

**Updated on August 22nd, 2017**

**Digital Learning Environments  
Fall 2017**

**University of California, Berkeley  
Graduate School of Education  
Policy, Organization, Measurement and Evaluation**

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**Meeting Day and Time:** Mondays and Wednesdays, 3:30-5pm

**Course Website:** <http://dle.berkeley.edu/>

**Course Description**

Digital Learning Environments are taking residence in the educational experience of many, from replacing components of traditional classroom instruction to providing open platforms for lifelong learning. In this class we will study the various forms and functions of a sampling of digital learning environments ranging from subject specific Intelligent Tutoring Systems in K-12 to domain neutral systems for post-secondary online learning. Guest lecturers from a variety of platforms that differ in grade level, curricular integration, and domain specificity, will present the principles behind their system and the work they are undertaking in the education technology space.

A weekly homework project will be assigned per digital learning environment focusing on one of the following aspects of the environment; pedagogical theory informing design, data analysis, and hands-on authoring of content in the system.

The objective of the course is for students to gain a level of familiarity with digital learning environments that will help them make informed decisions at the frontiers of digital-ed.

## **Course Objectives**

- Understanding the role digital learning environments are playing across K-16
- Understand the pedagogical theory underlying the design of these platforms
- Hands-on experience with the platforms through authoring and analysis of data

## **Grading**

Participation: 15%

*Participation is counted as class attendance. Starting September 7th, each class is worth one participation point. Each student starts with two extra participation points (two classes can be missed without a grade impact). Additional absences will be dealt with on a case-by-case basis.*

Midterm: 20%

Homework: 40%

*Homework will consist of weekly responses to selected readings, videos or other provided material submitted to Canvas. Group projects throughout the semester will also count towards students' final homework grade. Participation may also be counted through posting in different discussion threads.*

*If a submission is late within a week of a due date, 10% will be deducted from the score. If a submission is late by 1-2 weeks, 20% will be deducted from the score, etc. Extensions will be dealt with on a case-by-case basis. Discussion threads for guest lecturers should be completed the night before the guest lecturer appears in class.*

Final Project: 25%

*Students will work in groups to create their own digital learning environment. This project will incorporate every aspect of the course, as students will be asked to apply their knowledge regarding pedagogy and design, application and audience targets, as well as their selected forms of assessment features. They will compose a final paper, explaining the development and justifications for their selected features of their platform, as well as present to the rest of the class.*

### **Final Grades**

97%-100%	A+	86%-89%	B+	76%-79%	C+	66%-69%	D+
93%-95%	A	83%-86%	B	73%-76%	C	63%-66%	D
90%-92%	A-	80%-82%	B-	70%-72%	C-	60%-62%	D-

## **Texts**

There are no textbooks required for this course. All reading assignments will be posted on bCourses.

### **Special Needs/Accommodations**

Please see me as soon as possible if you need particular accommodations, and we will work out the necessary arrangements.

### **Agenda and Assignments**

*Assignments and readings are due at 11 AM on the day they are listed.*

**Wednesday, August 23rd:** Introduction to Class, Review of Syllabus

### **Module 1: Intelligent Tutoring Systems**

**Monday, August 28th:** Bloom

In this class we will discuss the ideas from Bloom's paper and how some of them inspired the one-on-one tutoring paradigm of Intellectual Tutoring Systems.

Reading: Bloom, B. S. (1984). The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. *Educational researcher*, 4-16.

**Wednesday, August 30th:** Intelligent Tutoring Systems

In this class we introduce students to the core principles of Intelligent Tutoring Systems which laid the foundation for computer aided instruction over 30 years ago. This will include the fine grained atomic cognitive task analysis performed in many of these systems.

Reading: Corbett, A. T., Koedinger, K. R., & Anderson, J. R. (1997). Intelligent tutoring systems. *Handbook of human computer interaction*, 849-874.

**Wednesday, September 6th:** Evaluating ITS

In this class we will use the Rand article to discuss the implementation of Intelligent Tutoring Systems in the classroom from a cost-benefit analysis perspective. We will also have a live Q&A session with the co-founder of Carnegie's Cognitive Tutor, the ITS evaluated in the RAND article.

