



# Doing learning analytics in higher education

-Critical issues for adoption & implementation-

Dragan Gašević  
@dgasevic

May 8, 2015  
Learning Analytics Network  
University of Edinburgh and JISC

Growing demand for  
education!

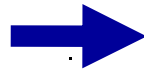
Feedback loops between  
students and instructors  
are missing/weak!

# Learners

Student  
Information  
Systems

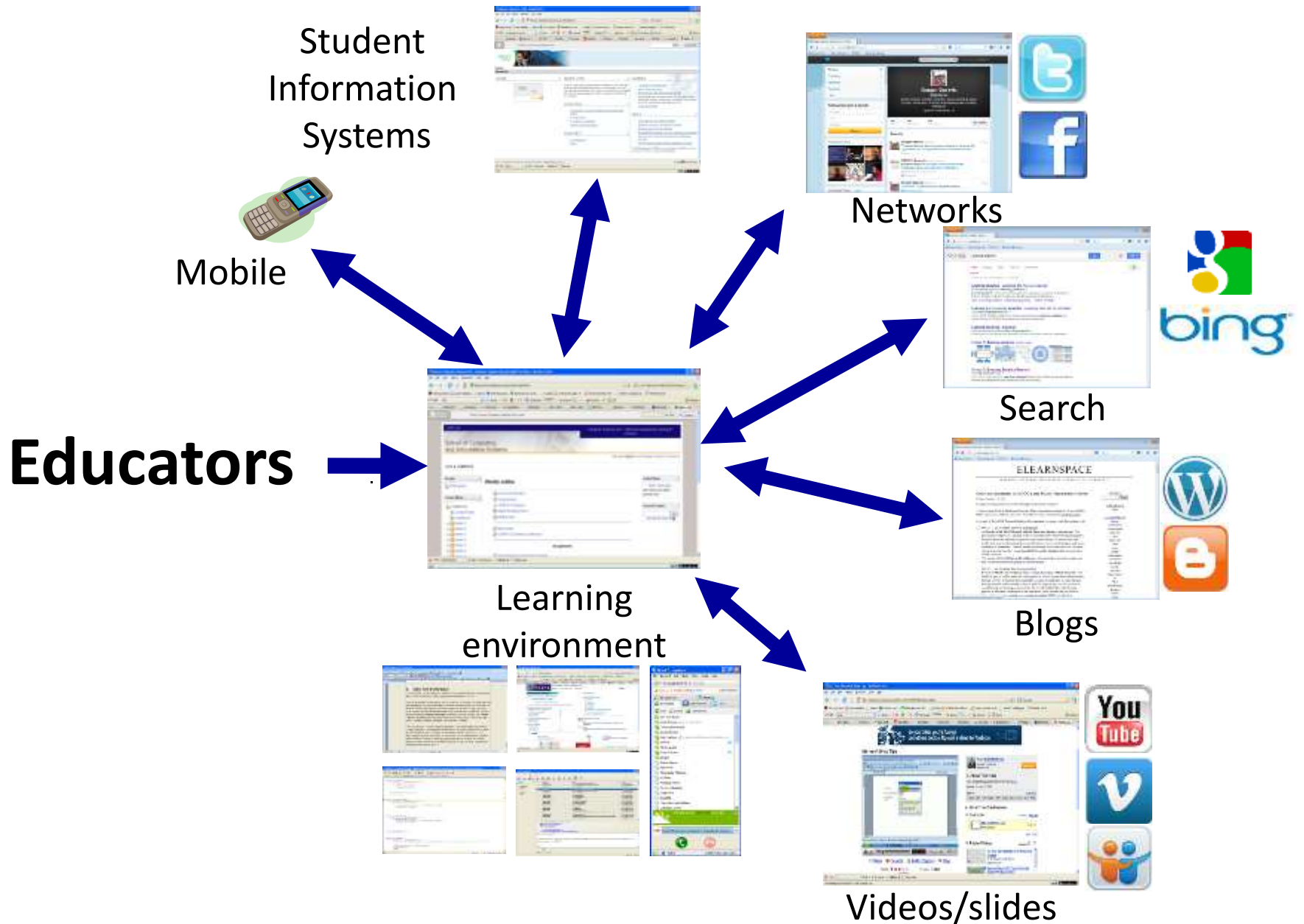


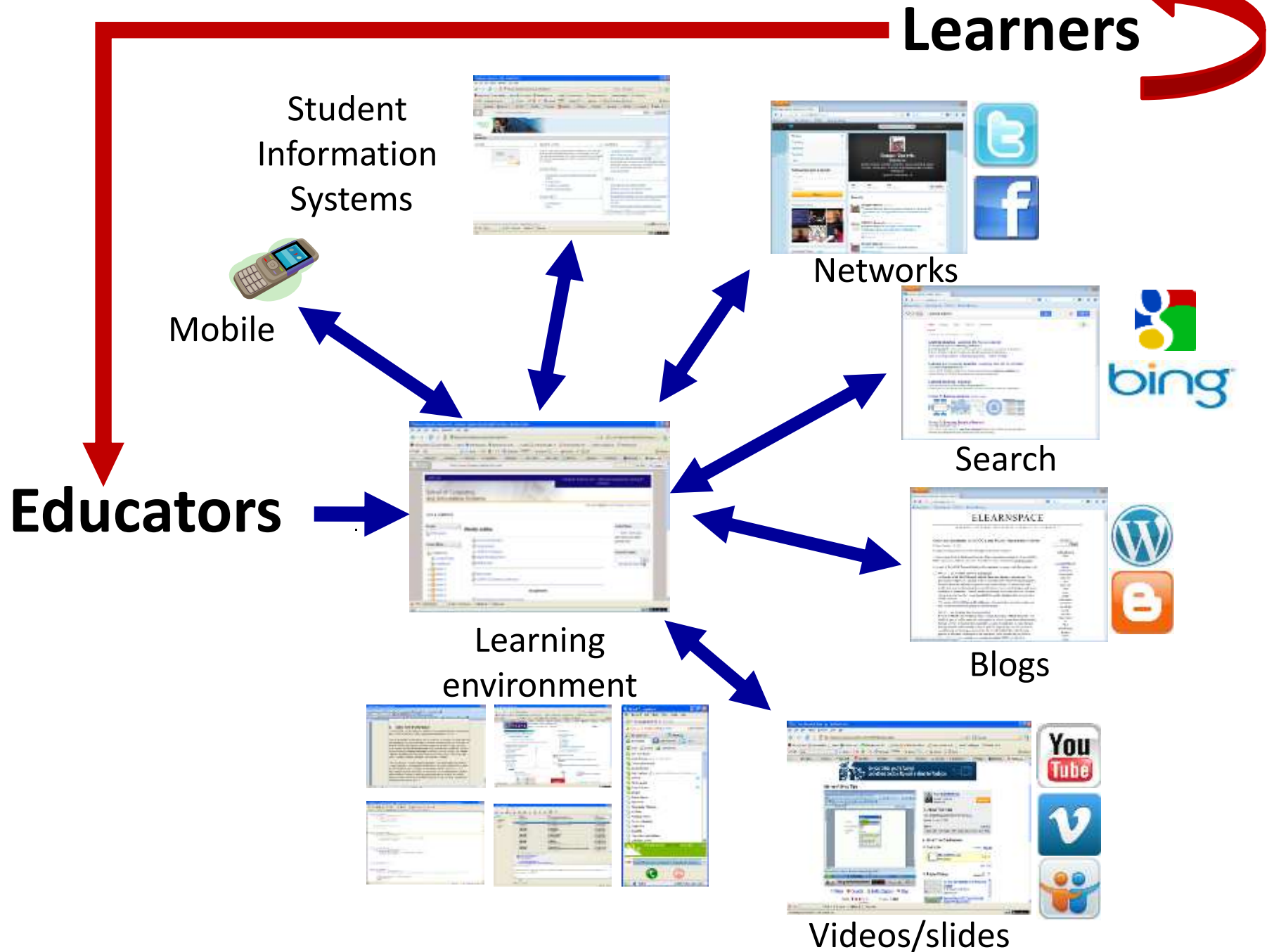
**Educators**



Learning  
environment

# Learners





# Learning Analytics – What?

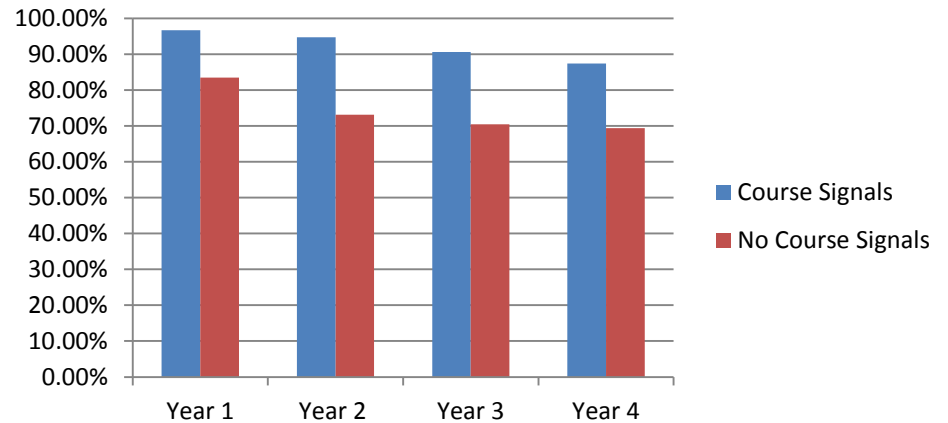
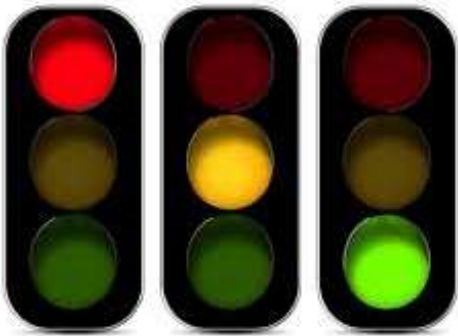
Measurement, collection,  
analysis, and reporting of data about  
learners and their contexts

# Learning Analytics – Why?

Understanding and optimising  
learning and the environments  
in which learning occurs



# **CASE STUDIES**



## Student retention

Arnold, K. E., & Pistilli, M. D. (2012, April). Course Signals at Purdue: Using learning analytics to increase student success. In *Proceedings of the 2nd International Conference on Learning Analytics and Knowledge* (pp. 267-270).

# Can teaching be improved?

Tanes, Z., Arnold, K. E., King, A. S., & Remnet, M. A. (2011). Using *Signals* for appropriate feedback: Perceptions and practices. *Computers & Education*, 57(4), 2414-2422.

# BETTER THAN EXPECTED

## Using Learning Analytics to Promote Student Success in Gateway Science

By Mary C. Wright,  
Timothy McKay,  
Chad Hershock,  
Kate Miller,  
and Jared Tritz

Learning Analytics (LA) has been identified as one of the top technology trends in higher education today (Johnson et al., 2013). LA is based on the idea that datasets generated through normal administrative, teaching, or learning activities—such as registrar data or interactions with learning management systems—can be analyzed to enhance student learning, academic progress, and teaching practice.

Examples of LA projects in colleges and universities include Purdue University's "Course Signals" system, an early-alert notification for struggling students, and Austin Peay State University's "Degree Compass," a course recommender program based on predictive analytics.

### Useful Weblinks about Learning Analytics

EDUCAUSE. (2011). *7 things you should know about first-generation learning analytics*. Boulder, CO: Author. Available at <http://www.educause.edu/Resources/7ThingsYouShouldKnowAboutFirst/242966>

US Department of Education. (2012, October). *Enhancing teaching and learning through educational data mining and learning analytics: An issue brief*. Available at <http://www.ed.gov/edblogs/technology/files/2012/03/edm-la-brief.pdf>

Society for Learning Analytics Research (SoLAR): <http://www.solaresearch.org/>

### Sample Initiatives:

Purdue Signals Project: <http://www.itap.purdue.edu/learning/tools/signals/>

