

Learning with Virtual Humans

Using simulated role players to teach and inspire

H. Chad Lane | 28 April 2010

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A problem



VS.



we may be losing this battle...

Another battle is going on...

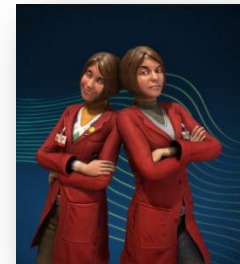
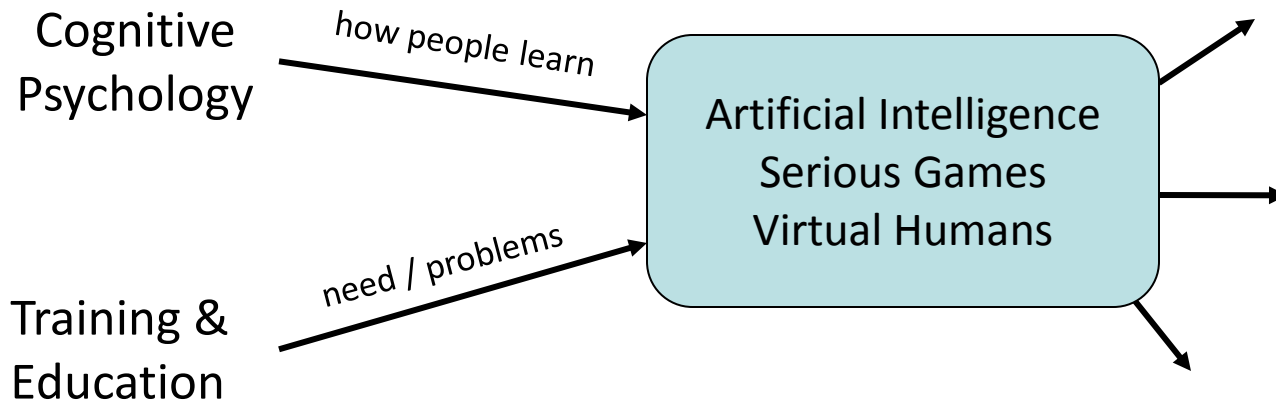
- for you.
- I'm trying to sell you on science.
- What's the competition?



What do I do?

- I do research in *artificial intelligence* and *the learning sciences*.

→ I try to use technology to help people learn.

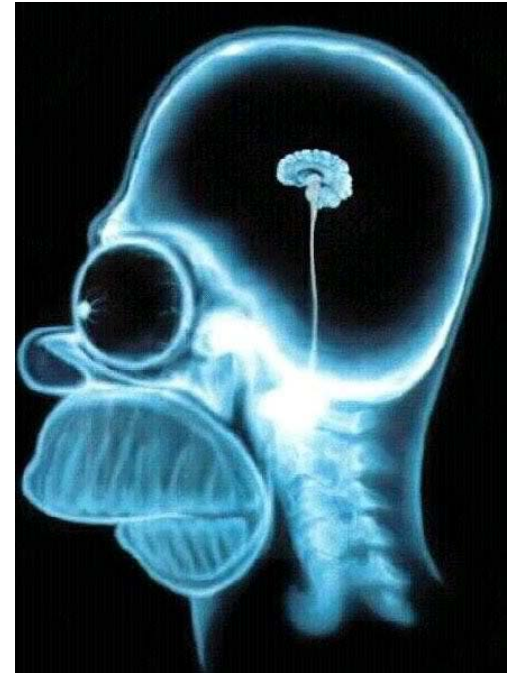


Goals for today

1. **tell you a few of my favorite findings about human learning**
2. **describe ICT research on games, cognition, and learning**

To function well, we have to do the following:

- **ignore what is irrelevant**
- **make assumptions**
- **establish beliefs**
- **evaluate, compare, & decide**
- **learn**
 - we practice, become proficient, and finally, automatic
 - this frees up working memory to learn again



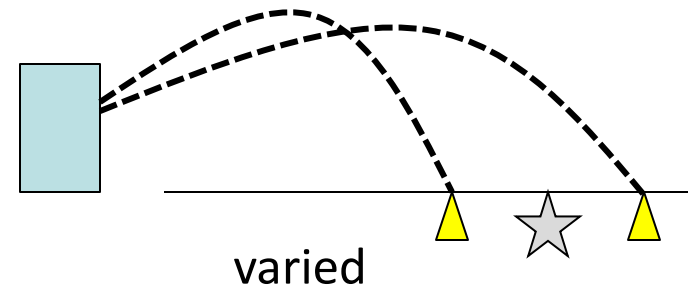
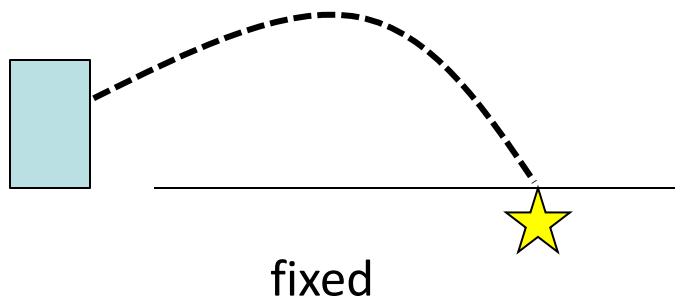
Self-perceptions & Self-assessment