Reading: Pane, J. F., Griffin, B. A., McCaffrey, D. F., Karam, R., Daugherty, L., & Phillips, A. (2013). Does an Algebra Course with Tutoring Software Improve Student Learning?. ([http://www.rand.org/pubs/research\\_briefs/RB9746.html](http://www.rand.org/pubs/research_briefs/RB9746.html))

## Module 2: ASSISTments

### **Monday, September 11th:** ASSISTments Authoring

Neil and Christina Heffernan (founders of ASSISTments) will introduce their platform and how to author for it.

Reading: Razzaq, L., Heffernan, N., Feng, M., & Pardos, Z. (2007). Developing Fine-Grained Transfer Models in the ASSISTment System. *Journal of Technology, Instruction, Cognition, and Learning*, 5(3), 289-304.

### **Wednesday, September 13th:** Is ASSISTments an ITS?

The amount of time needed to author content in ITS was one of the primary hindrances to its expansion to additional domains. We'll discuss the older authoring systems CTAT (Cognitive Tutor Authoring Tools) in comparison to more modern WYSIWYG (What You See Is What You Get) editors. We will also break down ASSISTments and compare and contrast the platform with tradition ITS.

Reading: Shrestha, P., Maharjan, A., Wei, X., Razzaq, L., Heffernan, N.T., Heffernan, C. (2009) Are Worked Examples an Effective Feedback Mechanism During Problem Solving? In N.A. Taatgen & H. van Rijn (Eds.), *Proceedings of the 31th Annual Conference of the Cognitive Science Society*. Cognitive Science Society.

### **Monday, September 18h:** Alternative Epistemologies of Math Curricula

Dr. Victor Kostyuk from Reasoning Mind will give a guest lecture where we will look at a popular alternative to the common core out being built upon Russian standards. We will also begin authoring in the ASSISTments environment.

ASSISTments Authoring Assigned: Build a 1-2 problem Skill Builder set

### **Wednesday, September 20th:** Item Workshop

We will use this class time to help and discuss the authoring process for ASSISTments as well as check in on students' progress in the assignment. Feel free to post any questions about the

assignment on the discussion thread designated to help groups complete the authoring process before the workshop.

### Module 3: Online Courses and Higher Education

#### **Monday, September 25th:** Models of Knowledge in Massive Open Online Courses (MOOCs)

In this class we will introduce the recent state of free open online courses, or MOOCs. This class will introduce the current state of applying knowledge tracing techniques from ITS to MOOCs. ASSISTments Authoring Assignment Due at 11:59 PM on Canvas

Reading: Coursera Report (slides) on large scale user survey results

([https://d396qusza40orc.cloudfront.net/learninghubs/LOS\\_final%209-21.pdf](https://d396qusza40orc.cloudfront.net/learninghubs/LOS_final%209-21.pdf))

Video: Watch video (~1hr) of ex-UC Berkeley Chancellor Dirks vs. Sebastian Thrun (Udacity founder).

#### **Wednesday, September 27th:** Partnering Institutions of Higher Education with Online Platforms

In this class we will have two guest lecturers and live Q&A sessions in order to become more familiar with the different interactions that formal institutions of education have with existing digital learning environments. The first will be the Dean of the UC Berkeley School of Information in conjunction with a representative of 2U, and the second will be an representative from Coursera, on the topic of research questions and data pipelines.

Reading: MIDS Program 2016 Status Report

([https://www.ischool.berkeley.edu/sites/default/files/mids\\_program\\_status\\_report\\_2016.pdf](https://www.ischool.berkeley.edu/sites/default/files/mids_program_status_report_2016.pdf))

#### **Monday, October 2nd:** Hands On with MOOC Data

This class will include an introduction to analyzing a public MOOC dataset from Harvard & MIT, as well as going through and selecting L@S Papers on various MOOCs topics to present in the following week.

Reading: Ho, A. D., Reich, J., Nesterko, S. O., Seaton, D. T., Mullaney, T., Waldo, J., & Chuang, I. (2014). *HarvardX and MITx: The first year of open online courses, Fall 2012-Summer 2013*. Working paper. Retrieved from

[http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2381263](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2381263)

#### **Wednesday, October 4th:** Surveying the State of MOOCs.

Students in Group 1 Present Their L@S Papers.

**Monday, October 9th:** Surveying the State of MOOCS

Students in Group 2 Present Their L@S Papers.

