Learning & Students Analytics Conference

In association with Vrije Universiteit Amsterdam / Amsterdam Center for Learning Analytics, University of Amsterdam / EduWorks

26 October 2017
Learning & Student Analytics Conference (LSAC): Implementation, Institutional Barriers and New Developments

UvA: REC-A Building, Nieuwe Achtergracht 166, 1018 WV Amsterdam

October 26, 2017

10.00-10.05  Word of welcome
10.05-11.00  Keynote prof. Dragan Gasevic
11.00-11.30  COFFEE BREAK
11.30-13.00  Research Presentations:
              Theory and Methods 1 Providing student and teacher support
              Methods and Data 1 Learning paths and student engagement
              Data and Theory 1 Representing digital learning interactions
13.00-14.00  LUNCH
14.00-15.00  Panel discussion Learning analytics policies
15.00-15.30  COFFEE BREAK
15.30-17.00  Workshop: LA policy challenges:
              Workshop 1 Changing business model of education
              Workshop 2 Presenting learning analytics to stakeholders of education
              Workshop 3 Learning analytics and organisational culture
19.30-22.30  CONFERENCE DINNER
10.00-11.00  Keynote Dragan Gasevic  Room: A1.03
11.00-11.30  Coffee Break  Location: de Balkon [the Balcony]

11.30-13.00  Research Presentations

Theory and Methods 1 Providing student and teacher support
Room: A1.03  Chair: Alan Berg

Nynke Bos, Leiden University
Using Educational Design Research to Develop Actionable Analytics to Support First Year Students

Jocelyn Manderveld, SURFnet
SURF Learning Analytics Experiment: Hands-on experience for Dutch higher education

Alan Berg, Central Services (ICTS), University of Amsterdam
Should students have a right to analytics?

Methods and Data 1  Learning paths and student engagement
Room: A2.09  Chair: Ilja Cornelisz

Joel Howell, Curtin University
Mastery vs. Avoidance? Impact of grade, sender, comparative information and message style on student affect and academic resilience

Anouk Gelan, Universiteit Hasselt, University of Amsterdam
Analyzing and visualizing learner behavior with learning analytics in language and mathematics learning contexts in the VITAL project

Ilja Cornelisz, Vrije Universiteit Amsterdam
Student Engagement with Computerized Practicing: Ability, Task Value and Difficulty Perception

Data and Theory 1  Representing digital learning interactions
Room: A2.10  Chair: Marc Esteve del Valle

Regina Motz, Universidad de la República
Detection of Interactions that Impact Learning

Dai Griffiths, University of Bolton
Development of a VLE Recipe for xAPI: process and implications

Marc Esteve del Valle, University of Groningen
Developing Learning Analytics Methods on Reddit

13.00-14.00 Lunch  Location: de Brug [the Bridge]
14.00-15.00 Panel Learning analytics policies
Room: A1.03 Chair: Hendrik Drachsler

Panelists:
Peter van Baalen, Anne Boyer, Jocelyn Manderveld

15.00-15.30 Coffee Break Location: de Balkon [the Balcony]

15.30-17.00 Workshops - LA policy challenges

Workshop 1 Changing business model of education
Room: A1.03 Moderator: Anwar Osseyran

Issue 1: Innovating the business model of data-driven higher education
Issue 2: Affordable and sustainable LA services
Issue 3: Formalised decision making in the era of data-driven education

Workshop 2 Presenting learning analytics to stakeholders of education
Room: A2.09 Moderator: Alan Berg

Issue 1: Support for LA Evangelists
Issue 2: Cooperation across competing organisations
Issue 3: Learning from LA failures

Workshop 3 Learning analytics and organisational culture
Room: A2.10 Moderator: Stefan Mol

Issue 1: Train the trainers
Issue 2: Implementation of personalized education on a larger scale
Issue 3: Privacy and ethics issues related to educational data

19.30-22.30 CONFERENCE DINNER

KIT | Meetings & Events, Restaurant De Tropen
Location: Mauritskade 63,1092 AD Amsterdam

ROUTE DESCRIPTION & PARKING RESTAURANT DE TROPEN
By car Leave the highway A10 via the exit Watergraafsmeer/ Diemen (S113) and follow the direction to Centrum/ Watergraafsmeer. This street is called ‘Middenweg’ and will change into ‘Linnaeusstraat’. KIT | Meetings & Events is located at the end of this street, at the corner with the Mauritskade.

