

The state of the art of Learning Analytics



Elsa Cardoso June 2018





About me



EUNIS Business Intelligence Task Force Leader







Information and Decision Support Systems group

Elsa.Cardoso@iscte-iul.pt Elsa.Cardoso@eunis.org

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take the leap with us.

join our task forces

The mission of the **European University Information Systems** (EUNIS) organization is to help member institutions develop their information technology (IT) landscape by sharing **experiences and working together**. One of the ways we do this is by **Task Forces** that are focused groups of EUNIS members dedicated to **key initiatives**, considered most relevant for the IT community in Higher Education. They are instrumental in transforming theories into concrete activities and in the **pursuit of standards and guidelines**. Currently we have six active groups: BencHEIT, Business Intelligence, InfoSec, Learning & Teaching, Student Mobility and <u>ERAI initiative</u>.



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our task forces.

student mobility or student

Student Mobility Task Force was founded in 2009. It is a group of IT implementers and stakeholders who contribute to the definition and adoption of standards and procedures for the digital exchange of information to facilitate mobility and lifelong learning in the European Higher Education Area and beyond.

Current projects:

• ERASMUS WITHOUT PAPER (EWP) aims to create an electronic and digital support network of exchangeable data and academic information from all students that take part in exchange programs.

• EMREX is a proven method for electronic transfer of achievement records between

learning and teaching

The Learning and Teaching Task Force, founded in 2004, explores all aspects of learning & teaching through technology. The group runs various projects and activities including an annual workshop and managing the EUNIS Dørup E-learning Award.

Key topics of interest include:

• Assessment and feedback

beyond.

staff on mobility.

Aareement

transferred.

- Technology in physical learning spaces
- Learning design & learning analytics
- Online learning & immersive technologies

higher education institutions in Europe and

• EUROPEAN STUDENT CARD (ESC) is a

management of a unique european Student

a thinning of administrative procedures and

the easy access to services for Students and

• OLA (On-line Learning Agreement) is an

on-line platform to digitalize the Learning

• EGRACONS (European Grade Conversion

the academic results when these are

System) is a grade conversion tool to convert

The ERAI initiative, launched in 2014, aims to

aggregate research on Higher Education and

a platform where to find this information and share it and the activity focuses on

on HE IT, and the EUNIS TFs' outputs.

scale it to a EU level. Its main goal is to provide

publications, surveys and popularizing research

A European Journal of Higher Education IT was

contributions coming from members, publishes

created under the umbrella of ERAI. Through

ERAI, EUNIS provides case studies, shares

and promotes surveys and analysis, etc.

e-ID and status recognition system which aims

business intelligence

The Business Intelligence (BI) Task Force was created in 2012, with the goal of creating an European collaboration network to exchange and share good practices among Higher Education (HE) BI practitioners. Main projects of this group include the 2013 Maturity Model Survey to assess the maturity level of BI initiatives in HE, the 2014 Paris EUNIS BI conference, and the 2017 Manchester Learning Analytics Workshop. Throughout the years, the BI Task Force has promoted national level collaboration events, in Ireland, Spain and Portugal, and

masterclasses at the EUNIS annual congress. Focusing on analytics, this group has natural synergies with other EUNIS Task Forces, in particular with the Learning & Teaching task force (working together on the topic of Learning Analytics), the BencHEIT (working on data visualization) and InfoSec (working on the impact that new data management regulations have on data analytics projects). Current activity is focused on learning analytics, institutional analytics and BI, data science, strategic decision making, and information visualization.

information security

The InfoSec (Information Security) Task Force, created in 2017, focuses on the current challenges of the information security field. It aims to share knowledge about information security development and compliance, as well as solutions to support the implementation of the GDPR from the information security point of view.

Its main objectives are to:

- Identify and share higher education information security and privacy threats. countermeasures as well as technical solutions
- Build a network of higher education information security and Data Protection professionals.

🗲 benchmarking 🖊

BencHEIT is focused on international benchmarking of Higher Education Institutions. The annual BencHEIT survey on IT costs and volumes of higher education institutions was launched in 2010. In this study, participating universities collect key figures of their IT operations to be able to position themselves, to recognize best practices and to see if their IT and its effectiveness compares to other similar education institutions in Europe. Participation in the survey is voluntary and free of charge. The survey is managed by CIOs within the EUNIS community. The outcomes of the benchmarking survey are presented at the EUNIS Annual Congress and at the annual BencHEIT workshop (this year on 27th November 2018, in Zurich).

and analysis initiative

For more information: BenchHEIT

Ilkka Siissalo (University of Helsinki, Finland) bm-pg@eunis.org

Business Intelligence Elsa Cardoso (University Institute of Lisbon **ISCTE-IUL**, Portugal) elsa.cardoso@eunis.org