- **We do not have accurate perceptions of ourselves.**
 - only 2% of high school seniors believe their leadership skills are below average
 - 25% of people believe they are in the top 1% in their ability to get along with others
 - 94% of college professors believe they do above average work
 - people think they are more likely than peers to provide accurate self-assessments
- **A tutor asks you “Do you understand?”**
 - strong correlation with students who say “no” and best learners

The conditions of learning (Kerr & Booth, 1978)

■ Design:

- Two age groups: 8-year-olds & 12-year-olds
- Task: beanbag toss to target on floor
- Conditions of Practice:
 - Fixed: All practice at a fixed (criterion) distance;
 - Varied: Practice at criterion distance +/- one foot (never at the criterion distance)



Kerr & Booth (1978): results

Final test: throw to criterion distance

Absolute error (in inches) on final test:

	Age of participant	
Practice condition	8 years old	12 years old
fixed (criterion distance)	8.31	5.55
varied (criterion +/- 1 ft)		

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Final test: throw to criterion distance.

Absolute error (in inches) on final test:

	Age of participant	
Practice condition	8 years old	12 years old
fixed (criterion distance)	8.31	5.55
varied (criterion +/- 1 ft)	5.42	4.63

Desirable Difficulties (Bjork, 1994)

- **Conditions of instruction that make performance improve rapidly often fail to support long-term retention and transfer,**

...whereas

- **Conditions of instruction that appear to create difficulties for the learner, slowing the rate of *apparent learning*, often optimize long-term retention and transfer.**

Mindsets (Dweck & Trzesniewski, 2007)

- **Study – two kinds of feedback in math instruction:**
 - group 1: taught the brain is a muscle – work it out and it will get stronger
 - group 2: taught generic study skills
- **conditions:**
 - two hours of instruction spread over 8 weeks
 - tracked in classrooms by teachers who didn't know about group assignments

Dweck & Trzesniewski (2007): Results

- **study skills group:**
 - steady drops from C+ to C- (usual pattern)
- **brain-as-a-muscle group:**
 - reverse: students went from C+ to higher grades
- **teachers ask to identify those who improved the most**
 - 76% were in brain as muscle group
- **kids concluded “working hard was not something that made you vulnerable, but something that made you smarter.”**
- **corollary: don’t tell your kids they are smart**
 - praise their effort, diligence, ability to learn, etc.

So...

- **Don't trust your perceptions/beliefs without a little self-evaluation first.**
- **If you aren't sure you understand, say you don't understand.**
- **If something is easy, you won't retain it as well. Vary practice, and keep it interesting.**
- **Praise effort, not ability.**
- **Seek challenges (and failure), don't avoid it.**

and now on to the science...

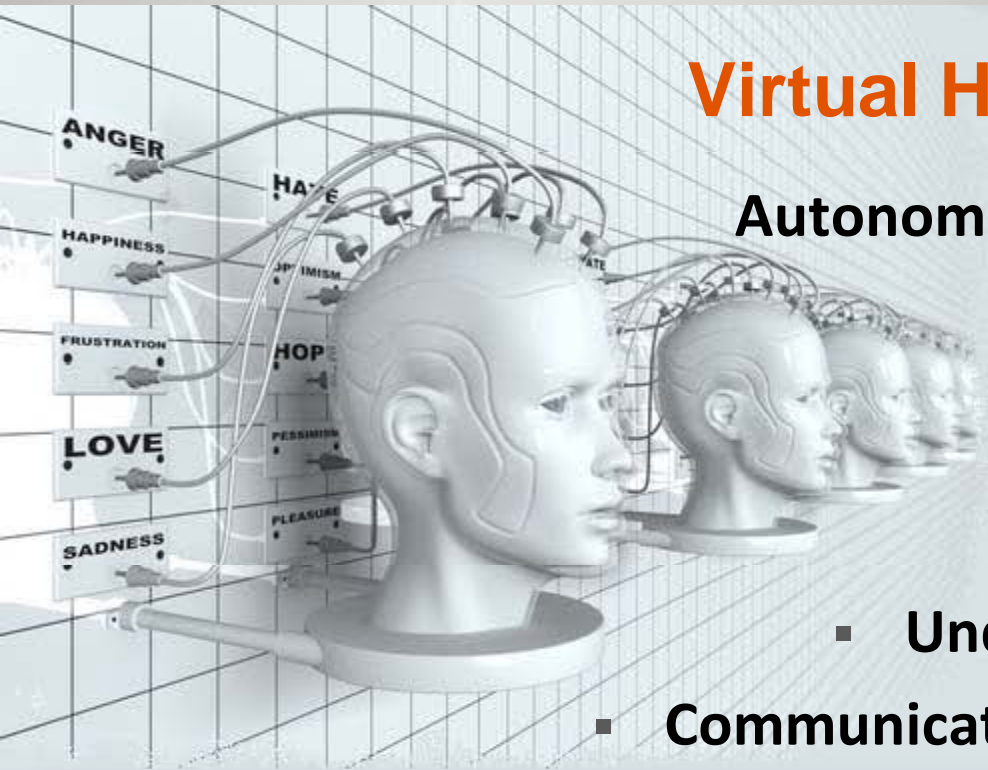
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Virtual Humans