Carnegie Mellon Open Learning Initiative: <http://oli.cmu.edu/get-to-know-oli/course-features/>

Austin Peay State University's Degree Compass: <http://www.apsu.edu/information-technology/degree-compass-what>

University of Michigan, Department of Physics, E<sup>2</sup>Coach: <http://sitemaker.umich.edu/eoach/home>

Although the promise of LA is great, key areas of the approach have been identified as needing to be better realized (Dringus, 2012). The key challenge is utilizing large data analyses for actionable and effective interventions in the classroom—that is, enabling “faculty to more precisely identify student learning needs and tailor instruction appropriately” (Johnson, et al., 2011, p. 28).

Here, we describe one large-scale LA initiative at the University of Michigan (U-M) to improve performance for thousands of students in gateway physics courses. Our goal is not only to describe the development and implementation of this unique initiative in STEM education but also to discuss how the approach we used can help meet some of the challenges to more widespread LA adoption.

CHANGE • JANUARY/FEBRUARY 2014



Name — **Hello Kate!**

Welcome to your ECoach site. We'll be here every step of the way to help you work towards your goal of succeeding in **Physics 240**.

Course

It's especially important for you to do well because you'll use physics as a **Chemical Engineering** major. As an engineer, you may have people's lives in your hands. They'll be counting on you to get the physics right when you design a steering mechanism, a bridge, or a replacement hip. Being a responsible professional starts here!

Concentration

Motivation for Engineering Students

You can turn to us for advice about using your study time effectively, the best approaches to studying for exams, and available resources to you.

Desired Grade

You told us that the grade you want to receive is a **B**. This is a good goal for you—you should be more confident that you can achieve this! We think you can! In fact, we've seen students come in unsure about their success and receive a **B** that you want. However, you should know that confidence does matter! We want you to go into each exam sure that you can do well! What if you aim for an even higher grade? Keeping in mind that you're usually an **A** student with a GPA of **3.6**, come up with a new, higher goal that will push you to do even better. ECoach will be here every step of the way to help you as you embark on this goal.

Confidence

UM Cumulative GPA

### Where Does Physics Fit?

Other Commitments

You told us that you value **relationships with family and friends, learning and gaining knowledge and sense of humor**. You also reported that you are **involved with student clubs or organizations**. This is on top of the work associated with your other classes. There *is* a way to make physics fit into this mix. Let's figure out what works for you.

