Virtual Open House

October 14 @ 11 AM EDT
Applications Due December 15th

http://metals.hcii.cmu.edu

Welcome!

• Ken Koedinger, Director

• Michael Bett, Managing Director

Extended Welcome from Our Learning Science Faculty

Vincent Aleven  Chinmay Kulkarni
Justine Cassell  Bruce McLaren
Sharon Carver  Amy Ogan
Ken Koedinger  Carolyn Rose
Jessica Hammer  John Stamper

Science & technology of learning: important, interesting, challenging!!

• Education is important
• Unlocking the mysteries of human learning is interesting
• Tech innovation is challenging, fun, powerful

Intelligent tutors helping city kids catch up in math
Learning games on mobiles in Africa
Virtual labs & MOOCs scaling education
Intelligent exhibits make doing science fun!
A bit about me, Ken Koedinger

- Modest educational background
  - Tech skills, want to make a difference
- Math ugrad, computer science masters, cognitive psychology phd => HCI
- Intelligent tutors for math
  - In city schools
  - Spin-off reaches millions
  - Doubles algebra achievement
- Direct LearnLab, formed METALS

Overview

- CMU & METALS are unique
- Curriculum
  - Capstone
  - Courses
- Finances

CMU Learning Science is Making a Difference

- Real-world impact of Cognitive Tutors
  - 600K students/year
  - Doubles achievement!
  - 2011 sale for ~$95M
- OLI college courses
  - 25 open online courses
  - 2x faster & better
Learning & Training Continues to Boom!!

- New ideas
- New technologies
- New companies
- New careers

Report on industry trends
https://www.td.org/Professional-Resources/State-Of-The-Industry-Report

The Ed Tech Market is Huge!

World market: $1.3 Trillion*
740M Students*
US K12 Market: $8.38B**

Many Spinoffs and Local Startups

*https://prezi.com/xgoky7n7um6/ed-tech-market-map/
Many Corporate Partners

Carnegie Mellon is Unique

Our Values... Innovative
Inspiring
Influential
Quality

Our Methods... cutting edge,
grounded in theory,
drawn from industry

Our Research...collaborative

Our Projects... practical and experiential

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Major Focus: Capstone Project

• Apply METALS skills on a two semester-long project
• Work in interdisciplinary teams (4-6 people)
• Work with clients
• Integrate skills gathered over the curriculum
• Learn to write reports & give presentations
Learn to Create Evidence-Based Innovations in Learning

Gather Field Data

Review Literature

Understand Needs

Understand Research

Create Effective Designs

...And design some more. Then do it all over again, but better!

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E-Learning Design Principles & Methods

- Gain a **broad understanding** of the field and literature.
- Know when to apply **evidence & theory**
- Learn how to adapt **methods** to specific needs

Ken Koedinger
TA: Mimi McLaughlin

Understand the best form of instruction

- More assistance vs. more challenge
  - Basics vs. understanding
  - Education wars in reading, math, science...
- Researchers like binary oppositions too.
  - We just produce a lot more of them!
  - Massed vs. **distributed** (Pashler)
  - Study vs. **test** (Roediger)
  - Examples vs. problem solving (Sweller ...)
  - **Direct instruction** vs. discovery learning (Klahr)
  - Re-explain vs. **ask for explanation** (Chi, Renkl)
  - Immediate vs. delayed (Anderson vs. Bjork)
  - **Concrete** vs. **abstract** (Pavio vs. Kaminski)


Instructional Complexity

How many instructional options are there?

More help, passive  More challenge, active

What instruction is best?

Many other dimensions of choice: animations vs. diagrams vs. not, audio vs. text vs. both, ...

> $3^{15*2} = 205$ trillion options!


What instructional choices are best for a particular course?

- Choices depend on a deep understanding of the content
  - A “cognitive model”
- But, do course designers know what they know?
Creating Cognitive Models is not Obvious

Which is hardest for algebra students?