Autonomous virtual characters that can have meaningful interactions with human users.

- Reason about environment
- Understand and express emotion
- Communicate through speech and gesture



What does it take to build a virtual human?

- Perception
- Speech Recognition
- Natural Language Understanding and Generation
- Dialogue Management
- Speech Synthesis
- Task and Domain Reasoning
- Emotions
- Gesture generation



Learning *with* virtual humans

- **role players in a social interaction**
 - social skill development
 - international business and/or negotiation partner
 - virtual patients
 - investigative interviewee
- **Research questions:**
 - how do you design the characters?
 - how should they behave?



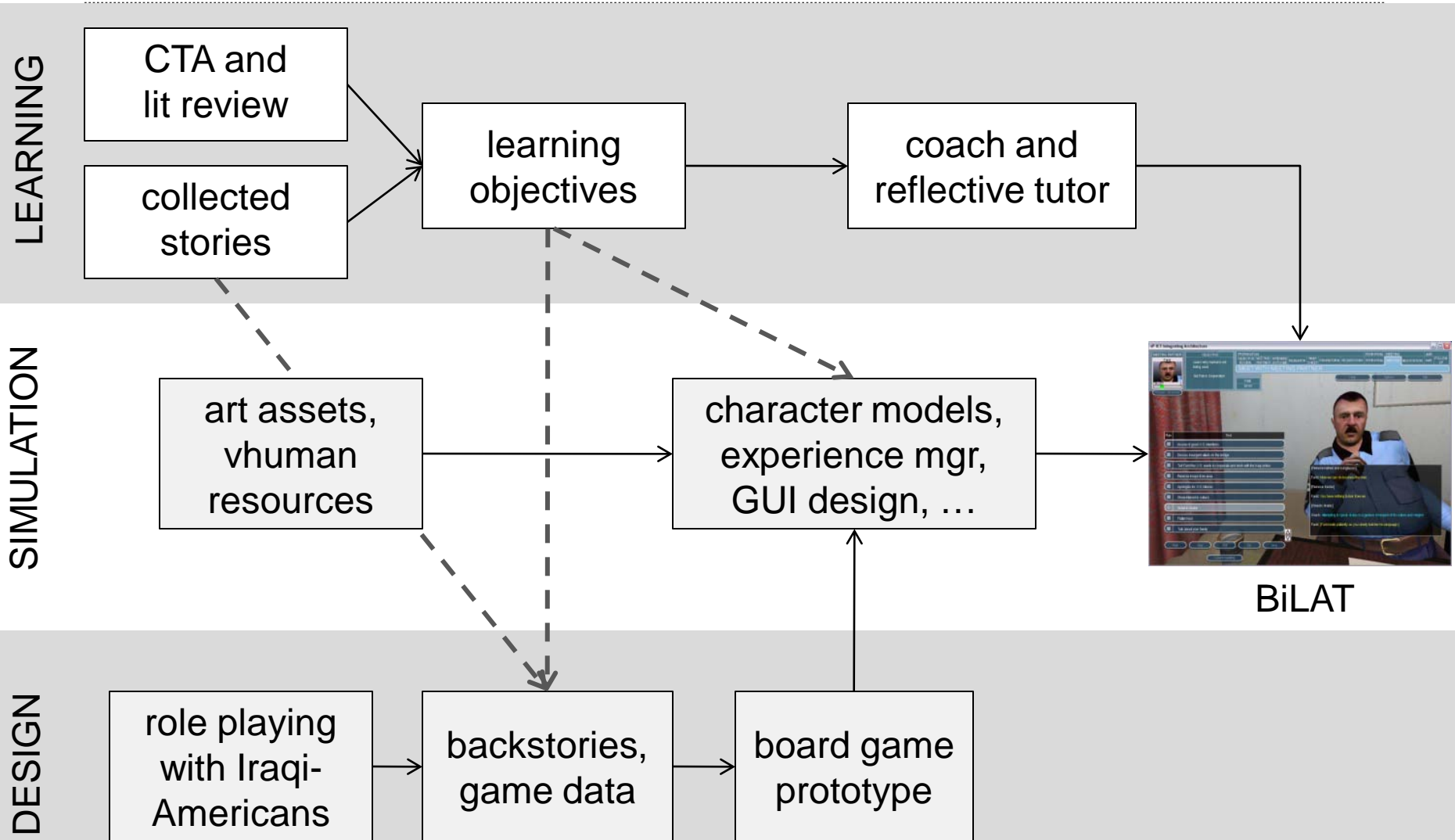
Intrinsic Motivation

The will to learn is an intrinsic motive, one that finds both its source and its reward in its own exercise. The will to learn becomes a 'problem' only under specialized circumstances like those of a school, where a curriculum is set, students confined and a path fixed. The problem exists not so much in learning itself, but in the fact that what the school imposes often fails to enlist the natural energies that sustain spontaneous learning. (p.129).

- Jerome Bruner, 1966

- **How can we combine sound pedagogical design principles with engaging/memorable content?**

How we built BiLAT

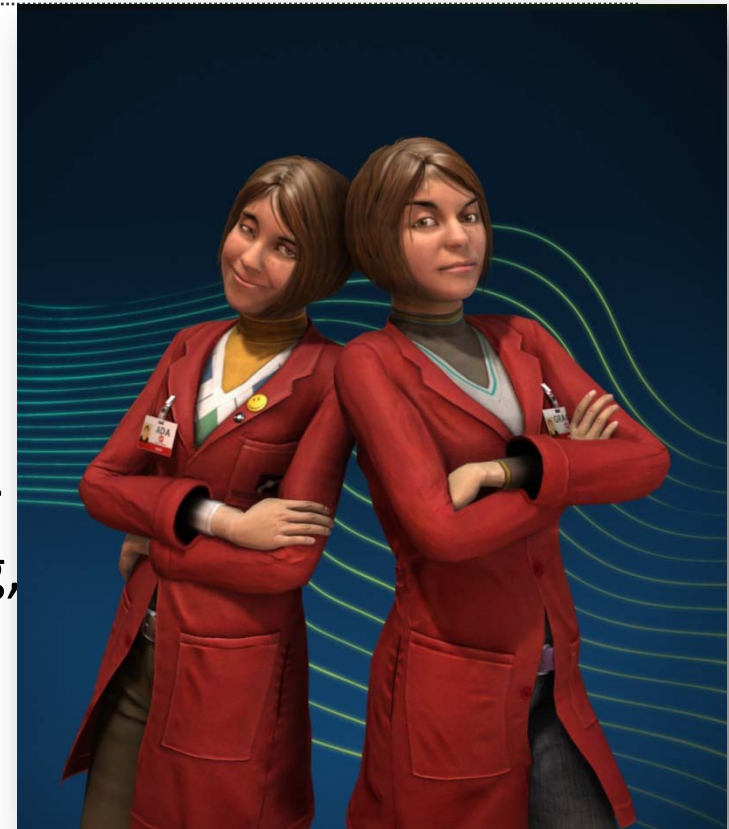


Empirical studies on learning in BiLAT

