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Ethical considerations involving data analytics in educational assessment: A systematic literature review

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Trinity College Dublin &

the University of South-Eastern Norway (USN eDU)

Opportunity versus Challenge: Exploring Usage of Log-File and Process Data in International Large Scale Assessments, Dublin, Ireland, 16 May 2019

Our interest in the topic..

Siddiq, 2017 - Keynote AEA-Europe



2018

aea
EUROPE

Murchan & Oldham, 2017



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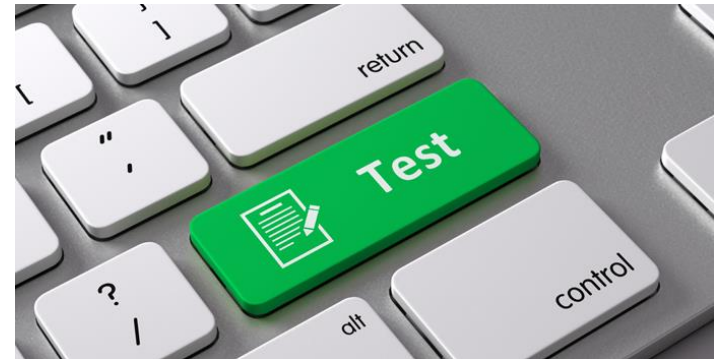


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South-Eastern Norway**

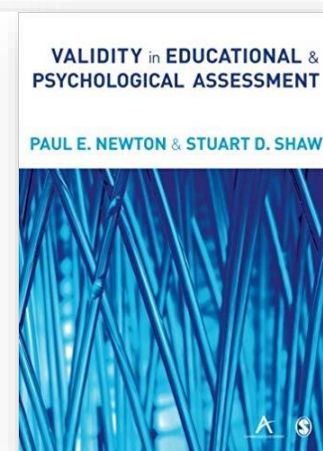
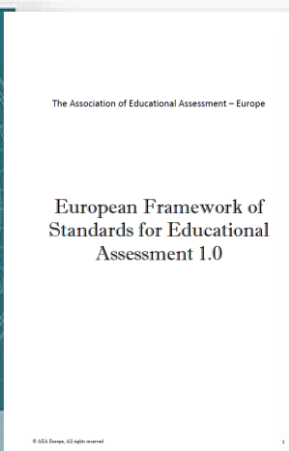
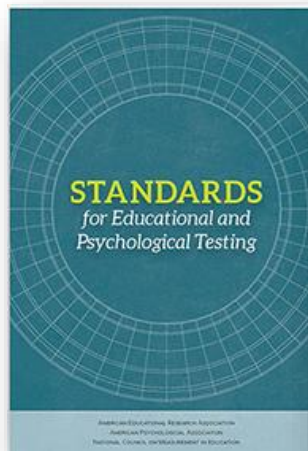
Background

A close-up photograph of a person's hands typing on a silver laptop keyboard. The person is wearing a green top and a white long-sleeved shirt. A gold bracelet is visible on their left wrist. In the foreground, there is a stack of white papers and a smartphone lying on a dark surface. The background is blurred, showing other people in a classroom or lecture hall.

Context



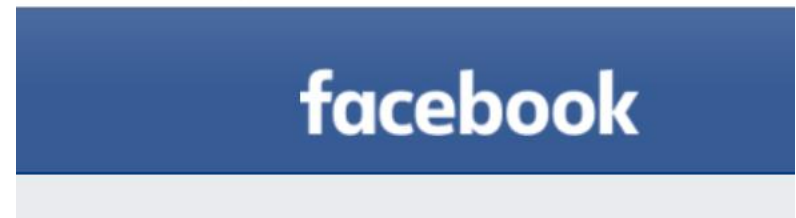
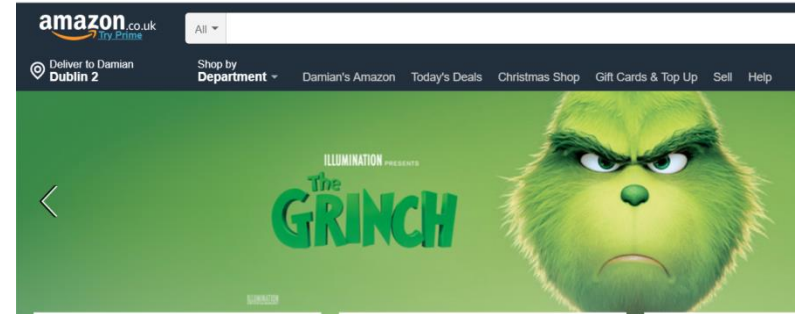
Logfile data, Learning analytics, Data mining, Big data, etc..