By public transport Tram stop Alexanderplein is located in front of KIT | Meetings & Events. This tram stop can be reached as follows: From Amsterdam Central Station: tram 9; stop Alexanderplein From Amsterdam Muiderpoort Station: tram 3 or 7; stop Linnaeusstraat From Amsterdam city center: tram 10 or 14; stop Alexanderplein

Taxi rank At 100 meters of KIT | Meetings & Events is a taxi rank, which is situated at the Linnaeusstraat, in front of the Amsterdam Tropen Hotel.

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Keynote Dragan Gasevic, IECS, University of Edinburgh

The field of learning analytics is established with the promise for the education sector to embrace the use of data for decision making. There are many examples of successful use of learning analytics to enhance student experience, increase learning outcomes, and optimize learning environments. Despite much interest in learning analytics, many higher education institutions are still looking for effective ways that can enable systemic uptake. The talk will first describe some selected examples of the successful use of learning analytics in higher education. Key challenges identified to affect implementation of learning analytics will then be discussed. This will be followed with an overview of an approach to the development of institutional policy and strategy for the learning analytics implementation in higher education. The talk will be based on the findings of several international studies and will critically interrogate the role of institutional and cultural differences.

Theory and Methods 1 Providing student and teacher support

Nynke Bos, Leiden University

Using Educational Design Research to Develop Actionable Analytics to Support First Year Students

Using Educational Design Research to Develop Actionable Analytics to Support First Year Students

Nynke Bos¹, Maartje Van den Bogaard¹ & Tinne DeLaat²

¹University of Leiden,
²University of Leuven

Purpose: There is increasing attention for the challenges new students face in their first year in university (Mack, 2010). Despite much effort, some groups of students are consistently more likely to struggle to cope with the transition between secondary and higher education (Leese, 2010). Students need to acclimatize to a new environment with new expectations, new information and students need to develop skills to cope with the demands of new educational environment. The first year of college is arguably the most critical regarding the retention of students into subsequent years of study (Arnold & Pistilli, 2012). It is therefore important to guide these students successfully through their first year in university (Charleer, Moere, Klerkx, Verbert, & De Laet, 2017). In recent years, some universities started to experiment with online applications for student support based on digital footprints students leave in university digital systems (see e.g. Arnold & Pistilli, 2012; Brooks, Greer, & Gutwin, 2014). Many of these experiments focus on predicting student retention on a course level, however, the challenge remains to translate these predictions into actionable results, better understanding of the learning process in question and subsequently design of actions to improve student learning (Lodge, Alhadad, Lewis, & Gašević, 2017). A theory led design has the potential to yield innovation (Kelly, Thompson, & Yeoman, 2015), opposed to the current atheoretical approach based on the need to leverage the learning data available (Jivet, Scheffel, Drachsler, & Specht, 2017). However, a theory-led approach has the pitfall to ignore contextual factors and impair actionableresults. A research method considering these contextual factors to develop actionable research-based solutions for complex problems in educational practice is educational design research (EDR). Current research explores the added value of an EDR approach to develop learning analytics solution to support first year students into their transition into higher education.

Design: EDR is a research design appropriate to develop research-based solutions to complex problems in educational practice or to develop or validate theories about learning processes, learning environments and the like (Plomp & Nieveen, 2013). The EDR approach consists of preliminary research, such as a needs and context analysis, the development phase consisting of iterative phases aimed at improving and refining the design and the...
assessment phase to determine if the design meets the specifications. During the preliminary research phase four sub-studies were undertaken.