Values

We see that you have many strengths coming into this class. Some of the most important are:

Expected hours of study

- You're already in your **second semester** of physics in college—you understand what's expected of you
- You're prepared to spend **12 hours per week** preparing for class, working on homework and studying
- Physics is applicable to your everyday life—there are examples all around you

There are also some factors that could be potential challenges for you. These may include:

Study partner

- Physics is a difficult **subject for anyone to master**
- You said that you're **not taking this course because you're interested**—hopefully you'll find a topic that you find exciting
- **You don't know anyone else in this class yet**

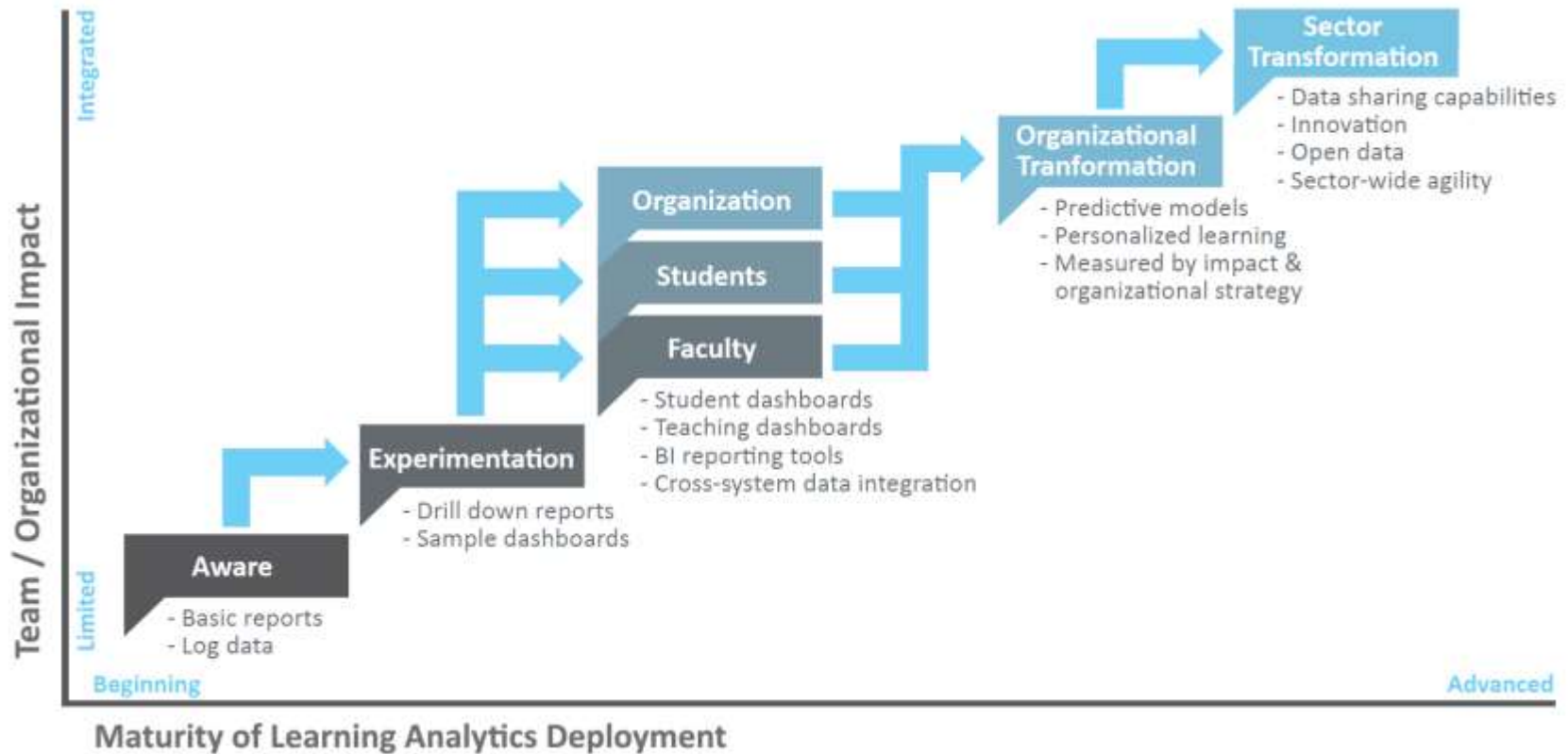
Reason for taking Physics

You should know that lots of people come in with these challenges and do great. ECoach will draw on this knowledge of your strengths and weaknesses to recommend study techniques that are tailored to your specific needs. If you follow this advice and put in a lot of hard work, you can do well in this course too!