Process Data

- Part of modern life.
- Accelerated by scale of digital data.
- Information that goes beyond primary outputs from engagement with technology. Webpages visited, time spent, breaks taken....
- A big employer, reaching into business, retail, politics,

Aer Lingus 



DATA ANALYST - INSURANCE CUSTOMER ANALYTICS

PARAGON EXECUTIVE INTELLIGENCE

Dublin City Centre Negotiable Permanent

Updated 25/10/2018 Laura Kennedy

★ Saved

Apply Now

DESCRIPTION

This is a really interesting role for an outstanding provider to understand the behaviour of and com

Data Analyst - Insurance Customer Analytics

This is a really interesting role for an outstanding provider to understand the behaviour of ar

- Combine internal and external data to understand the success of customer communication
- Use statistical analysis, A/B, and other techniques to turn data into actionable insight
- Define and create critical performance indicators through effective communication
- Ability to measure and demonstrate the impact of increased offer update and rollouts

To discuss this unique opportunity further and to obtain

Data Scientist (Goodreads)

Job ID: 738789 | Goodreads LLC

DESCRIPTION

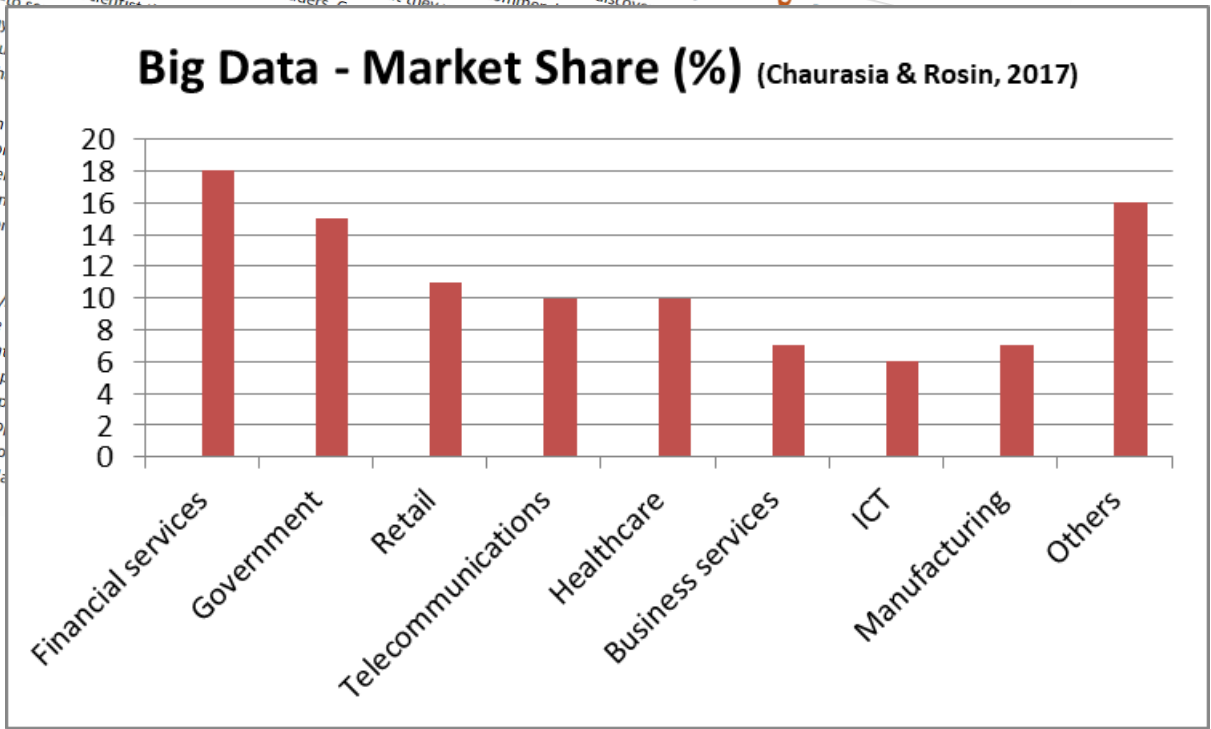
With over 75 million users, 68 million reviews, and 2 billion books, Goodreads is the world's largest site for readers and book recommendations. Founded in 2007, Goodreads is a Top 100 web destination where readers find and share books they love. Loved by avid and casual readers alike, Goodreads members can discover books by seeing what their friends are reading or by using the Goodreads Book Recommendation algorithm. Ratings and recommendations, track what they have read, and list what they want to read next. Goodreads is seeking a Data Scientist to become their go-to person for data insights. Do you naturally turn that story into one that impacts the company?

