



# Research Priorities in Learning Analytics

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# NSF: Synthesis, Integration & Design Workshops

DCL: Principles for the Design of Digital Science, Technology, Engineering, and Mathematics (STEM) Learning Environments

9 workshops funded

<https://circlcenter.org/events/synthesis-design-workshops/>



# NSF: Specified Process and Products for these Workshops

- *the workshops must have both a public and private component*
- *the workshops will produce a draft and final white paper that will be made publicly available on their website*
- *PIs must attend a PI Summit in June*
- *Final reports due August 31, 2019 (no no-cost extensions!)*



# Research Priorities for Learning Analytics

- Central theme: to explore new ways to use powerful tools in data science applied to educational data to define competence, measure it, and build it using a rich array of new approaches to study learning.

# Learning Analytics is...

The measurement, collection, analysis and reporting of data about learners and their contexts for purposes of understanding and optimizing learning and the environments in which learning occurs.





# Learning Analytics: Data Science for Education

We have been doing research on learning for a long time.

*What's changed?*

- Theories of learning (field of Learning Sciences)
- Explosion of educational technology changing pedagogy
- New forms of data about learning (digital footprints)
- Advanced computing power for analyses



# Data-Rich Environments for Learning

## **Process of learning:** *How we learn*

- Multi-modal records of student activity: clickstream from online tools, sensor data, eye tracking, library use, resources accessed, etc.

## **Products of learning:** *What we can assess*


- Discussion posts, blogs, tweets, hashtag use, etc.



# Guiding Framework

- Recognize the need to modernize and rationalize learning goals in post-secondary education
- Aim for insights that can improve **all contexts** of post-secondary education - not limited to strategies that can only be implemented at elite universities
- Gathering of academics, non-for-profits, business leaders = opportunity to learn from other perspectives



A decorative graphic at the top of the slide features a network of dark grey nodes connected by thin, light blue lines, set against a light blue gradient background.

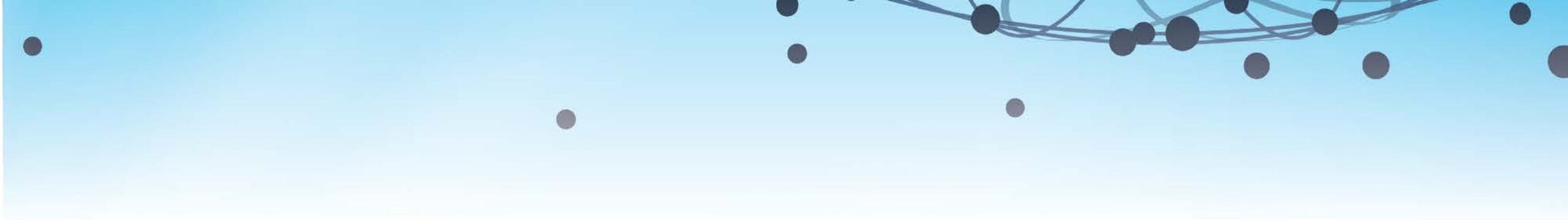
# Learning Analytics: New Tools for Assessing Learning


- Defining competence
- Measuring competence
- Building competence

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# US Post-Secondary Education

- \$400 billion in degree-granting colleges and universities
- 50% of those enrolled are not seeking credits for a degree
- \$700 billion in training, certificate-courses, and others

- 
- two thirds of employers didn't ask recent college graduates for their transcripts
  - "...the credential landscape is crowded, chaotic, and confusing to individuals, institutions, and employers" (*Giving credit where credit is due*)



Measure outcomes, what the individual actually knows and can do, rather than in terms of inputs such as semester hours

- Valid assessment
- Liberal Education and America's Promise
- Degree qualification profile
- Measuring college learning
- National skills standards board
- Badges
- Microcredentials
- Certificates
- Licenses
- Digital footprints
- Human skills

