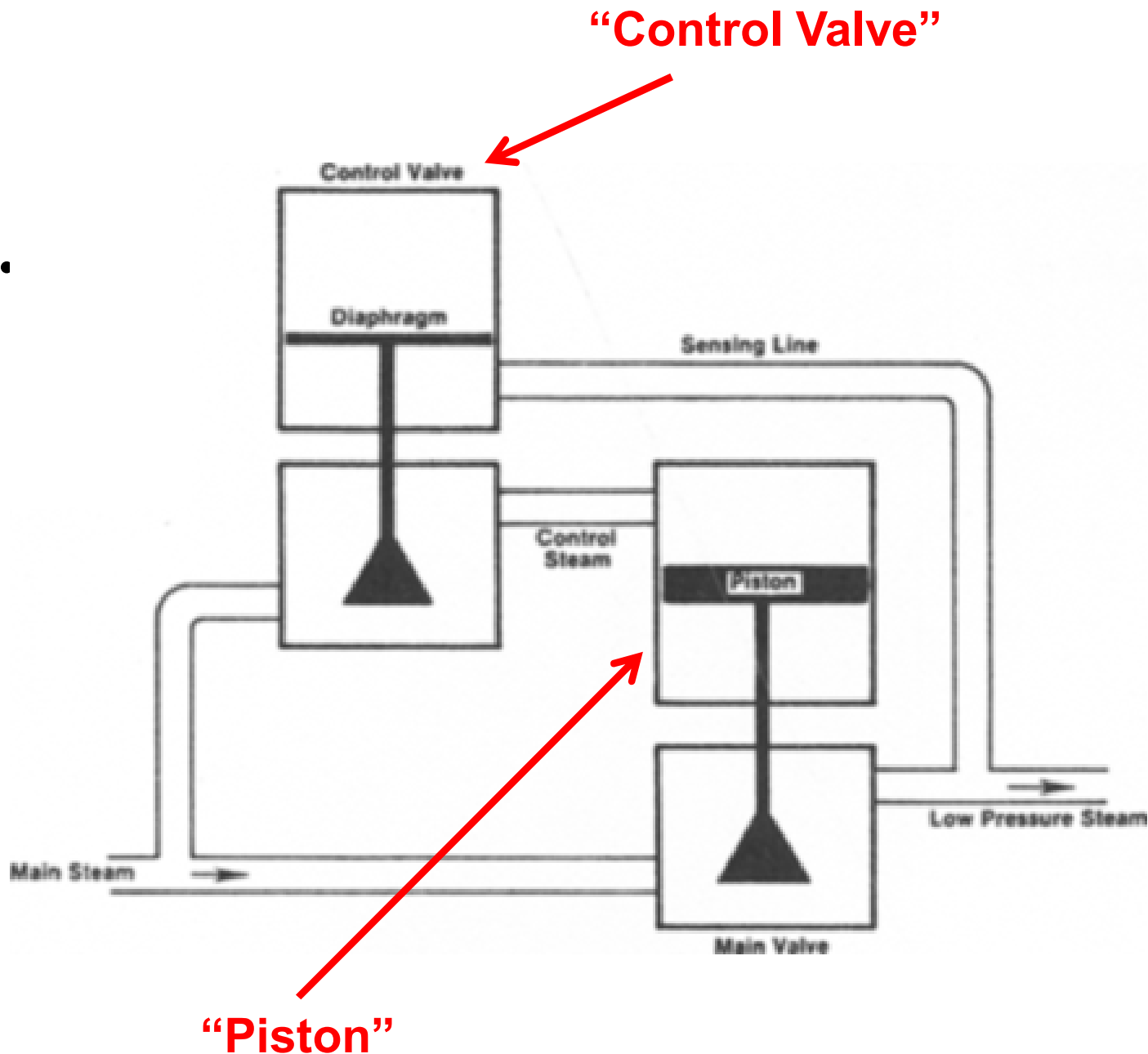


BASIC
STEAM
CYCLE

Graphic of a **high-level view** of the steam plant

Many views possible at different detail levels

(graphic original source unknown)



Graphic of a more detailed view: only one small part of steam plant (individual valves, pistons)

(graphic original source unknown)

COLOUR GRAPHICS! A MOUSE! It's the future.

STEAMER researcher
Dr. Edwin Hutchins
says:



“This image appeared on the cover of Summer 1984 issue of AI Magazine (Vol. 5, No.2). It shows project programmer Louie Weitzman interacting with the graphical editor. The system diagram for the basic steam cycle is shown on the screen to Louie's left.” <http://hci.ucsd.edu/hutchins/Steamer.html>

Tactical language and culture training systems (TLCTS)

- Family of systems from academic spin-out company Alelo Inc. (Key researcher: W. Lewis Johnson)
 - Project began in early 2000's at USC, backed by millions in UD defense \$\$\$
- Original target audience: military personnel from US, Australia, Canada
- Teach spoken language skills and cultural awareness
 - Skill building exercises
 - Narrative “missions” that simulate real situations (ex. Being on patrol in Afghanistan)
- Now various systems tailored for NATO troops, NGOs, and increasingly businesspeople



Mission Game



Xaled: salaam mister! (Hello mister!)