Responsibilities

- Understand the Goodreads/Book community
- Acquire data by building the interfaces for RedShift and Data Warehouse
- Investigate the feasibility of applying machine learning to relationships, constructing appropriate models
- Build models using statistical modeling, neural networks, and social network modeling

Apply now

Job details



Log Files – Broader Picture

Big data

Loose term with no arbitrary cutoff point regarding size (Wang, 2017). Relation of Big Science. Characterised by the 3 Vs: Volume, Velocity, Variety (Boyd & Crawford, 2012) Applications in political science, public health, economics, criminology.... Education.

Education Data Mining

Methods and techniques from statistics, machine learning and data mining to reveal patterns in educational data and answer questions(PISA, other tests, research...)

Learning analytics

Measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs (SoLAR) cited by Siemens (2012).

Log files

Time-stamped records of students' navigational choices while using a computerised environment (Barab, Bowdish & Lawless, 1997).

Learning Analytics

Advantages

- Curriculum improvement
- Instructor improvement
- Assist with employment predictions
- Model student learning outcome, behaviour, process
- Personalised learning pathways
- Personalised interventions
- Real-time scaffolds
- Detailed monitoring and analysis of individuals
-
-

Challenges

- Complex data collection over multiple systems
- Data analysis
- Data security
- Misuse of data
- Ethical & Privacy issues, Consent
-
-

The 3 whats of Innovation (Rojas 2014)

1. What is this?

- Data on correct/incorrect/partial knowledge, plus...
- Added data on time management, student engagement, time on task, fatigue, engagement strategy...

2. What can we do with it?

- Develop a broad profile on learner/examinee based on actions; Make inferences based on the actions & behaviours (may be wrong)
- Improve measurement, with added data
- Shape and facilitate better learning

3. What are the rules for it?

- National/Intl. data protection regulations
- Professional ethics
- Institutional guidelines.....

Will you graduate or drop out from college? Ask 'big data'

Universities are using predictive analytics to spot students in danger of dropping out

© Tue, Sep 25, 2018, 00:00

Jenna Clarke-Molloy



A growing number of Irish universities are using predictive analytics to spot students in danger of dropping out.
Photograph: iStock

Research questions

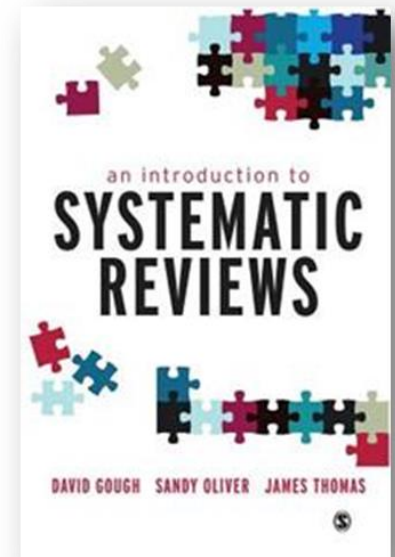
- 1. To what extent are ethical considerations reflected in recent research that draws on logfile data/Learning Analytics derived from assessment of students?**
- 2. To what extent does the research literature reflect regulatory issues and developments in relation to analysis of such process data?**
- 3. What specific issues arise in relation to ethics given conceptual and technical developments in logfile analyses of student assessment data?**

Study Design - Systematic literature review

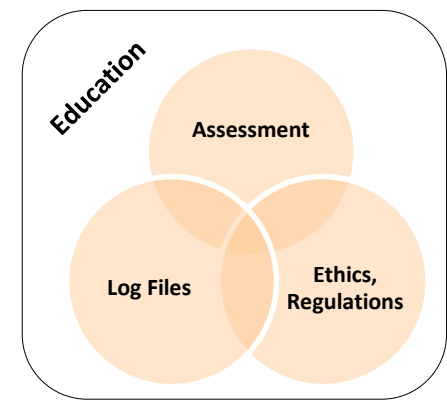


Campbell Collaboration (2012); Gough et al., (2012);