Global HR software market expected to reach \$11B by 2023



## Upgrade Your HR Department With These High-Tech Tools

Artificial intelligence can make hiring less of a headache.

in f



By Kate Rockwood (Contributing Writer)



BUSINESS NEWS OCTOBER 9, 2018 / 11:12 PM / 5 MONTHS AGO

## Amazon scraps secret AI recruiting tool that showed bias against women

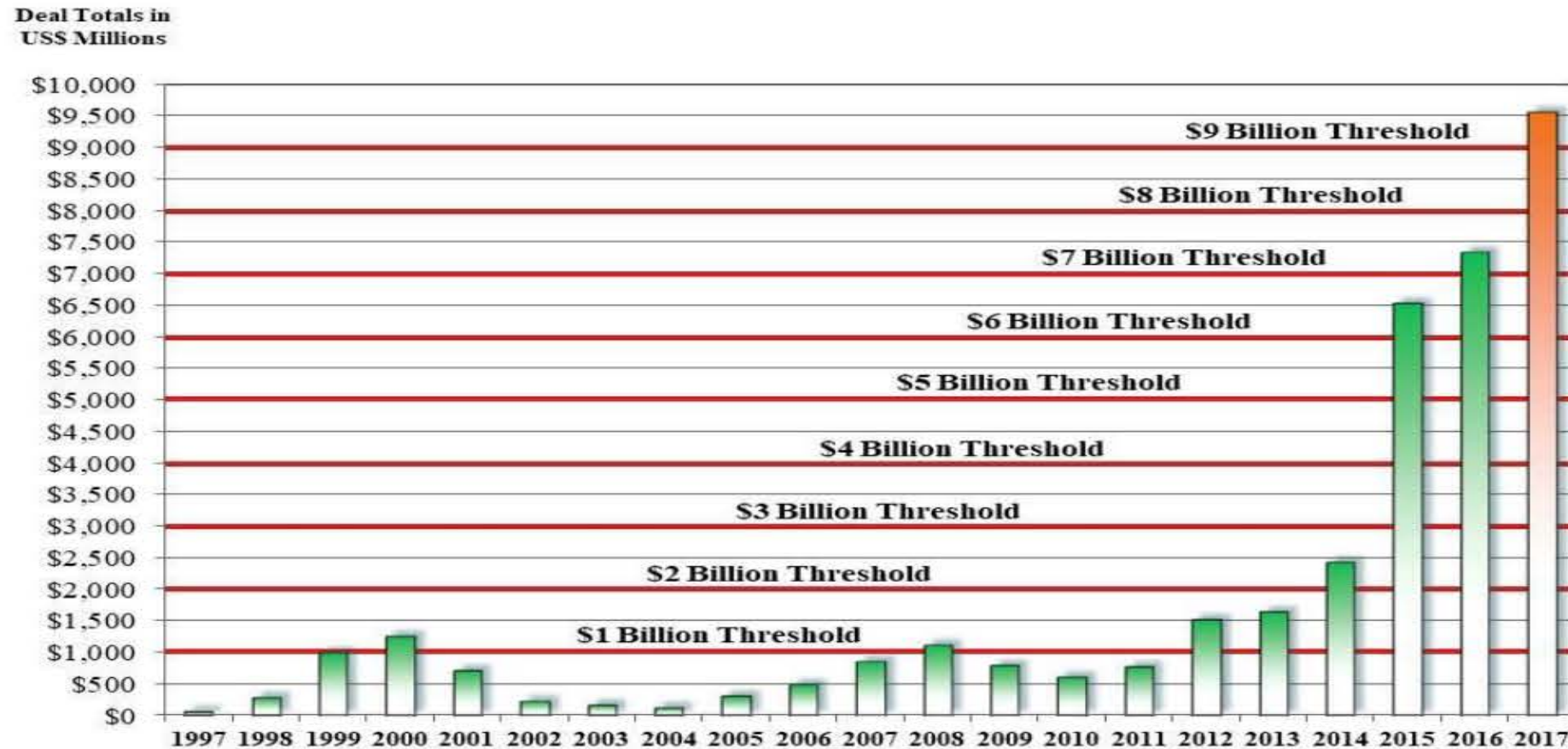
Jeffrey Dastin

8 MIN READ



SAN FRANCISCO (Reuters) - Amazon.com Inc's (AMZN.O) machine-learning specialists uncovered a big problem: their new recruiting engine did not like women.