Two literature reviews were conducted, one regarding student transitions into higher education and one regarding the use of learning analytics to support student retention and success. A contextual sub-study consisting of interview with students and student counsellors and sub-study consisting of contextual analysis based on an institutional baseline measurement of challenges and interventions in the transition into higher education. The preliminary phase resulted in recommendations for using learning analytics to support student transitions into higher education. One of the main challenges identified for students in their first year, is their lack of reflection on academic grades, and planning after students receive these grades the end of an examination period.

The developmental phase consisted of iterative cycles of designing and using the intervention. The objective of the intervention is to inform and support users with issues that were identified in the preliminary research by means of data analysis techniques to leverage human judgments (Siemens & Baker, 2012). During this cycle, short pilots were evaluated with the student counsellors (observations and surveys) and the students (survey). The iterations and the results of this phase have been extensively covered by Charleer et al. (2017).

The third phase of the EDR consist of reflection to produce ‘design principles’ and enhance solution implementation. One of the main conclusions of this cycle is that student reflection is not triggered by means of the dashboard itself; analytics becomes actionable when students are offered explicit guidance for awareness purposes and reflections processes to occur (see also Jivet et al., 2017; Charleer et al., 2017). In this case, the student counsellors offered this explicit guidance.

Results: Current research explored the added value of an EDR as a method to develop a learning analytics solution to support first year students with their transition into higher education. It described the iterative process of designing research-based solutions. This resulted in a dashboard to facilitate communication between student counsellors and students by visualising grade data that is commonly available in any institution (Charleer et al., 2017). Using EDR as a method for designing learning analytics solutions enables researchers to gain fundamental understanding of the underlying processes, goals, context, and even constraints in implementing analytics interventions. Current research shows three distinct processes which will benefit learning analytics. First, the focus on real contexts which is different for experiments. For example, within an EDR approach confounding variables are not controlled for, but are essential for the information they provide ensuring the scalability across contexts and domains. Second, EDR does not simply connect theory and research, but uses theories to build their own theoretical framework for the study (Jen, Moon, & Samarapungavan, 2015). Third, the collaboration between researchers and end-users will assure the uptake of the innovation. In the current research the dashboard will be available institutionalwide.

Implications: This research stresses the importance of contextual conditions when designing analytics solution. The recent drive towards theory led learning analytics intervention promote the use of data to assess the effectiveness of educational practices and resources (see e.g. Jivet et al., 2017; Wise & Shaffer, 2015). Critics of these trends argue that education is highly context-specific and practitioner-dependent (McKenney, & Mor, 2015). Current research shows that both are equally important to design actionable analytics, not only the theory determines the intervention, but absolutely key was the importance of contextualising the learning, teaching and counselling in the selected area. This contextualisation assured uptake within the organisation and moreover, an institutional wide adaption of the dashboard.

Acknowledgments: The research leading to these results has received funding from the European Community’s Erasmus+ programme, Key Action 2 Strategic Partnerships, of the European Union under grant agreement 2015-1-UK01-KA203-013767 ABLE project.

Resources:
LSAC2017


Jocelyn Manderveld, SURFnet

SURF Learning Analytics Experiment: Hands-on experience for Dutch higher education

Jocelyn Manderveld and Herman van Dompseler,
SURFnet

Keywords: Hands-on experiment online student activities xAPI learning record store visualization

Abstract: In 2016 SURFnet started the Learning Analytics Experiment for Dutch institutes for higher education to gain hands-on experience with learning analytics. With this experiment, SURFnet demonstrates the possibilities of learning analytics in education. By carrying out this experiment, educational institutions can answer the following questions: Is learning analytics really so complicated? How does learning analytics fit into an educational infrastructure? How do you collect data? How do you visualise data? In this paper we present the set-up of the Learning Analytics Experiment, the learning analytics architecture and infrastructure used and the institutes who participate in the experiment as well as the first results of the experiment.

Alan Berg , Central Services (ICTS), University of Amsterdam

Should students have a right to analytics?