Story Problem
As a waiter, Ted gets $6 per hour. One night he made $66 in tips and earned a total of $81.90. How many hours did Ted work?

Word Problem
Starting with some number, if I multiply it by 6 and then add 66, I get 81.90. What number did I start with?

Math educators say:
story or word is hardest

Equations are hardest for students...

Expert blind spot!
Experts do not know what they know: They are incorrectly think equations are easy for students

Learning Objectives

What to do
• Design Principles
  – Multimedia instruction
  – Learning by doing
  – Supporting metacognitive, motivation & dispositions

When & how to do it
• Design Methods
  – Cognitive Task Analysis
  – Assessment design
  – User experience
  – A/B testing

What tools/technology to use

How to analyze and improve instruction

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METALS Core Courses

• E-Learning Design Principles & Methods
• Educational Goals, Instruction and Assessment
• Interaction Design Overview
• Tools for Online Learning
• Capstone Project
### Example Elective Courses

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<td>Intelliger Tutoring Systems</td>
<td>Applications of Cognitive Science</td>
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<td>Information Systems</td>
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<td>Comp. Models of Discourse</td>
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<td>Role of Tech in Learning in</td>
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<td>Social Web</td>
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<td>Ubiquitous Computing</td>
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<td>Big Data Pipeline</td>
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<td>Sensemaking: Cognitive, Social, and Technical</td>
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<td>Computer-Assisted Language</td>
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<td>Perspectives</td>
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<td>Learning</td>
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### General Electives Continued

- Crowd Programming
- Entrepreneurship
- Designing for Service
- Web Accessibility
- Gadgets, Sensors and Activity Recognition in HCI
- Machine Learning Text Mining
- Advanced Web Design
- Designing Human Centered Software
- Social Perspectives in HCI
- Language and Statistics
- Decision Making Under Uncertainty

- >100 others in other part of the university, if approved
  - Business, CFA, H&SS, CS, Robotics, Entertainment Technologies

### We want students who are:

- Passionate about using technology to develop better learning outcomes
- With backgrounds especially in
  - computer science
  - design
  - psychology
  - education
  - business
  - any educational content domains

### On the Philosophy...

- METALS education provides students
  - Skills to engineer & implement innovative & effective educational solutions
  - Real-world project-based experience
  - Team management

- You will learn about all of software development, psychology, & design
  - You will not become an expert in all in 1 year
  - You will learn to communicate with specialists in other areas
What You Will Be Able to Do After METALS? Part 1

- Design, develop, & implement innovative, effective, & desirable educational solutions
- Innovative
  - Use state-of-the-art technologies
    AI, machine learning, language technologies, intelligent tutoring systems, mixed reality, ...
- Effective
  - Apply cognitive & social psychology principles to instructional design, analysis, & redesign
  - Design & evaluate using cognitive task analysis, data mining, statistics, experimentation

What You Will Be Able to Do After METALS? Part 2

- Desirable
  - Design skills to enhance learning and enjoyment
- Innovative: Analytic, psychometric & educational data mining skills
- Putting it together: Develop continual improvement programs that employ experiments & analytics to reliably identify best practices & opportunities for change

Gain Breadth & Expertise

- You may already possess expertise in some of these areas, but not in all.
- METALS will
  - Deepen your prior expertise
  - Broaden your knowledge in new areas

Finances

- 2015-2016
  - 3 Semesters
  - $20,500 per semester
  - $20,000 for living expenses
  - $80,000 commitment
- 2016-2017 Tuition Not Set
- Currently exploring offering merit-based tuition assistance
  - If you are skilled & passionate,
    - let us know!
Application Guidelines

• Apply Online

• Applications Due December 15th

• Applications Must Demonstrate
  – Your interest in EdTech
  – Past relevant experience/training
  – Plans after you graduate

• GREs
  – Expected 165 Quantitative, 160 Verbal
  – But we look at the entire application...

• TOEFL
  – 25 or better in 3 out of 4 sections and
  – 23 or better in forth section

Questions?

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