Learning and Teaching Dr Gill Ferrell (Aspire, UK) gill@aspire-edu.org

InfoSec

Kenneth Kahri (University of Helsinki, Finland) kanneth.kahri@eunis.org

Student Mobility Carmen Díaz (SIGMA, Spain)

carmen.diaz@eunis.org

ERAI Project manager Johan Bergström (Umeå University, Sweden) johan.bergstrom@eunis.org

ERAI - EUNIS research

Agenda

- Defining Learning Analytics
- Drivers of LA
- Discussion of case studies
- Conclusions

Defining Learning Analytics

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Analytics

- "Putting analytics to work is about improving performance in key business domains using data and analysis."
- "By analytical we mean the use of analysis, data, and systematic reasoning to make decisions."



(Davenport et al., 2010)

THOMAS H. DAVENPORT, JEANNE G. HARRIS Co-authors of *Competing on Analytics* and ROBERT MORISON

Analytics at Work Smarter Decisions Better Results



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Analytics: types of questions



(Adapted from Davenport et al., 2010)

Learning Analytics defined



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



Goal: converting educational data into useful actions to **foster learning** and **improve learner success**

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Business Intelligence

"A broad category of applications and technologies for gathering, storing, analyzing, sharing and providing access to data to help enterprise users make better business decisions."

(Burton, Geishecker et al. 2006)

Business Intelligence Improving Business Insight



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Learning Analytics is a recent research area, in which **Business Intelligence** and **Analytics** techniques are applied to learners and their contexts, with the purpose of acquiring a greater insight about the entire learning process (including outcomes).

Learning Analytics roots

Contributions from different fields and communities ullet



Academic Analytics



Improvement of organizational processes, workflows, resource allocation, and institutional measurement through the use of learner, academic, and institutional data



Goal: improve organizational effectiveness

Academic Analytics



Application of business intelligence tools and practices in higher education

(Goldstein and Katz, 2005)

AA "has the potential to create actionable intelligence to improve teaching, learning and student success"

(Campbell et al., 2007)

Different levels and stakeholders



Examples of analytics



Drivers of Learning Analytics

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- Big Data
- Online Learning
- Accountability and political concerns
- Stakeholders



Adapted from (Ferguson, 2012)

Our world today

- Explosion and fragmentation of data
- New data sources
- Increased computing and analytic power
- Democratization of data & BI and the rise of data literacy



How much data is generated every minute?

DOMC



Technical challenge

"Big Data"

How can we extract value from these big sets of learning-related data?

Data sources:

- Learning Management Systems (LMS)
- Academic information systems
- External systems (e.g., social media)

• Different types:

- Interaction data
- Personal data
- Academic information



Adapted from (Ferguson, 2012)

https://paulswider.com/2018/01/01/modernized-student-lifecycle-management-in-higher-education/

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Educational challenge

The Online Learning trend

How can we optimize opportunities for online learning?

- Current Online Learning challenges:
 - Students may feel isolated and loose motivation
 - Massive number of students
 - Teachers need new techniques to evaluate learning and identify at risk students



Adapted from (Ferguson, 2012)

Economic challenge

Accountability and political concerns

How can we optimize learning and educational results at national or international levels?

 Increasing demand for educational institutions to measure, demonstrate and improve performance

Stakeholders



Adapted from (Ferguson, 2012)

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SHEILA

Supporting Higher Education to Integrate Learning Analytics



http://sheilaproject.eu/

SHEILA project

- State of art of LA adoption in Europe
- SHEILA framework to establish a LA policy with 6 dimensions

http://sheilaproject.eu/





SHEILA

LA Stakeholders

- Students
- Senior managers
- Teaching staff

Interests

Concerns

Stakeholders interests

 Improve: Student learning performance Student satisfaction and retention Teaching excellence Explore what LA can do for our institution/ staff/ students
 An overview of: student attendance, Submission of assignments Access to coursework and resources Student performance Inform course design Manage a big class Know "why" students struggle
 Personalized approach to learning: Informed teaching support and curriculum design Assistance with educational transitions: into HEd and to employment

Adapted from (Tsai, 2017)

Stakeholders concerns

Senior managers	No one-size-fits-all solution Pressure to adopt LA Benefits for the whole institution Strictness of existing data protection regulations (GDPR)
Teaching staff	Workload Judging staff performance Not all learning is digital No one-size-fits-all solution Correlation does not suggest causation Surveillance on students
Students	Data collection is unnecessarily personal Production of stereotypes and biases Limitations in quantifying learning Worries about loosing the human contacts (automated feedback)