- **most effective for Soldiers with less experience (Durlach, ASC08)**
- **Coaching promotes understanding of polychronicity (ICCE08)**
- **Conceptual feedback (i.e., less specific) is not as helpful during training, but improves future performance within the game (AIED09)**
- **Learners who spontaneously adopt social goals learn best (Ogan, AIED09)**
- **Simulated social interactions lead to increased understanding of underlying cultural explanations (ITS2010)**
- **Immersive technologies (animation, sound, etc.) produce more deliberation in action selections (ITS2010)**

Ada and Grace

- **target audience:**
 - 7-12 year olds
- **goals:**
 - enhance museum experience
 - motivate interest in AI, computer science, animation, programming, robotics
- **virtual human technologies:**
 - speech/NL understanding
 - smartbody nonverbal behavior



Virtual Humans in the Boston Museum of Science



closing thoughts...

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What I think is most important for scientists

- **curiosity**
- **passion**
- **humility**



things I think you should do

- **watch TED talks (www.ted.com)**
 - especially those from people outside what you think will interest you
- **teach**
 - your ability to communicate your ideas is as important as the ideas themselves
- **be social**
- **be aware of your perceptions, emotions, beliefs...**
 - not hijacked by them

Thank you! Good luck! Enjoy life!

- <http://people.ict.usc.edu/~lane>