Petticrew & Roberts (2006); Boland, Cherry & Dickson (2017)



Method – Search protocol



FOUR Elements (initial)

GOVERNANCE

ASSESSMENT & FORMAT

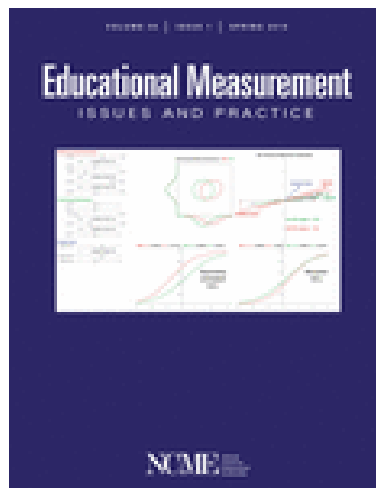
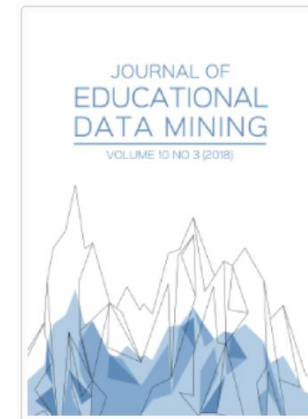
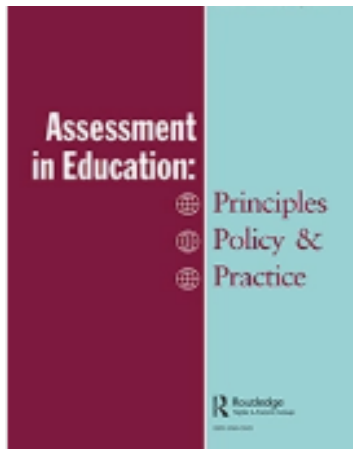
ANALYTICS

EDUCATION

Method - Search application

	Two Databases	ERIC, Web of Science	
1	Electronic Search – 4 elements	Governance, Assessment & format; Analytics, Education	= 1301 studies
2	Title & Abstract Screening – Inclusion/Exclusion Criteria	English; Publication Type; K-12/College; Achievement-Assessment-Outcomes; Analytics/Logfiles.	= 66
3	Full-text screening (FT)	Meet original criteria; Nature of publication; Content relates to 3 RQs	= 25
4	FT Coding, Data extraction & Analysis	.. Study aim, Design, Assessment format, Assessment purpose, Specific findings/issues in relation to 3 RQs	