Should students have a right to analytics?
Alan Berg, Sjoukje Kerman
Central Services (ICTS), University of Amsterdam

Purpose: The purpose of the presentation is to move away from a focus on barriers to deploying Learning to the benefit of services for students and teachers and their rights around the quality of analytical support. Learning
Analytics (LA) is a new field of study, only starting to exist as a unique study since around the early to mid 2010’s (Siemens, 2013). The evidence to the effectiveness of LA from the field is inconsistent (Ferguson & Clow, 2017). In addition, full blooded deployments involve technical conversations around the plumbing, anonymizing and synthesizing of data (Khalil & Ebner, 2016; Berg, Mol, Kismihok & Sclater, 2016) as well as far more importantly teaching approaches (Mor & Wasson, 2015). In this presentation, the authors will describe the barriers to delivering a University wide, consistent and layered system for the aggressive and incrementally improving deployment of Learning Analytics. We will not dwell on the well-known conversations around ethics and privacy (Drachsler & Greller, 2016) or standardization of evaluations of tools (Scheffel et al, 2014) or the details of specific projects (Brouwer et al, 2016). However, we will seek flip the presentation and generate a debate with the audience discussing the following question: "Should students have a right to analytics?".

Design: The UvAInform program at the University of Amsterdam consisted of 7 pilots with a number using common and architecture known as a Learning Record Store based on the xAPI standard for capturing online student activity streams (Berg et al, 2016), which is an approach JISC currently apply as part of a National Infrastructure for LA by (Sclater, Berg & Webb, 2015). Although individual pilots within the program were successful from a research and experience building perspective the UvAInform program did not motivate further investment in a scaled-up program for University wide services.

Results: The UvAInform program confirmed that it is difficult for the University of Amsterdam to make top down in combination with bottom up decisions on the deployment of highly technical, difficult to describe yet potentially paradigm changing data driven methodologies.
We intend the presentation to generate a further conversation within the communities attending.

Implications: A project is in progress to discuss and inform and listen to decision makers and provide training on the core themes of Learning Analytics. Through this approach we hope to successfully navigate and negotiate and report back on the correct vector for the introduction of new approaches to supporting the University holistically.

Acknowledgments: The authors wish to acknowledge the tireless hard work of those who had labored within the UvAInform project at the University of Amsterdam.

Resources:
**Methods and Data 1 Learning paths and student engagement**

**Joel Howell, Curtin University**

Mastery vs. Avoidance? Impact of grade, sender, comparative information and message style on student affect and academic resilience

Mastery vs. Avoidance? Impact of grade, sender, comparative information and message style on student affect and academic resilience

*Joel A. Howell, Lynne D. Roberts, & Vincent O. Mancini* Curtin University, School of Psychology and Speech Pathology

**Purpose:** Learning analytics enable automated feedback to students through alerts. However, there is an underlying assumption that simply providing analytics to the student will be sufficient to improve use and self-regulated learning. To date, research exploring student reactions to learning analytics feedback has been limited and largely theoretical. Working within a framework of supporting learner’s agentic engagement with feedback (Winstone, Nash, Parker & Rowntree, 2016) the aim of the present research is to explore student reactions to possible learning analytics messages (alerts).

**Design:** The present research uses a between-within subjects experimental design. We examined whether varying feedback on alerts for hypothetical assessments based on grade (High Distinction, Pass, and Fail), sender (course coordinator versus automated message), provision of comparative peer achievement, and message style (supportive versus factual) resulted in differences in student affect and academic resilience.

**Results:** Three hundred and twenty undergraduate students (*Mage* = 22.36 years, *SD* = 6.55 years; 72 males, 245 females, 3 alternative genders) completed an online survey with random allocation to experimental conditions. Multivariate analyses of variance indicated significant differences in affect and academic resilience between grade levels (large effects). Within Pass and Fail grade levels, but not within High Distinction grade level, some smaller effects were observed for comparative peer achievement, message style, and sender.