# **INSTITUTIONAL ADOPTION: CURRENT STATE**

Very few institution-wide  
examples of adoption

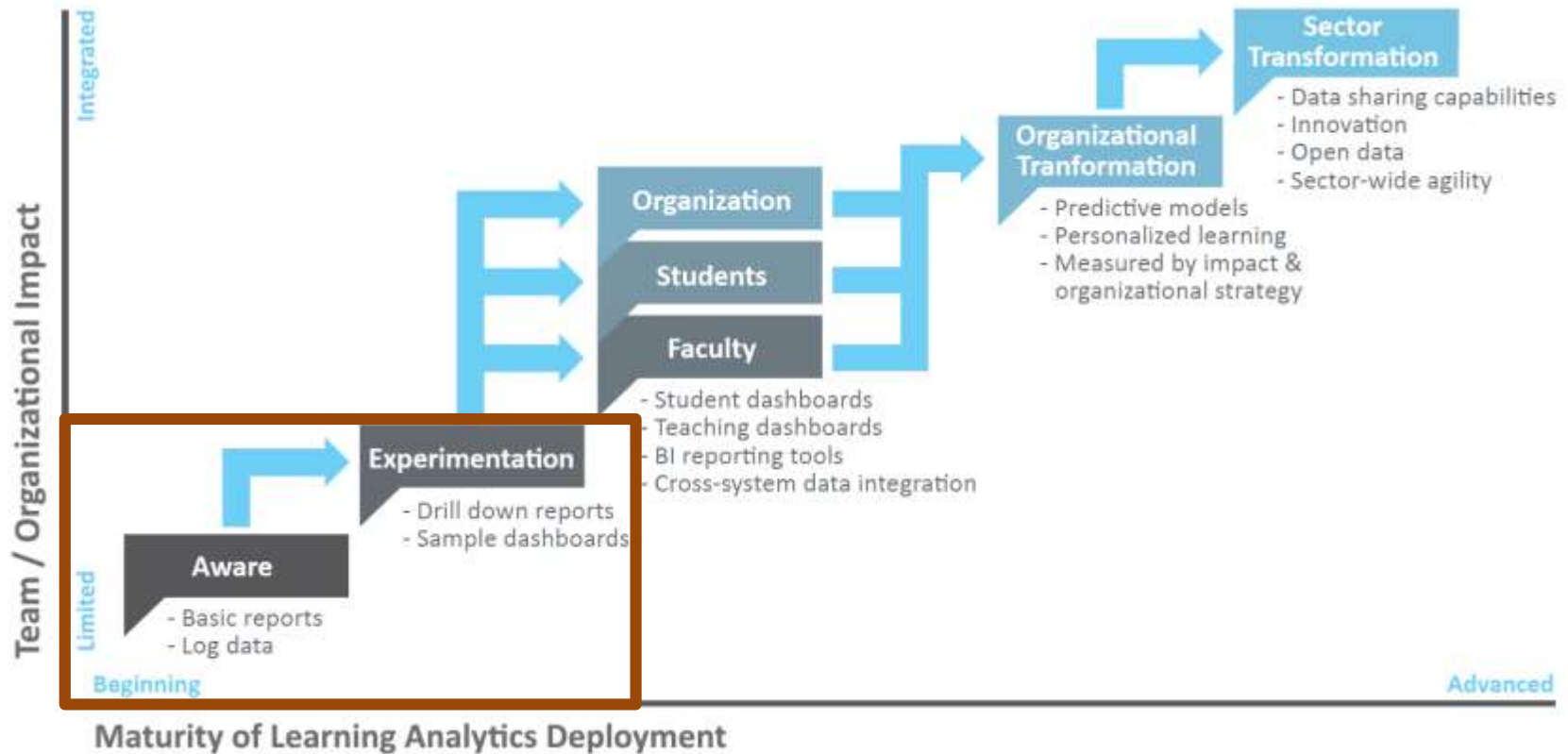
# Sophistication model



Siemens, G., Dawson, S., & Lynch, G. (2014). Improving the Quality and Productivity of the Higher Education Sector - Policy and Strategy for Systems-Level Deployment of Learning Analytics. Canberra, Australia: Office of Learning and Teaching, Australian Government. Retrieved from [http://solaresearch.org/Policy\\_Strategy\\_Analytics.pdf](http://solaresearch.org/Policy_Strategy_Analytics.pdf)



# Sophistication model



Siemens, G., Dawson, S., & Lynch, G. (2014). Improving the Quality and Productivity of the Higher Education Sector - Policy and Strategy for Systems-Level Deployment of Learning Analytics. Canberra, Australia: Office of Learning and Teaching, Australian Government. Retrieved from [http://solaresearch.org/Policy\\_Strategy\\_Analytics.pdf](http://solaresearch.org/Policy_Strategy_Analytics.pdf)

# ~70% institutions in phase 1

Goldstein, P. J., & Katz, R. N. (2005). *Academic analytics: The uses of management information and technology in higher education* (Vol. 8). Educause.

# 305 institutions, 58% at stage 1, 20% at stage 2

Yanosky, R. (2009). *Institutional data management in higher education*. ECAR, EDUCAUSE Center for Applied Research.

Interest in analytics is high, but  
many institutions had yet to make progress  
beyond basic reporting

Bichsel, J. (2012). *Analytics in higher education: Benefits, barriers, progress, and recommendations*. EDUCAUSE Center for Applied Research.

What's necessary to  
move forward?

