

Making Room for AI in the Classroom

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Will AI Change the Way We Learn?



Today's Talk

- AI is coming
 - New technologies, smart products, with examples
- New Infrastructure needed to support smart systems
 - Data interoperability & privacy standards will be required
- Getting ahead of disruption
 - Re-thinking school

Relevant AI Technologies

- User Interface: language, speech, vision, motion
- Knowledge modeling and inference: personalization
- Intelligent agents: personal assistants, AI coaches, bots
- Semantic analysis: robo-graders, summarization
- Machine learning: finding patterns in “big data”

Deal volume (#) and funding total (\$) for U.S. edtech companies, 2011-2018



Technology's Power: U - U - U

Ubiquity – always available



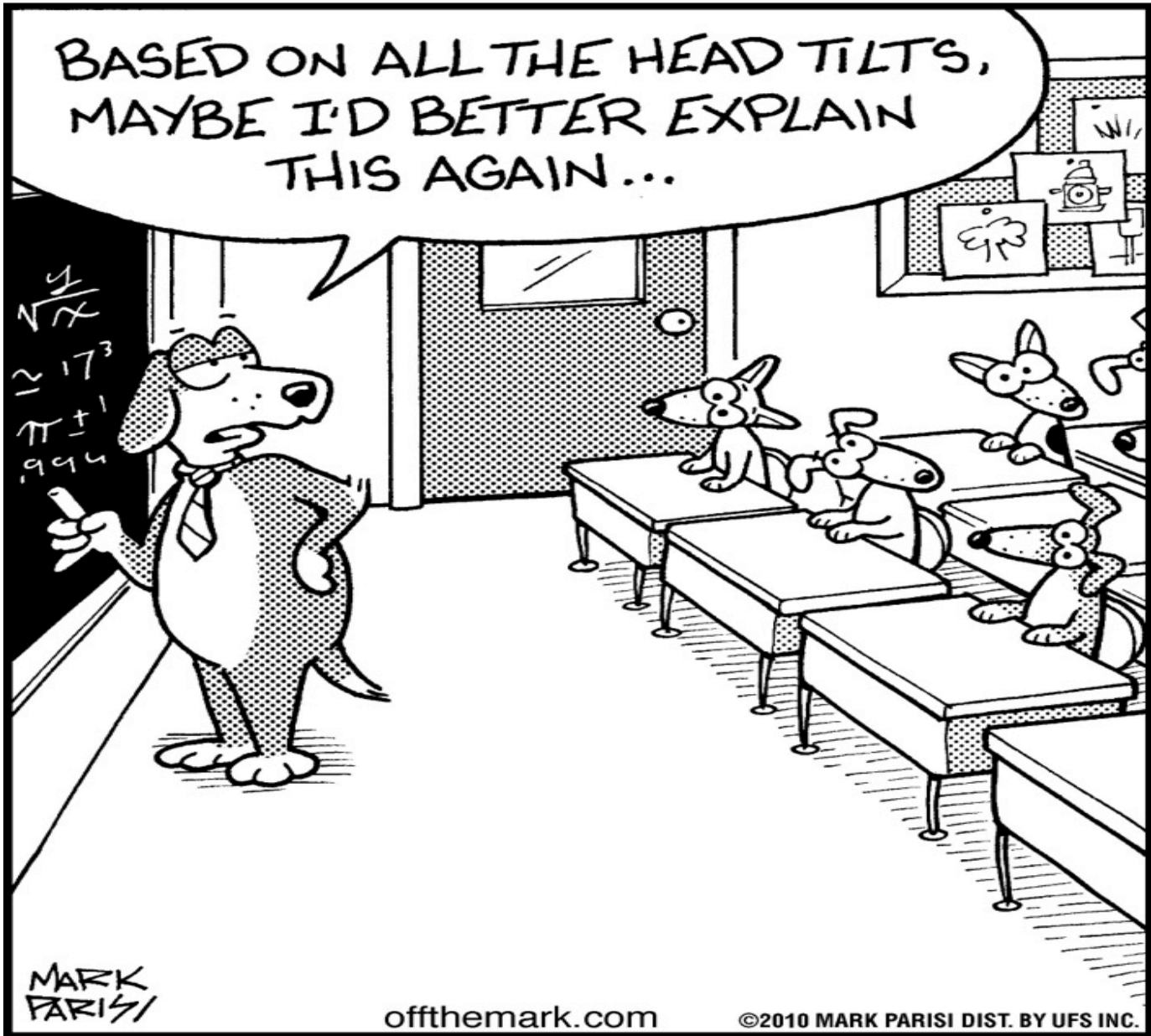
Utility – useful in real-life situations