Journals

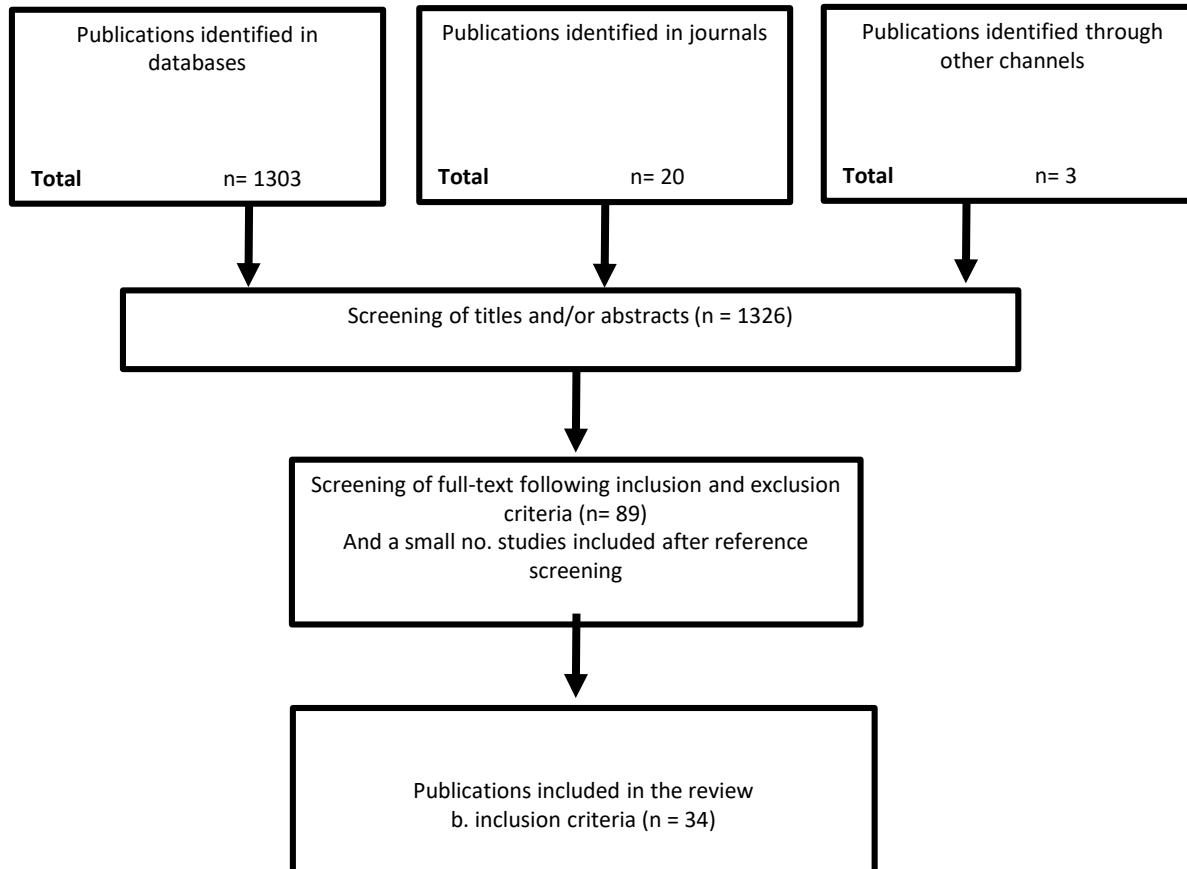


Selection criteria

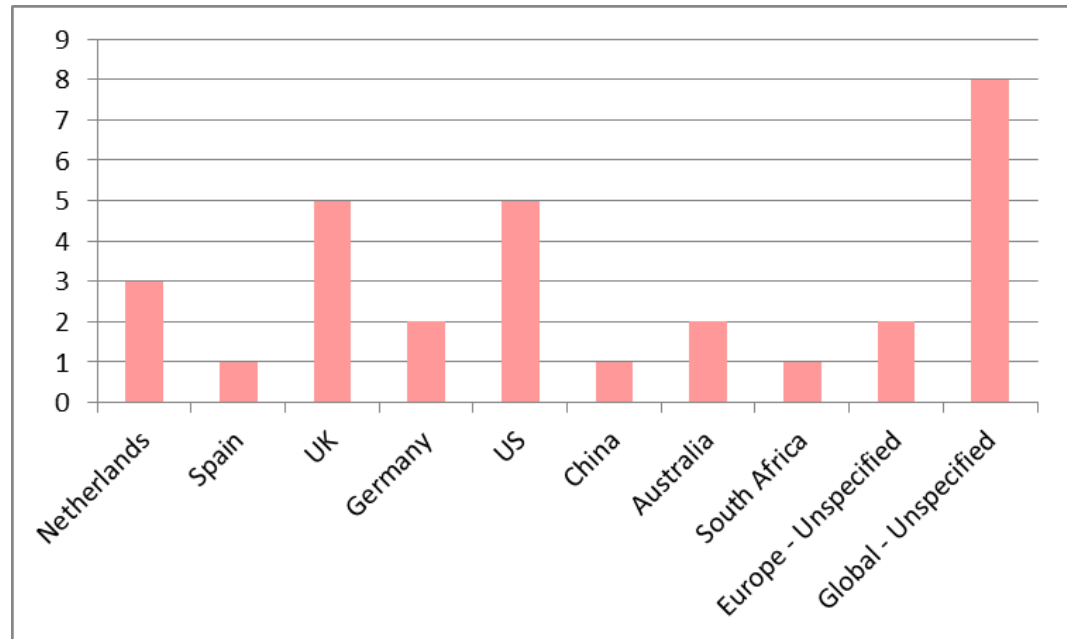
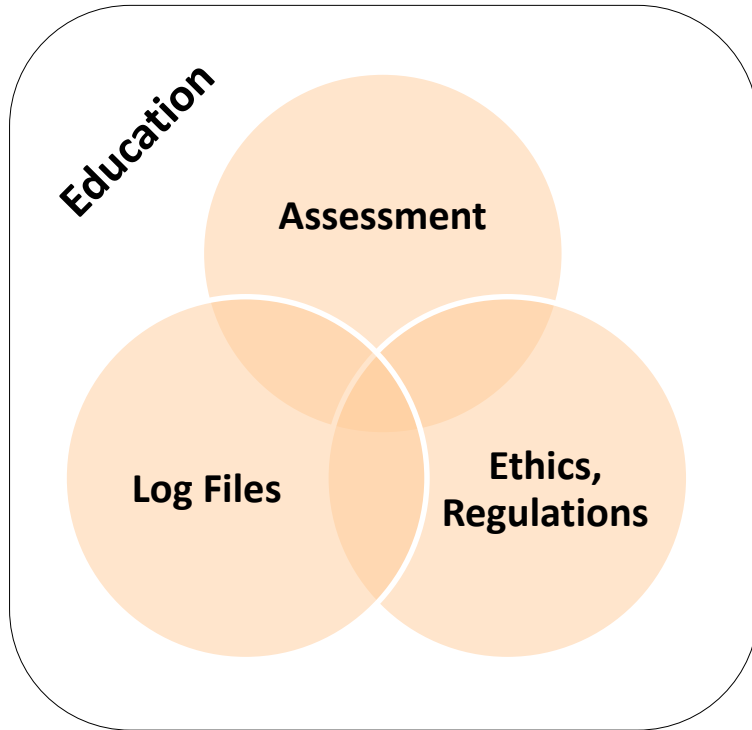
Inclusion criteria (Title & Abstracts)