# **DIRECTIONS**

# Data – Model – Transform

# Data – Model – Transform

Creative data sourcing

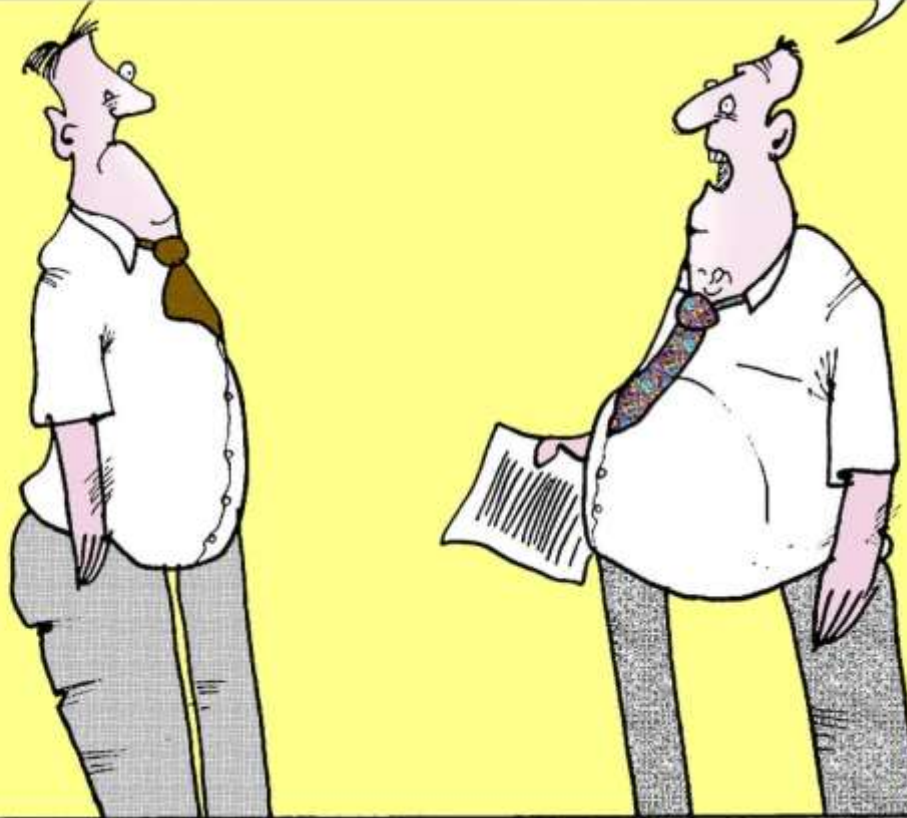
Necessary IT support

Data – Model – Transform

Question-driven, not data-driven

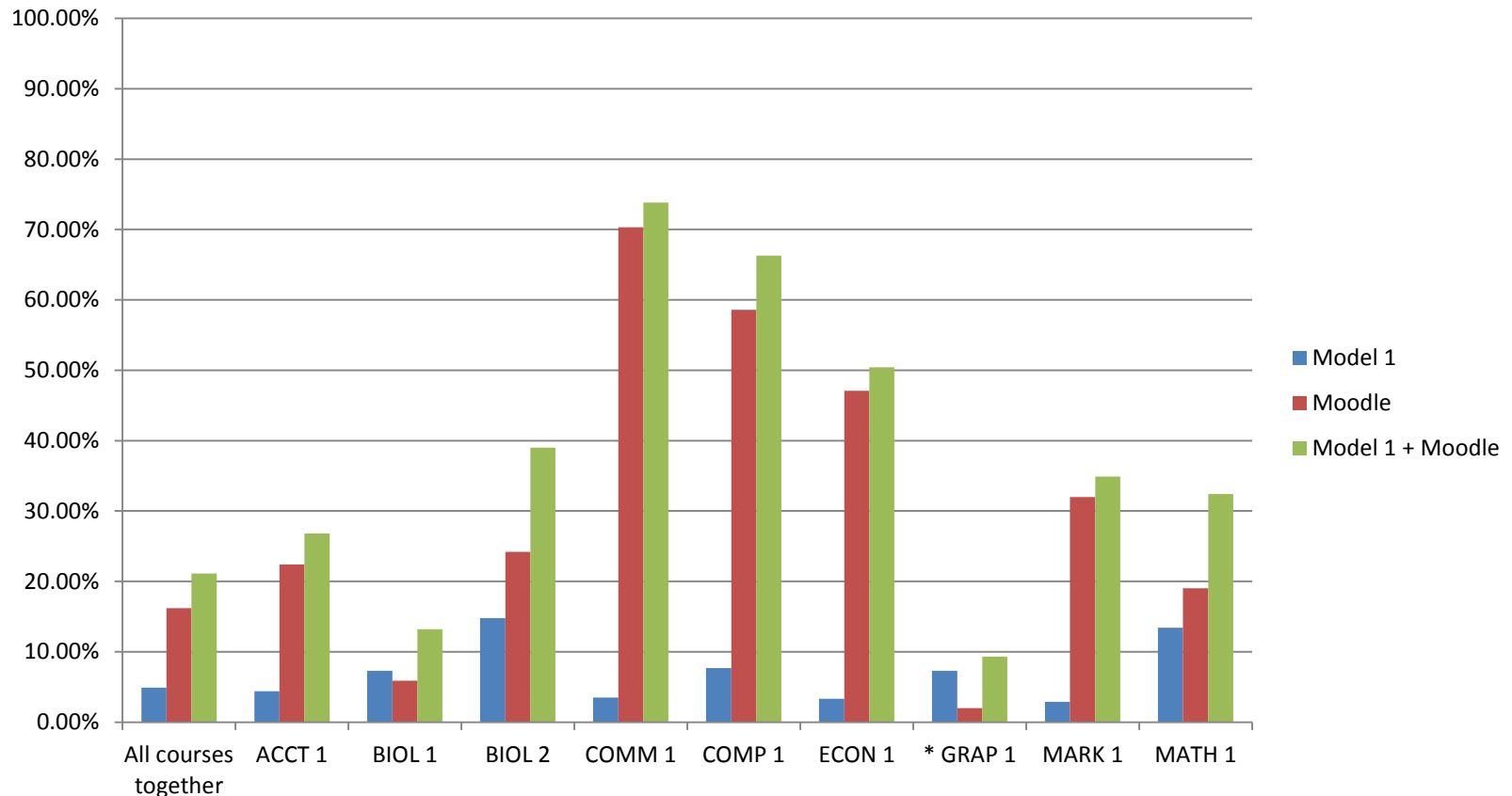


**HAVING CONDUCTED A COMPREHENSIVE  
ANALYSIS OF DOZENS OF SUBSETS OF DATA  
FROM A WIDE RANGE OF SOURCES WE'VE CONFIRMED  
THAT THE LIKELY ANSWER IS 36...NOW WE JUST  
NEED TO IDENTIFY THE QUESTION!**



Learning analytics is about  
learning

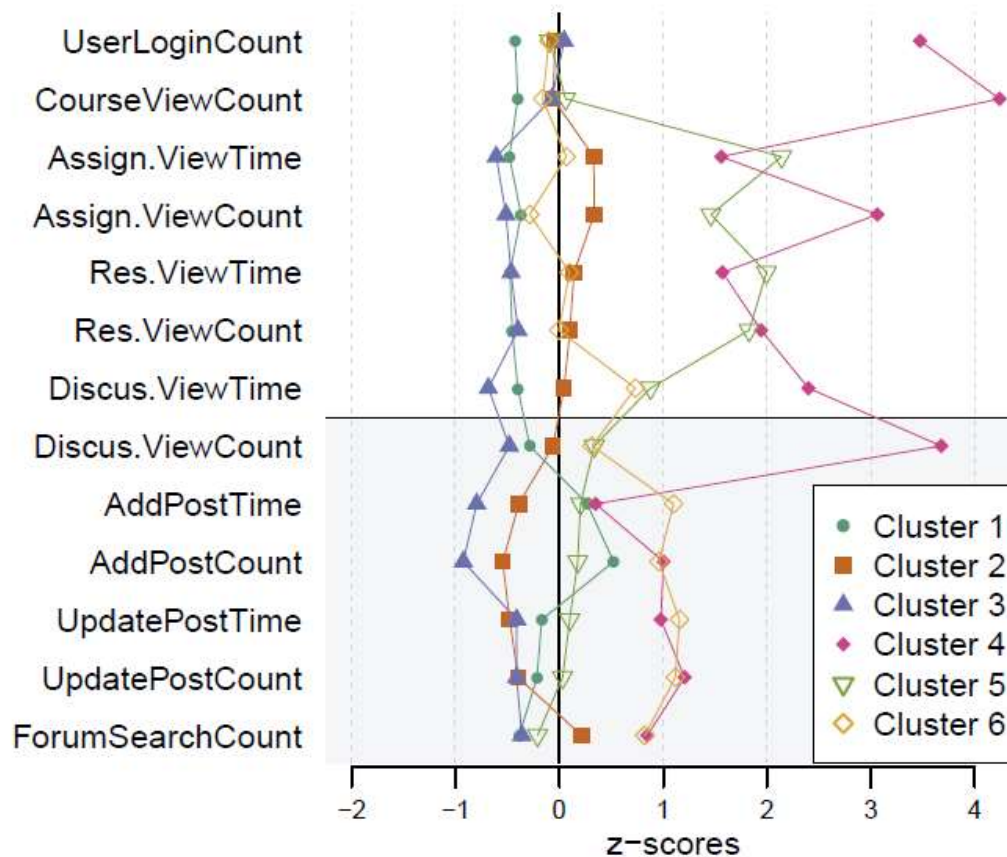
# Instructional conditions



Model 1 – demographic and socio-economic variables

\* - not statistically significant

# Learner agency



Large effect sizes  
(1.4-2.5  $\sigma$ ) on  
critical thinking and  
academic success

Once size fits all does not work  
in learning analytics

# Data – Model – Transform

Participatory design of analytics tools

Analytics tools for non-statistics experts

Develop capabilities to exploit (big) data

# Visualizations can be harmful

Corrin, L., & de Barba, P. (2014). Exploring students' interpretation of feedback delivered through learning analytics dashboards. *In Proceedings of the ascilite 2014 conference* (pp. 629-633). *ascilite*.

What's our reality?