Usability – natural, compelling



The Cutting Edge: Affect Recognition

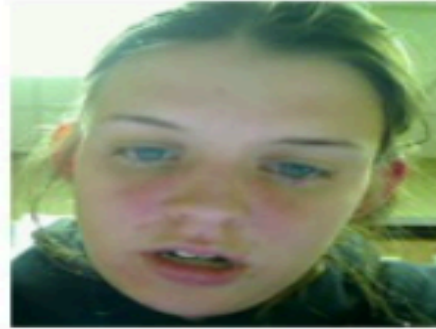


Affect During Learning

Anger



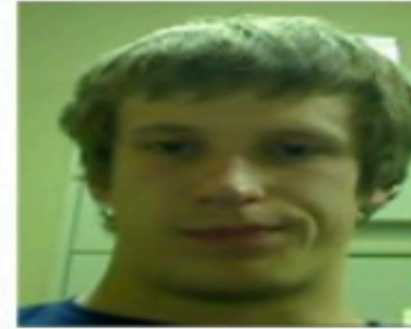
Anxious



Confusion



Boredom



Contempt



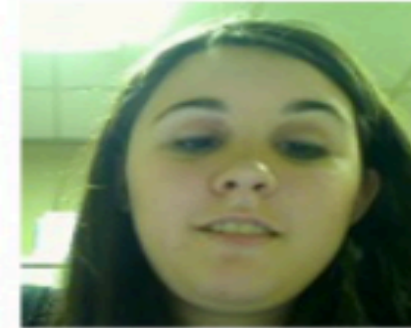
Curious



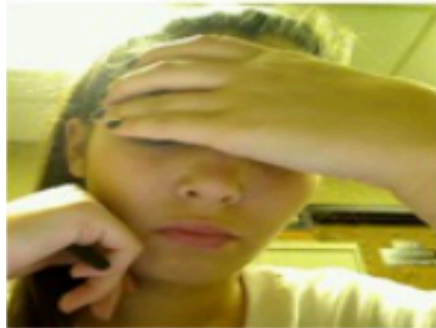
Disgust



Eureka



Fear



Frustration



Happiness



Surprise



Sidney D'Mello
Notre Dame

Intelligent Agents: Ada and Grace



Lewis Johnson, Alelo Inc

- Language, customs, pronunciation & gestures are developed in game scenarios.
- An “aide” stands nearby to help if needed
 - Hints, pronunciation, faux pas
 - This AI non-playing character makes game play “pleasantly frustrating” for the learner



So, how are we to integrate
AI into the Classroom?

That's the Wrong Question!

AI Products are Already in Education

- Adaptive drill & practice systems (e.g. for homework)
 - Personalized sequence using internal assessment & strategy
 - Yixue and the Chinese after-school market
- Robo-graders for student writing
 - Limited, but responsive, patient, consistent & tireless
- Analytics, e.g., early warning systems
- These non-classroom systems will get smarter & easier to use

Infrastructure To Support an Open Ecosystem

Innovation

AI & Personalization
Cloud & Non-LMS Activity
Credentials
Life-Long Learning

Dashboards & Analytics
Competency-based Training
Job Performance Feedback
Mastery-based Education