Ethics and privacy of LA

- One of the strategic points and challenges addressed by the SHEILA framework
- Other useful resources:

analytics.jiscinvolve.org

	Code of practice for learning analytics
LEARNING ANALYTICS EXPLAINED Niall Sclater	Code of practice for learning analytics A literature review of the ethical and legal issues
	respect in the second
R Contraction	Copyright © Inc November 2014, This work is licensed under the Creative Commons Attribution 3 o http://creative.commons.org/license4/by/5.0/

Example from the

Past

- **Problem:** students do not have a good understanding of how they are progressing in their courses
- Goal: aims to help students understand their progress early enough to be able to seek help and either increase their likely grade or withdraw from the module and take something else
- Institutional goal: aim for Purdue at an institutional level was to apply the principles of business intelligence to enhancing student success at a course level, thus contributing to overall retention and graduation rates





- Signals mines data from the SIS, the VLE and the gradebook. This is then transformed and processed to produce a 'traffic light' indicator showing how at risk each student is considered to be
- The predictive algorithm has four components:
 - Performance based on points earned on the course so far
 - Effort interaction with the VLE compared with other students
 - Prior academic history including high school GPA and standardised test scores
 - Student characteristics e.g. age or credits attempted



Student View of the Signals Dashboard





- Instructors then implement an intervention schedule they create, possibly consisting of:
 - Posting of a traffic signal indicator on a student's CMS home page
 - E-mail messages or reminders
 - Text messages
 - Referral to academic advisor or academic resource centers



Faculty View of the Signals Dashboard



(Arnold, 2010), (Arnold & Pistilli, 2012)

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Examples from the Present







https://www2.mmu.ac.uk/

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MMU Staff & Student Dashboards



- University-wide transformation program started in 2010
- Personalization: "wrapping the University around the Learner"
- Evidence-Driven Action
 - University Data Warehouse with weekly snapshots since Sept 2011:
 - Student records
 - VLE
 - Surveys
 - Attendance
 - Submissions

Adapted from (Stubbs, 2017)



⁽Stubbs, 2017)

MMU Staff & Student Dashboards



- Learner Tracker App
 - Designed with students for students



Adapted from (Stubbs, 2017)











https://www.ntu.ac.uk/

Fitting the Dashboard into the university ecosystem



⁽Foster, 2017)

NTU Student Dashboard



NTU case study key points

- Study of engagement in the progression from 1st to 2nd year
- Engagement is the most important predictor of success
- Demographic factors and entry qualifications are also important
- Students evaluations were positive and Dashboard triggered action (e.g., more study, seeking tutoring)



Quantified Student

 A Study Behavior App Goal: Create a runkeeper app for studying; Collect data from students, and feed the data back to the students with the goal to improve their study experience

www.quantifiedstudent.nl

Adapted from (van der Vorst, 2017)



Quantified Student

 Calibrating Students
 Goal: Find relations between study results and things like concentration and sleep to coach students in becoming better students.



www.quantifiedstudent.nl

Adapted from (van der Vorst, 2017)

Learning Scorecard





A research project of Learning Analytics, BI, and Gamification in use since 2016



Instituto Universitário de Lisboa

www.learningscorecard.pt (Cardoso et al. 2016, 2017, 2018)

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Learning Scorecard

- Provide HE students with an analytical environment to monitor their learning progress in a course during the semester
 - In a interactive an fun way
 - Promoting self-discipline
- Provide a *right-time* aggregated view of class performance to the course coordinator

Goal: Increase the student learning experience in a course

(Cardoso et al. 2016, 2017, 2018)





Learning Scorecard student dashboards

- Monitoring of individual learning experience and progress in a course with gamification techniques
 - XP
 - Ranks
 - Quests
 - Leaderboards
 - Trophies
 - Badges
 - Avatars
 - Guilds...

(Cardoso et al., 2018)

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Learning Scorecard student dashboards



(Cardoso et al., 2018)

Learning Scorecard Faculty Dashboard

- Information rich providing a multi-dimensional view of student learning data (Engagement, Motivation, Responsibility, Collaboration)
- Aggregated data
- Leaderboards are also used

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www.learningscorecard.pt

(Cardoso et al., 2018)

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Conclusions

Conclusions

- LA is a recent research field in a early stage of adoption by Higher Education Institutions
- LA holds an enormous potential to improve student learning experience, performance and satisfaction
- Careful address the challenges and concerns of stakeholders

Want to start a Learning Analytics project in your Institution?



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Further resources

Handbook of Learning Analytics – First edition



2017 The Handbook of Learning Analytics Editors: Charles Lang, George Siemens, Alyssa Wise, Dragan Gašević ISBN: 978-0-9952408-0-3 DOI: 10.18608/hla17

Download Book Order printed copy

https://solaresearch.org/hla-17/



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Thank you!

Elsa.cardoso@iscte-iul.pt