1. Published in English
2. Published as a Conference proceedings, Report, Book or Paper in a Refereed journal
3. K-12, and/or College and University educational settings
4. Use of student achievement/attainment/test results or outcomes
5. Abstract contains specific reference to use of learning analytics, data analytics or log-files as part of the study

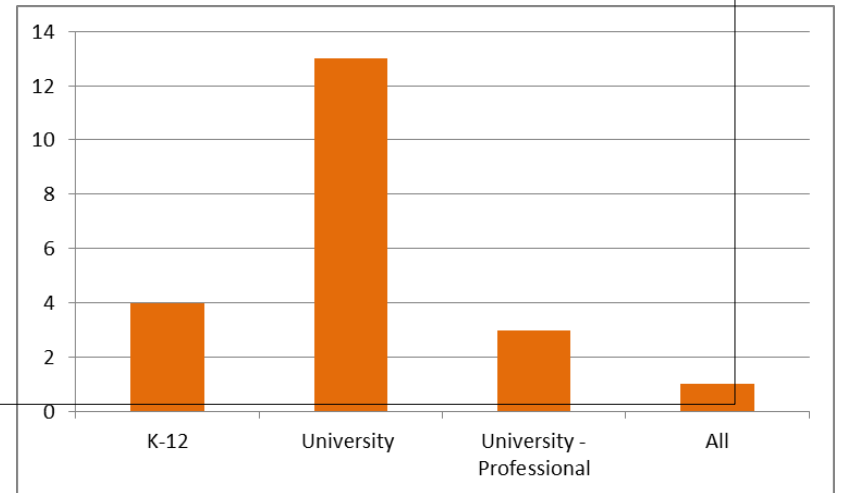
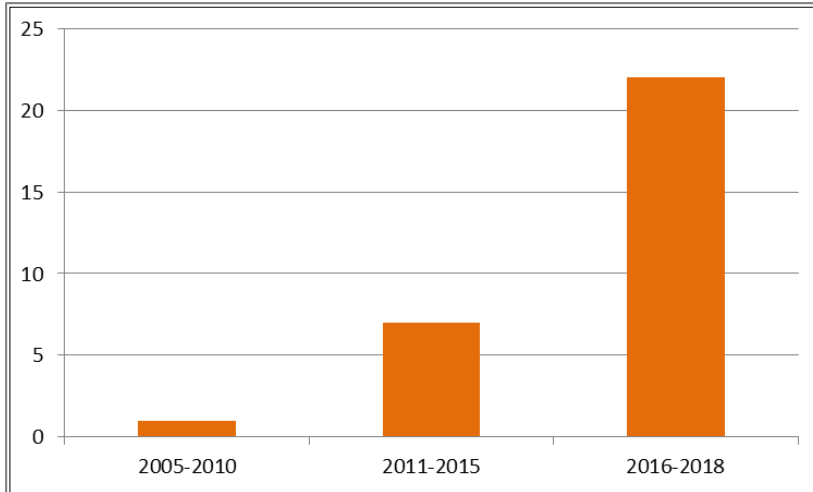
Studies included