No Object	Esc → Pause	F1 → Help	R → Hint	Space → Closer	G → Glasses	Shift → Run
	Tab → Objectives	O → Options	T → Trans.		H → Hat	

Selected RECOGNIZED: salaam

Skill Builder *Exercise*

QUIT

LESSON: Meeting Strangers PAGE: Exercise

Record an appropriate response in French.



Question



It's late morning. You just met Halimé and now it's time to say goodbye. Say something appropriate to her.

Feedback:

Sounds like you said: 'salut'. This is too informal for someone you just met.

Display Answer

But first: practice with Skill Builder

Overview: Two videos

- Introduction to TLCTS, circa 2008 versions
 - <http://www.youtube.com/watch?v=zUr8k73D8zY>
 - Introduction to much newer VCAT systems, targeted at much broader audience (e.g. Including businesspersons)
 - http://www.tacticallanguage.com/alelo_inc_trailer_vcat.html
- **Watch for *modules* in the system, and *how they adapt to learners***

Where is the adaptivity?

- System models decision-making processes of characters (i.e. agents) and uses this to generate their behaviour
 - Creates a very flexible simulation
 - Offers the wide variety of practice required
- Ongoing modelling of learner's communication skills to determine what is mastered, where to focus practice
 - Software chooses what tasks to present
 - Information for (human) supervisors
 - Can generate tailored reviews

Emphasis on retention

Retention over time is key!
Skills MUST be ready when needed— lives may depend on them

- When main training stops, learners do review activities to prevent decay
- Review can be mobile (see right)
- Review is customised to target weakest skills, based on learners' previous activities

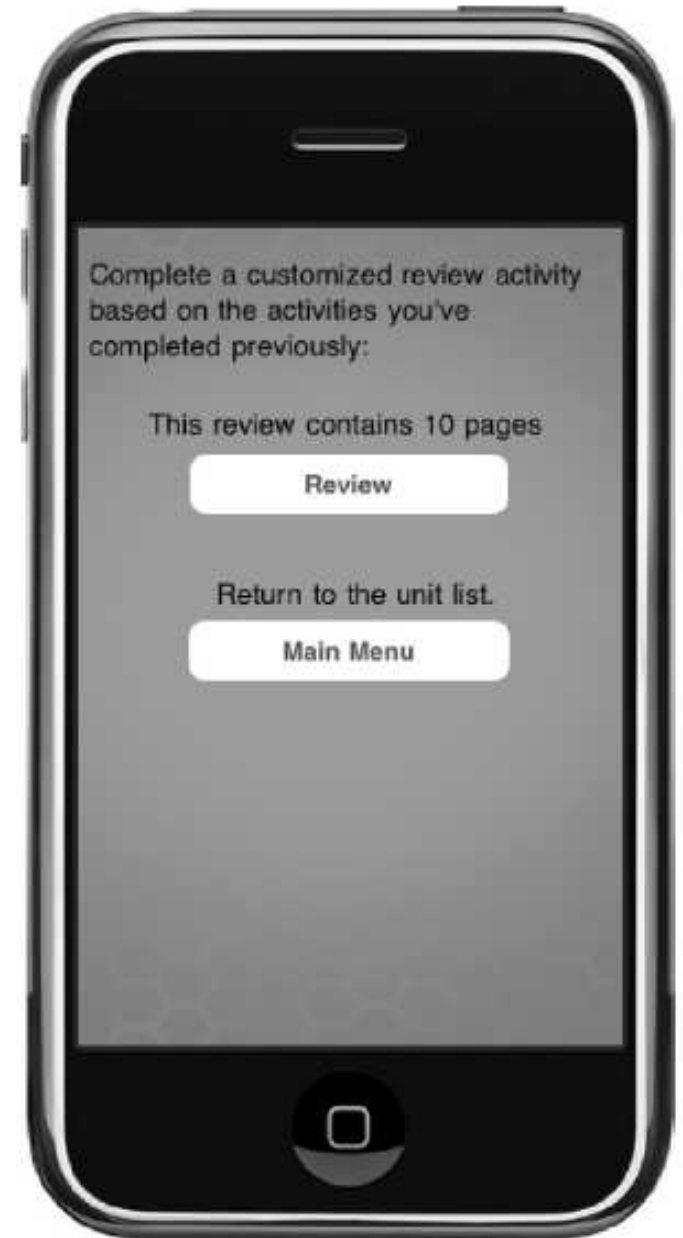


Figure 14.4. Dynamic refresher training lessons.

Widely deployed, saving lives?

- Per a 2008 paper, Alelo estimates that **up to 50,000 people** have trained on TLCTS in the **US military alone, with up to 10,000 more *each year***
- US Marine Corps internal research suggests that intercultural competence gained through systems (Tactical Iraqi) was contributor to 3rd Battallion, 7th Marines being **first unit to return with ZERO combat casualties after 2 tours of duty in Iraq**

That sounds like something the ALE field can be proud of.