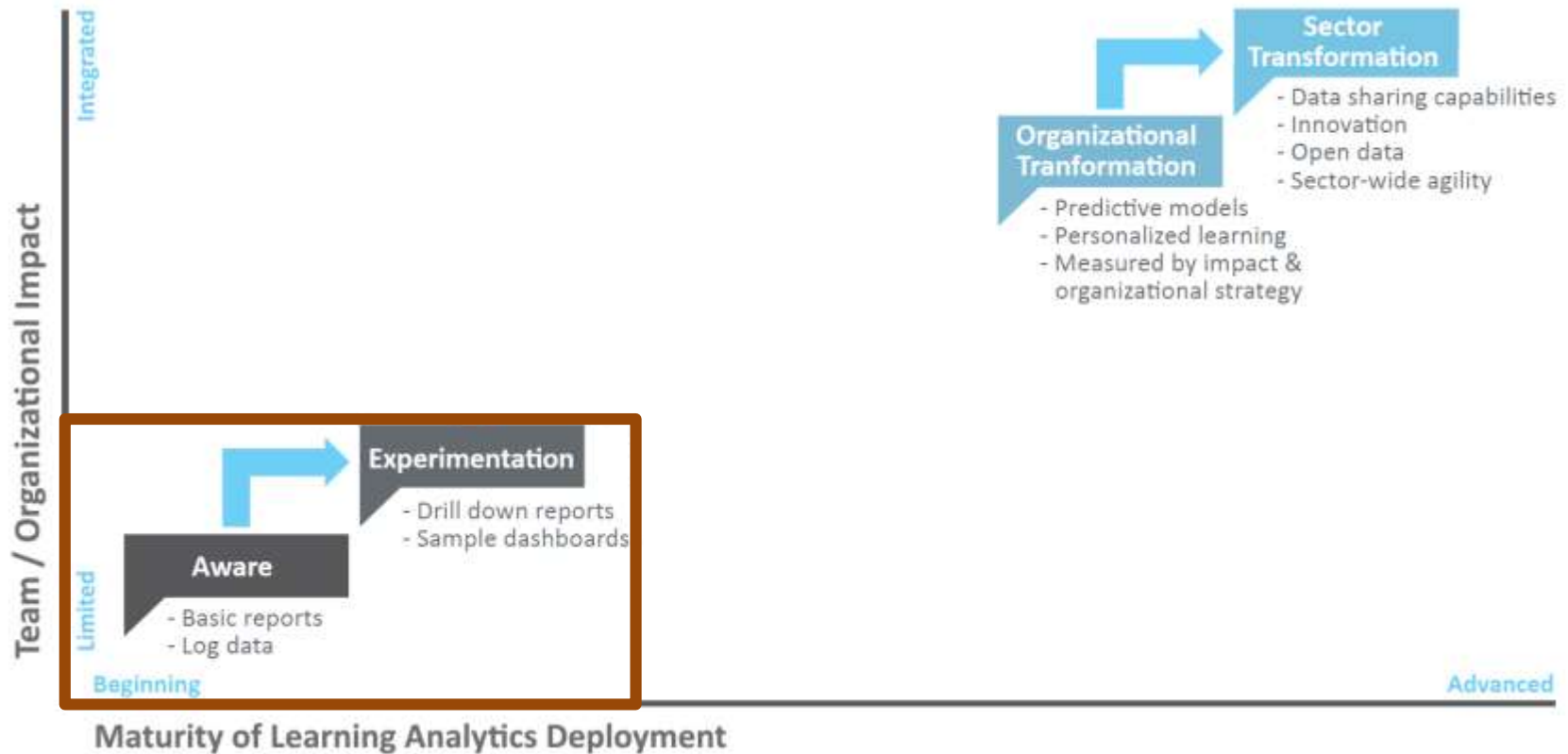
**CHALLENGES**

# Current state

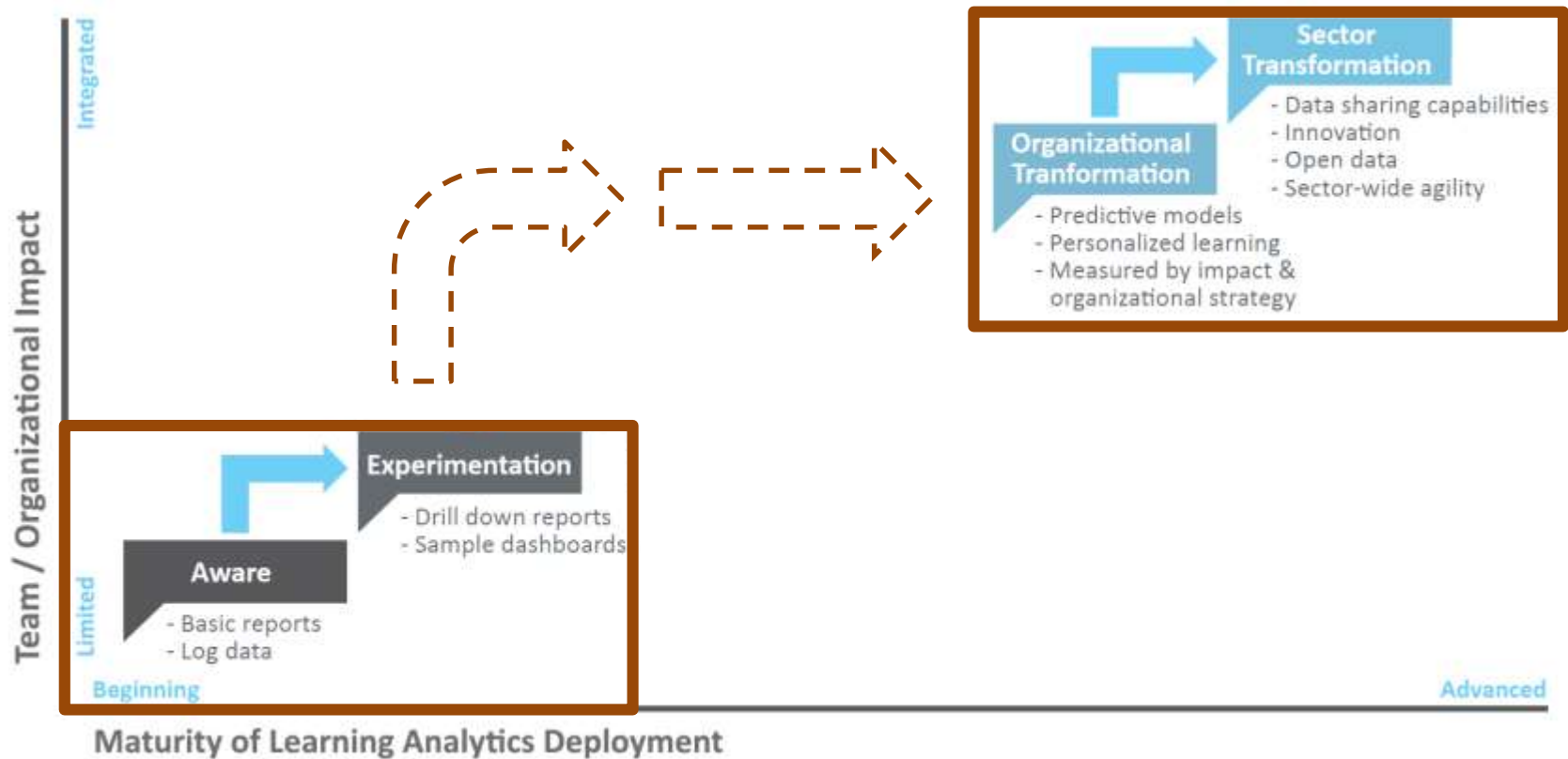
Benchmarking learning analytics status, policy and practices for Australian universities



# Senior management perspective



# Senior management perspective



Solution-driven approach

Bought an analytics product.

Analytics box ticked!

# Lack of data-informed decision making culture

Macfadyen, L., & Dawson, S. (2012). Numbers Are Not Enough. Why e-Learning Analytics Failed to Inform an Institutional Strategic Plan. *Educational Technology & Society*, 15(3), 149-163.