Preliminary findings

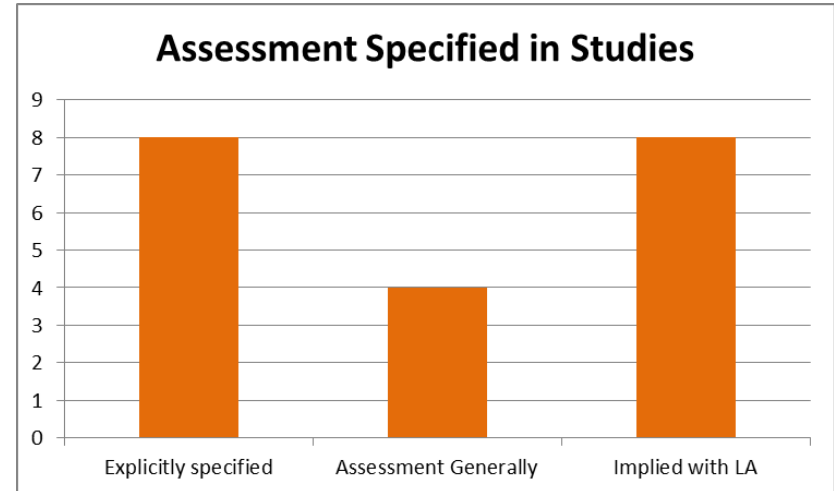
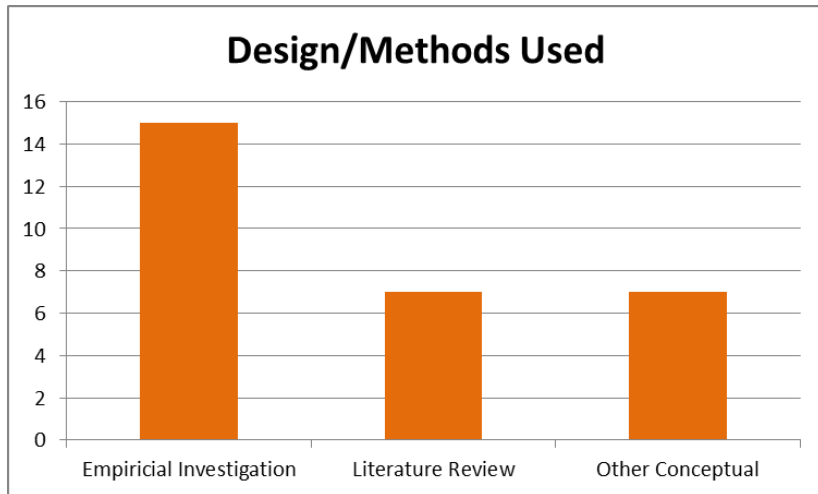


..... Findings



Education Level

..... Findings



Types of Assessment – Log File Analysis

- ✓ **Computer simulation – undergraduate** (Angeli et al, 2017)
- ✓ **Homework** (Cao et al, 2009)
- ✓ **Summative, formative** (Drachsler & Kalz, 2016; Faber et al, 2017)
- ✓ **Unspecified results from university courses** (Dyckhoff et al, 2012; Rodriguez et al, 2016)
- ✓ **Speaking skills, higher order skills** (Pena-Ayala, 2018)
- ✓ **E-portfolio** (van der Schaaf et al, 2017; van der Stappen & Lee, 2018; Watson et al, 2017)
- ✓ **Student blogs & posts** (Watson et al, 2017)
- ✓ **Large scale assessment** (Wolf et al., 2014; Zeide, 2017).

Assessment issues - discussion

- Overall small number of studies focused on assessment
.....Assessment lagging behind?
- Timestamping – examinee awareness?
- K12 – College divide
- Need for updated Assessment Guidelines/Frameworks?



Let us know your thoughts

Parting Thoughts

1. **Commercial practices increasingly evident in education data systems, e.g. recommender systems. Unlikely to reverse.**
2. **A wealth of technical advances evident; not matched with detail about how issues of privacy and ethics addressed.**
3. **Consent; Transparency; Access; Responsibility; Privacy; Stewardship; Avoid negative impact**
4. **Log file analysis can lead to mistaken inferences; validity and ethical issue**
5. **Students consent to taking assessments... what is their level of consent for subsequent analysis and interpretations of process data?**
6. **Avoid mistrust in relation to log-file analyses.**

Limitations & Next Steps

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