# Global Private Investments in Learning Technology Companies







- Simulations
- Artificial Intelligence
- Automated tutors
- Game-based
- Digital apprenticeship
- Just-in-time learning



**Why can't markets drive continuous improvement in learning?**







## Morning Agenda: 8:45 am - Noon

### Featured Speakers

- Research Talks Q1: Defining Competence  
Marie Cini, David Blake
- Research Talks Q1: Defining Competence  
Bror Saxberg (virtual), Tammy Wang
- Research Talks Q3: Evaluating New Approaches to Learning  
Yun Jin Rho, Norman Bier



## Tomorrow's Agenda: 9:45 am – Noon Panel Discussions

- Research Topic 1: Defining Competence
- Research Topic 2: Measuring Competence
- Research Topic 3: Evaluating New Approaches to Learning





# Welcome to the Breakout Sessions!

*This is where it really gets fun...*



# Today's Agenda

- Two 1.5 hour break-out sessions
- You will change topics from Session 1 to Session 2
- We will have note-takers in each session (but please share your own notes, use of poster sheets, etc.)
- Adjourn by 5:30 pm
- Group dinner in North Quad at 6 pm



## Tomorrow We Reconvene at 8 am: Integration Session


- Breakfast your hotel or here in Palmer @ 7:30
- Discussion about today's sessions, integration across breakout groups, identify key issues, structure focus for NSF report.
- Add your insights to the RQ that you didn't discuss in your 2 break-out sessions..



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# Research Topic 1: How can we define the educational outcomes, competencies, and habits of mind that should serve as the goals of post-secondary institutions?

- Can post-secondary institutions get access to data on employee activities and use it to gain insights into the competencies and expertise actually valued in the workforce?
- How can collaborations between academic research and corporate “people analytics” research best be managed?
- Can the tools of “people analytics” be expanded to help define the habits of thought and the problem solving skills of experts in academic disciplines (what does it mean to “think like an engineer”)?
- How can privacy be ensured without compromising the utility of the data?

# Research Topic 2: How can we measure an individual's competence?

- How can we discover whether the competence measured in an educational setting translates into competence in employment?
- Can analytic tools employed by businesses to measure employee performance be used to determine how well credentials correlate with demonstrated competence?
- What tools can be developed to learn from the increasingly rich set of data trails generated by students – including use of instructional technologies, online-discussions with colleagues and instructors – to understand their approach to desired levels of competence.
- Can this include both subject area competence and skills such as critical thinking, team participation, and communication?
- Can the tools of “people analytics” be applied to capture a richer measure of each student’s approach to meeting achievement goals?
- Can tools be developed that correlate information gathered on a student’s performance in a school setting with actual on-the-job performance? Can this be used to measure the performance of different strategies of instruction? Different competency goals?
- If simulations, including team-based simulations, are used, can automated tools be developed to mine the multi-dimensional data generated by them.
- Can an individual’s competence be measured with information derived from employment data and sophisticated “prior learning assessments”?



# Research Topic 3: How can innovations in approaches to learning (both technologies and instructional strategies) be evaluated?

- Can tools such as adaptive rapid experimental design be used to evaluate the impact of innovations in instructional design?
- How can individual student data be used to guide instruction tailored to each student and provide individualized advice, and counseling?
- What data should be collected about each student (demographics, fine grained indicators of mastery and deficiencies, skills in online and other interactions including team performance and ability to communicate, English language skills, other measures)?
- Can this portfolio be built and curated like personal medical records (e.g. distinct access and consent rules for instructors, instructional software, and researchers)?