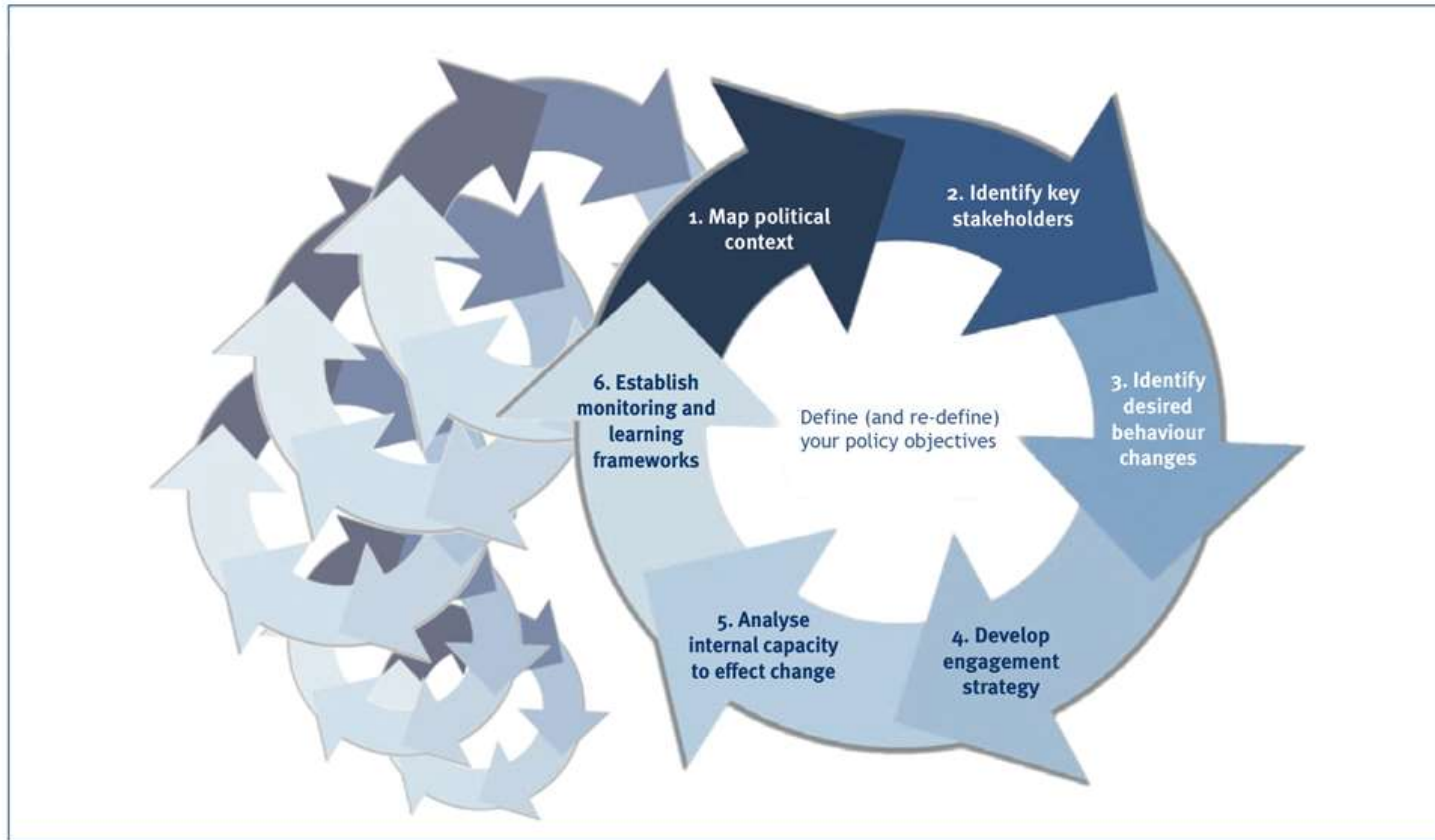
Researchers not focused on  
scalability

**FINAL REMARKS**



Embracing complexity of  
educational systems

# Rapid Outcome Mapping Approach (ROMA)



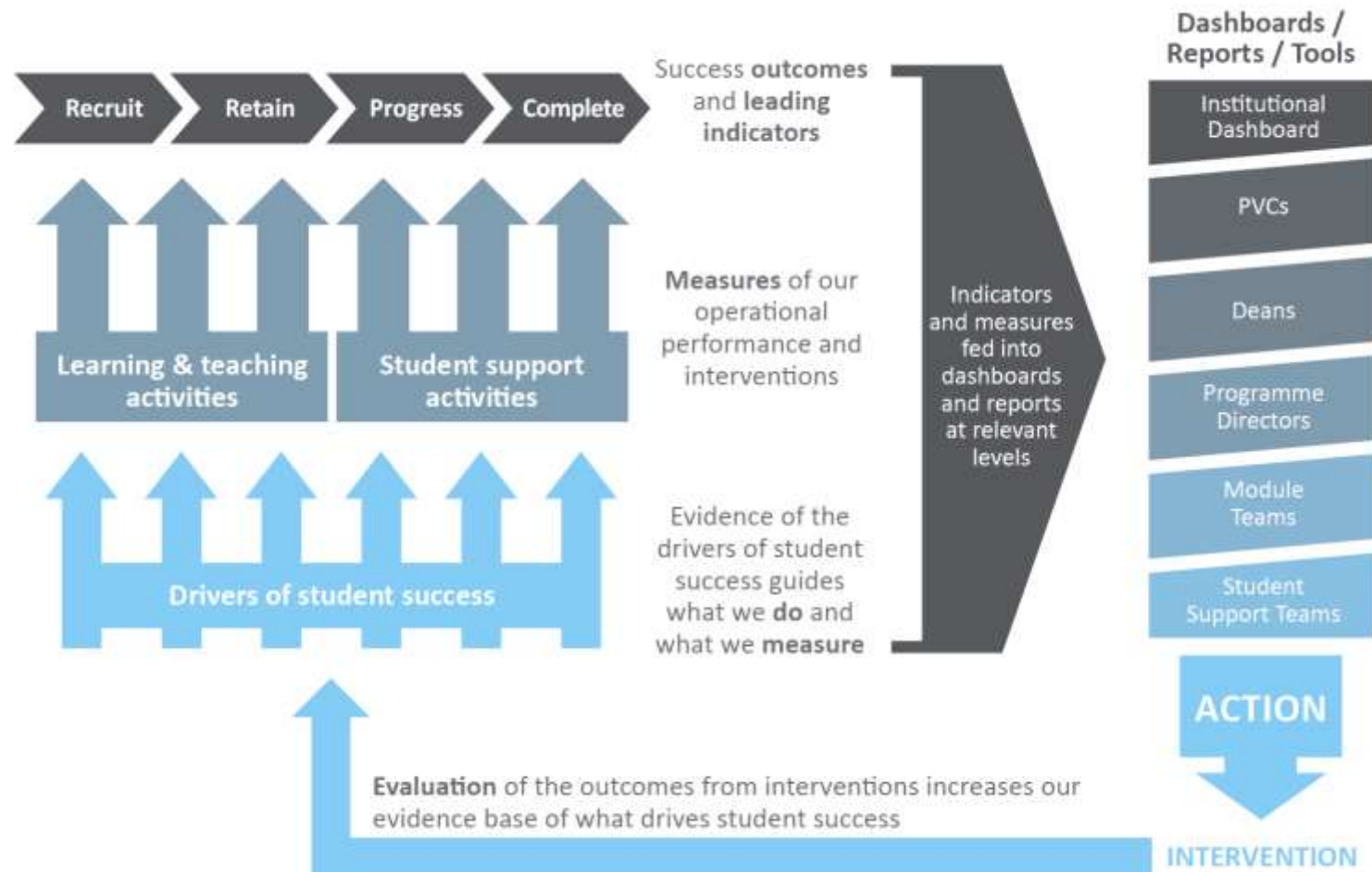
Macfadyen, L. P., Dawson, S., Pardo, A., & Gasevic, D. (2014). Embracing big data in complex educational systems: The learning analytics imperative and the policy challenge. *Research & Practice in Assessment*, 9(2), 17-28.

Capacity development

Multidisciplinary teams in  
institutions critical

Learning from  
the successful examples

# An institutional learning analytics vision



Tynan, B. & Buckingham Shum, S. (2013). Designing Systemic Learning Analytics at the Open University. *SoLAR Open Symposium – Strategy & Policy for Systemic Learning Analytics*.