**Wednesday, October 11th:** Monitoring Affect in Intelligent Tutoring Systems

Getting students in the right frame of mind to learn is often more than half the battle. This class will introduce means for measuring affect and what utility this information may have.

Reading: Pardos, Z. A., Baker, R. S., San Pedro, M. O., Gowda, S. M., & Gowda, S. M. (2013, April). Affective states and state tests: Investigating how affect throughout the school year predicts end of year learning outcomes. In Proceedings of the Third International Conference on Learning Analytics and Knowledge (pp. 117-124). ACM.

**Monday, October 16th:** Midterm Review

**Wednesday, October 18th:** Midterm

#### Module 4: Social Learning

**Monday, October 23rd:** Learning Management Systems

Matthew Smith from Instructure will guest lecture about research with the Canvas LMS

**Wednesday, October 25th:** Overview of Social Theories of Learning

ITS systems were mostly built from a cognitive theory of knowledge acquisition that does not take into account social transmission and construction of knowledge. In this we will briefly overview the alternative, socially oriented, theories of learning, including connectivism, common theory of reference from the learning analytics community.

George Siemens, the creator of Connectivist theory, will join the class for a live Q&A.

Reading: Kop, R., & Hill, A. (2008). Connectivism: Learning theory of the future or vestige of the past?. The International Review of Research in Open and Distributed Learning, 9(3).

**Monday, October 30th:** Social Learning Platforms

Greg Bybee from NovoEd will guest lecture about engineering learning platforms with social learning as a priority.

**Wednesday, November 1st: Open Learning Analytics**

Reading: Siemens, G., Gasevic, D., Haythornthwaite, C., Dawson, S., Shum, S. B., Ferguson, R., ... & Baker, R. S. J. D. (2011). Open Learning Analytics: an integrated & modularized platform (Doctoral dissertation, Open University Press).

**Module 5: Open Educational Resources**

**Monday, November 6th: Open Educational Resources (and beyond)**

In this class we will talk about how students interact with numerous sources for OER. The tradeoffs between a platform offering OER, such as Kahn Academy, and platforms that offer full courses and curriculum will be discussed.

Dr. Prasad Ram from Gooru will guest lecture about building an OER, what a search engine for learning means to Gooru, and the philosophies of learning underpinning future projects.

Reading: Porcello, D., & Hsi, S. (2013). Crowdsourcing and curating online education resources. *Science*, 341(6143), 240-241.

**Wednesday, November 8th: Learning Maps**

In this class we introduce the skill to skill mappings seen in platforms such as Kahn Academy and Dynamic Learning Maps.

**Module 6: Data and Education**

**Monday, November 13th: Big Data**

Numerous industries have benefitted from or been born out of data. Digital Learning Environments are producing data in unprecedented volumes.

Reading: *Daries, J. P., Reich, J., Waldo, J., Young, E. M., Whittinghill, J., Ho, A. D., ... & Chuang, I. (2014). Privacy, anonymity, and big data in the social sciences. Communications of the ACM, 57(9), 56-63.*

**Wednesday, November 15th:** Ethical/Privacy Considerations for Education Data

What makes education different in the ethical and privacy considerations surrounding education data and its uses?

Readings: The Asilomar Convention for Learning Research in Higher Education,  
<http://asilomar-highered.info/>

*Barocas, S. and Nissenbaum, H. Big data's end run around anonymity and consent. In Privacy, Big Data, and the Public Good: Frameworks for Engagement. J. Lane, V. Stodden, S. Bender, and H. Nissenbaum, Eds. Cambridge University Press, NY, 2014.*

Module 7: Education Technology

**Monday, November 20th:** EdTech Fair

This class will be dedicated to exploring many of the different emerging digital learning platforms in a variety of different topics and design philosophies already discussed in this course.

**Wednesday November 22nd:** No Class, Thanksgiving

**Monday, November 27th:** Education Technologies

A number of interactive devices used in tandem with various educational technologies will be demoed. This is an “education gadgets” day!

Reading: Szafir, D., & Mutlu, B. (2013, April). ARTFuL: adaptive review technology for flipped learning. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 1001-1010). ACM.

**Wednesday, November 29th:** Workshop Day for Final Projects

**Monday, December 4th:** No Class, Reading Week

**Wednesday, December 6th:** No Class, Reading Week

**Monday, December 11th:** Final Presentations

**Wednesday, December 13th:** Final Presentations