**Implications:** The present research has implications for how feedback through learning analytic alerts can best be constructed within each grade level to enhance learner affect and experiences. However, it appears that the key factor as to how students will respond to learning analytics feedback is less about the specific construction of the message than the grade received.

**Acknowledgments:** The present project was funded by a Curtin Innovation grant

**Resources:**


Purpose: The field of Learning Analytics (LA) opens new possibilities for researching how students learn online, based on the systematic collection and analysis of data about their learning interactions with a variety of online learning environments. The Erasmus+ VITAL project (Visualisation Tools and Analytics to monitor Online Language Learning & Teaching, 2015-2017) aimed to explore these possibilities by implementing LA in 4 different blended or distance learning contexts in 3 European universities. A multidisciplinary team was put together using statistical and process mining techniques to identify learning patterns and learner profiles, to investigate how LA can contribute to better learning design and to analyze whether indicators of success or failure could be discovered. By presenting the results to the students and instructors in the form of learning dashboards visualizing progress and performance, the project aimed to explore how to support students in their autonomous learning process and stimulate their self-reflection and how to allow instructors to monitor their students' progress and struggles so as to adapt their teaching accordingly.

Design: In a first phase a context-specific tracking design was created. Indeed, to deliver useful feedback to students, instructors but also course designers, it is crucial that the implementation of LA is rooted in the pedagogical design of the learning context under analysis. To transcend the local learning contexts of the project a LA design was implemented based on the e-learning specification ‘Experience API’ (xAPI). This technical specification allows applications to dynamically track, store and share data about learners in their context building on a standardized tracking vocabulary and APIs for learning applications and reporting tools to communicate and exchange data. An open xAPI model describing common tracking vocabularies can allow to capture, analyze and share standardised datasets and answer various online learning research questions. After implementing xAPI tracking in the universities' in-house language or maths learning environments (UHasselt, UvA) or LMS (UCLan), a pilot phase allowed the data analysis team to select and test existing process mining algorithms on different test datasets. The data were collected in the project's central Learning Record Store, more specifically the open source Learning Locker by partner HT2Labs. The pilot phase allowed us to refine the data collection process before collecting, during the main data analysis phase, 4 datasets of 285 UHasselt students, 224 UvA students + 254 UCLan students of semester 1 of 2016-2017.

Results: A descriptive and exploratory research design allowed the different university teams to validate course design hypotheses based on the observed uses of online contents and functionalities. Process mining discovery was used to identify most frequent learning paths throughout the learning environment and a cluster analysis was carried out to profile the learners based on their online behavior. Based on the research findings, learning dashboards for students and instructors were developed using open source D3.js. For an optimal pedagogical interpretation of the dashboards, local course, student and contents metadata were linked to the xAPI performance data. After the courses were finished, the learning analytics data collected during courses were visualized on the dashboards. The experiences with these dashboards were evaluated in the 3 universities by students providing them only own data on the personal dashboard and by the instructors providing them only own students' data on the course dashboard.

Implications: The standardized xAPI data format allowed us to build common progress and performance visualization tools while considering the specific learning contexts by selecting the pedagogical indicators considered most relevant for each use case. The LA dashboard design was developed such as to generate future data live from the Learning Record Store, to present these to new student cohorts and to further refine research findings. The xAPI tracking recipes, used open technologies, process mining algorithms, reports, dashboard tools code, dashboard tool user guidelines and recommendations used in the project will be put at free disposal under open licenses.
Acknowledgements: The VITAL project has been funded with support from the European Commission (Project number: 2015-BE02-KA203-012317). The information in this research reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Resources:

Ilja Cornelisz, Vrije Universiteit Amsterdam
Student Engagement with Computerized Practicing: Ability, Task Value and Difficulty Perception

Ilja Cornelisz & Chris van Klaveren
Amsterdam Center for Learning Analytics, Faculty of Behavioural and Movement Sciences, Vrije Universiteit, Amsterdam