<http://people.kmi.open.ac.uk/sbs/2013/10/designing-systemic-analytics-at-the-open-university>

Cross-institutional  
experience sharing & collaboration

## Open Learning Analytics: an integrated & modularized platform

Proposal to design, implement and evaluate an open platform  
to integrate heterogeneous learning analytics techniques

<http://solaresearch.org>



Learning Analytics Initiative



<https://www.apereo.org/>



Ethical and privacy consideration








# Ethical use of Student Data for Learning Analytics Policy

**Also listed as:**

Ethical use of Student Data for Learning Analytics Policy

This policy aims to set out how the University will use student data in an ethical way in order to shape the student support provided. The policy is based around eight key principles, each of which is linked to particular aspects of learning analytics.

-  [Policy on Ethical use of Student Data for Learning Analytics \(125KB\)](#)
-  [Ethical use of Student Data for Learning Analytics Policy FAQs \(122KB\)](#)
-  [Using information to support student learning \(427KB\)](#)

**Charter Principle:**

We treat each other with dignity and respect

## Code of practice for learning analytics

### A literature review of the ethical and legal issues

Niall Sclater

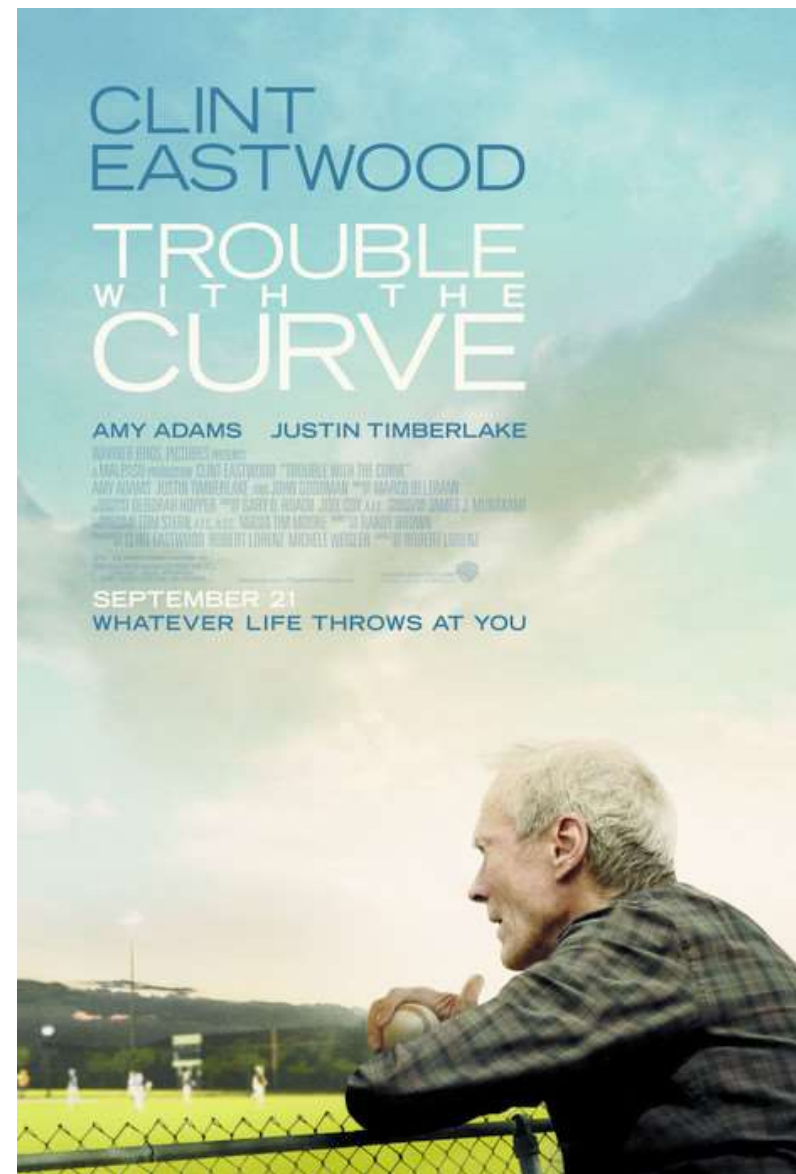
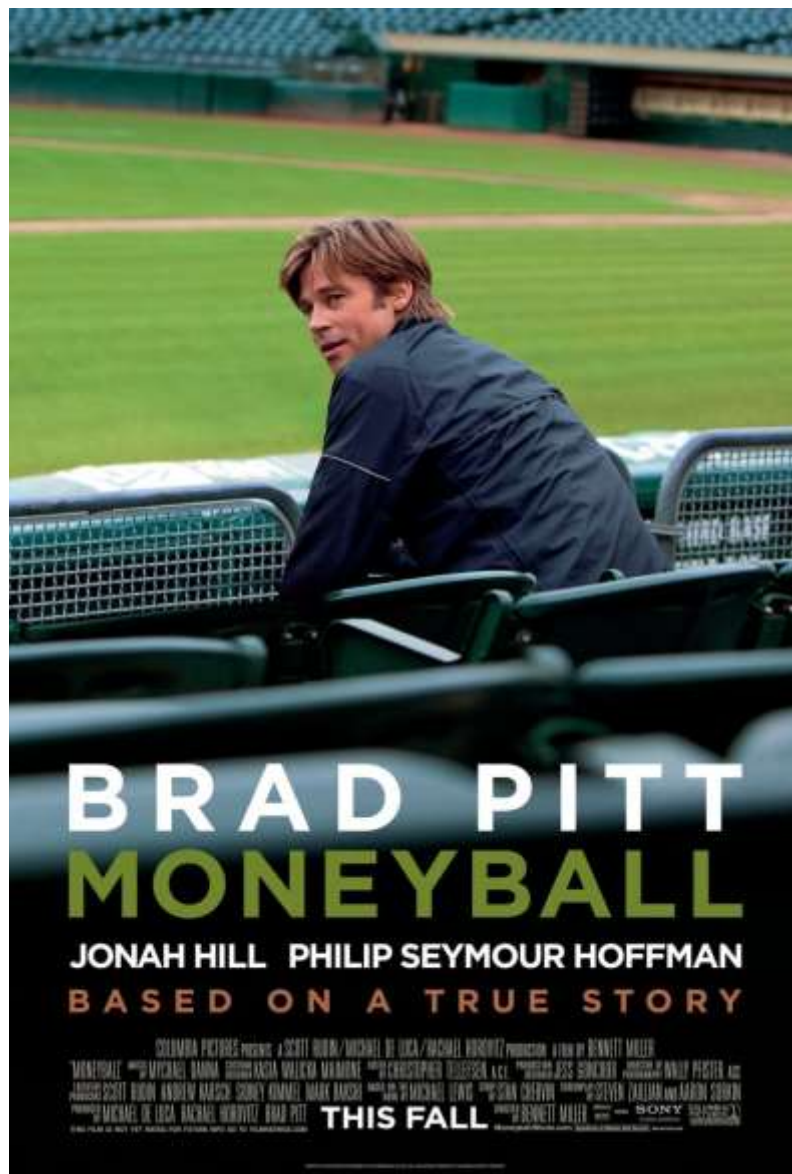


Copyright © Jisc November 2014  
This work is licensed under the Creative Commons Attribution 4.0  
<http://creativecommons.org/licenses/by/4.0/>



# Development of analytics culture

Manyika, J. et al. (2011). *Big Data: The Next Frontier for Innovation, Competition, and Productivity*. McKinsey Global Institute, <http://goo.gl/Lue3qs>



# Thank you!



*The 6th International*  
**Learning Analytics & Knowledge Conference**

*University of Edinburgh, Edinburgh, UK, April 25-29, 2016*