Ecosystem Management Tools

Identity, State,
Goals, Prefs

History

Competencies

Activity and
Affect

Content
Metadata

Infrastructure

Secure Data and Network Backbone

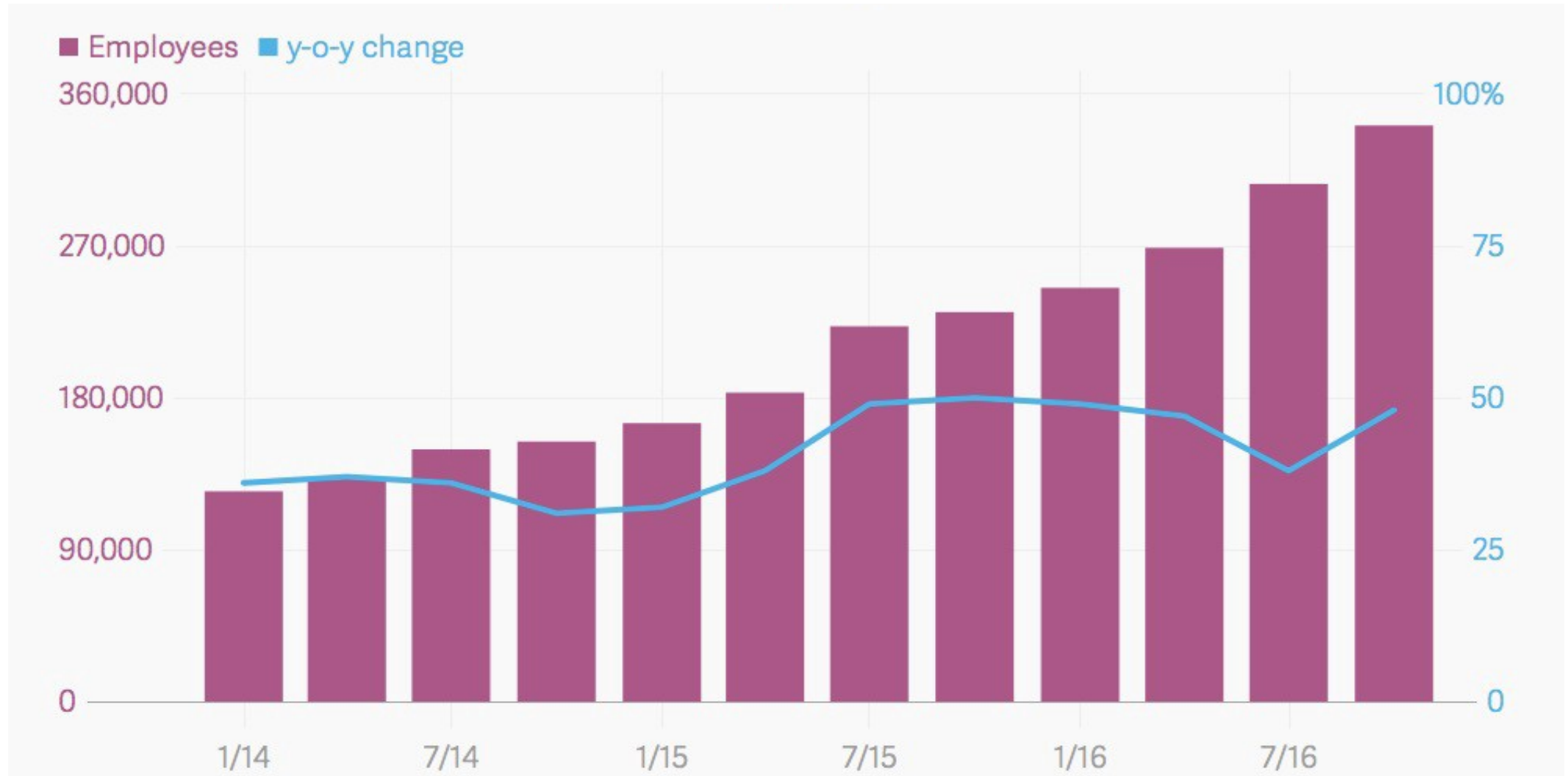
Data Security and AI

- Smart systems depend on access to data about students' history, competence, learning objectives, challenges, preferences, interests, etc.
- Innovative applications on the web are often based on other applications' data (vs. the LMS data silo)
- Student data security has become a political issue
- The IEEE and other standards organizations are trying to develop data governance guidelines that help schools, students, and parents find a sensible balance.

Learning Engineers Needed!

- Using technology in education (at all levels) will require a workforce of specialized systems engineers, as in other industries
 - Learning science, systems design, new technologies, products' strengths and weaknesses, government regulations, standards, project management, examples of successes and failures, ...
- Several graduate programs have been started to teach tomorrow's learning engineers
- If you happen to be in Washington DC next week: ICICLE'19
<https://www.ieeeicicle.org/2019-conference>

Jeff Bezos: “Do More”



Source: Sarah Kessler, The optimist's guide to the robot apocalypse

Doing More in Education

- Broader access
- Higher completion rates
- Learning more (coding, languages, science)
- Mastery-based learning (vs. age-based cohorts)
- Life-long learning
- ...

Implications for Education Policy

- The school, classroom, and classroom teacher are no longer the only approach to achieving national educational goals
- An unlimited number of configurations of teacher/system solutions can be imagined at the school, regional, and national level
- Reengineering education
 - Define goals: Not what, not how, but why!
 - US K12 schools: education, socialization, certification, custodial care

This is Just the Beginning

“Faculty are using the parts of their brains they used to use to think about their research to think about their courses.”

Prof. John Mitchell
Vice Provost for Online Learning
Stanford University



Additional Resources

- EdSurge.com Newsletter
- Kulik, J.A., & Fletcher, J.D., 2012. “Effectiveness of Intelligent Tutoring Systems.” IDA Document D-4464. Alexandria, VA: Institute for Defense Analyses.
- Tim O’Reilly, Do More! What Amazon Teaches Us About AI and the “Jobless Future”, www.medium.com, June 8, 2017.
- Walcutt, J.J. & Schatz, S. (Eds.) (2019). Modernizing Learning: Building the Future Learning Ecosystem. Washington, DC: Gov’t Publishing Office.
- Barr, A. & Robson, R. (2019) Missing pieces: Infrastructure Requirements for Adaptive Instructional Systems. Proceedings of the Workshop on Adaptive Instructional Systems, at HCI International 2019, Orlando.

Questions?