Purpose: “When digital tools support students’ engagement with challenging material, thus extending learning time and practice, or help students to assume control over the learning situation, by individualizing the pace with which new material is introduced or by providing immediate feedback, students probably learn more. (OECD, p. 166)” In this study, we aim to find an answer to how task perceptions regarding low-stakes computerized
practicing relate to observed patterns of student engagement and performance for students of different ability. Furthermore, we evaluate the impact of personalization on task perceptions and how differences in perceptions and effort evolve over time. Both aspects (i.e. interlinkages between task perceptions and learner readiness and effects of personalization across a heterogeneous group of learners) are currently unresolved issues in the empirical literature (Tomlinson, 2003). To our knowledge, this study is the first to evaluate the relationships between the effort exerted in computerized practicing, student ability and perceptions related to task value and task difficulty constructs.

**Design:** This research focuses on 455 secondary school students collected throughout the school year 2014-2015. During this period, the academic performance and computerized practicing intensity of students was monitored for 4 different subjects (Dutch, Biology, Economics and History). Afterwards, students were asked about their experiences with computerized practicing, making it possible to link observed differences in practice intensity and student ability to questionnaire items related to constructs of task difficulty and task value. Both a personalized and non-personalized version of computerized practicing are evaluated in this study and students were randomly assigned to both practicing treatments within classes. When students practice with the personalized practicing program relative practicing performance, knowledge type, difficulty level, and mastery learning are taken into account. When the practicing process is not personalized, a predetermined sequence of exercises is offered, which, at least in theory, is representative for the upcoming summative test.

**Results & Implications:** The results for perceived task interest and usefulness point out that both have the potential to promote student engagement, albeit in different ways and only when students work in a personalized practicing environment. Whether the task is perceived as interesting is related to a higher propensity to practice when a student is assigned to the personalized condition, but conditional on this result, no differences in practice intensity are observed. When the task is considered to be useful, the potential to improve student engagement in the personalized condition is not driven by a higher likelihood to practice in a given session, but if students take up this opportunity, they will do so for a longer period of time.

In evaluating the implications of interest and perceived usefulness, only usefulness corresponds to higher levels of practice intensity and only for students assigned to the personalized condition. Again, none of these differences are mirrored by differential patterns in performance on summative tests. Exploring how practice intensity evolved over time furthermore reveals that students first need to gain experience with the task, before differences in perceived attitudes emerge and can be correlated to corresponding differences in practice intensity. When disaggregated by ability, results regarding task perceptions are markedly different for the two versions of computerized practicing. In the non-personalized condition, students with relatively lower pre-scores value practicing as useful and as too difficult, while in the personalized condition students with relatively higher pre-scores value this process as useful. One plausible interpretation for this result is that students of relatively lower ability consider practicing useful if it closely resembles the summative test for which they are preparing, whereas higher ability students attribute more usefulness value when practicing is relatively challenging and more directly addressing their personal learning needs.

**Future Research:** For future research, it is furthermore important to acknowledge that one explanation for the suboptimal results of current computerized personalized practicing tools may well be that adaptive processes are generally offered in a one-size-fits-all approach, as was the case in this study. The results presented in this paper with respect to ability suggest that students would assign more task value to computerized practicing if the process would properly take into account the heterogeneity of the student population. It can be argued that there are infinite ways to personalize the learning process and optimal adaptation of the content offered to a heterogeneous group of learners cannot be realized using only a single algorithm. Optimally, a system continuously evaluates for each student the algorithm which best accommodates the individual learning needs and preferences. As a result, it may well be that multiple algorithms are to be developed and implemented in order to continuously adapt the practicing process to individual needs.
**Data and Theory 1** Representing digital learning interactions

Regina Motz, Universidad de la República

Detection of Interactions that Impact Learning

*Detection of Interactions that Impact Learning* Regina Motz¹, Ofelia Cervantes², Blanca Viera³

¹Universidad de la República, Uruguay ²Universidad de las Américas Puebla, México ³Administración Nacional de Educación Pública/CERP del Suroeste, Uruguay

**Purpose:** The Ceibal Plan is a socio-educational project of Uruguay, created by decree of April 18, 2007, “to carry out studies, assessments, and actions necessary to provide a laptop to each school-age child and to each public school teacher, as well as to train teachers in the use of this tool, and to promote the elaboration of educational proposals in line with them” [1]. The Ceibal Plan (the One Child Laptop program implemented in Uruguay) seeks to promote digital inclusion to reduce the digital gap, both in relation to other countries and among the citizens of Uruguay. Moreover, it provides educational support services, using information technologies, to all students in public education at the primary and secondary level in Uruguay. It emphasizes the use of two platforms: CREA 2 (Learning Management System offered by Schoology) and PAM (Adaptive Platform for Mathematics offered by Bettermarks). CREA 2 reporting in May 2015 a daily activity of 85,000 users per hour and PAM a daily activity of 95,000 active users per day in 2014. Despite these numbers, the report entitled "Deepening the effects of Ceibal Plan" [2], conducted by professionals of the Institute of Economics from Universidad de la República and funded by the plan itself and the National Public Education Administration (ANEP), states that the distribution of laptops has not generated an improvement in the academic performance of students. This report also points out that it is considered "primordial" the "develop strategies aimed at promote teacher empowerment and the creation of collective capacities to focus on teaching and learning through access and innovative use of technology."

Teachers with initiative and concerned about the improvement in the academic performance of their students have explored the use of formal social networks existing in online communities (such as CREA and PAM) and informal social networks (such as Facebook), as spaces to stimulate the search and construction of knowledge through interaction between students, as well as between students and the teacher.

We work in a project that aims to the development of a software platform that allows teachers to visualize patterns of interaction and relate them to learning levels in a student-centered way regardless of the spaces (Facebook, CREA, PAM) where the data is generated. Patterns of these interactions are critical information that supports teachers in making strategic decisions for improving the academic performance of students. However, we found that primary and secondary level teachers are not yet in a good relation with learning analytics technologies. In our presentation, we will show the method used to attract teachers towards the use of software for learning analytics.

Our proposal is to present the progress of the project we are conducting as an interdisciplinary work among computer scientists, educators and psychologists to develop a tool that assists teachers to discover interactions that occur in social networks and analyze how they impact on learning [3]. The approach builds an integrated profile of the student, incorporating their demographic, educational and social characteristics. Applying information retrieval techniques, we capture student’s facets from institutional and non-institutional social networks. The data is provided both from their activity in the Learning Management Systems (CREA2 and PAM)) as well as in from informal social networks such as Facebook, Google+ or Twitter. These non-institutional social networks (self-regulated social network spaces) are relevant spaces because their students behave in a different way than in the LMS, among their colleagues. The types of interactions analyzed are student-material, student-students and student-teachers. We apply traditional learning social analytics models increasing with approaches that contemplate the semantic nature of interactions to capture interactions quality, these may range from positive to a negative interaction.

A pilot study is conducted to validate the benefits of using the platform to support the teacher in detecting cases requiring specialized care, such as isolation (possible depression), bullying, strategic communication agents, etc. The pilot scenario is within the framework of teacher training groups. This allows us to work with students of legal age and who are also proactive in the use of technology, which mitigates the risk of not having enough
interactions in the platforms to study. On the other hand, it is one of the possible ways produce changes as they are generated from the new generations of teachers. Further, we propose a rush formation plan for all teachers not familiar enough with learning analytics technologies.

We seek to provide the teacher with timely access to relevant information in their students learning process to assist them in designing inclusive education strategies. For this, it is important to give teachers a work environment with data that allows them to take a proactive nature, and that offers relevant contents according to the observed activity and individual interests specified through student profiles. In this sense, the data to be analyzed is not only quantitative but rather qualitative in nature.

Data provided by Ceibal Plan on the use of institutional resources by students, and incremented by our project, included, but are not limited to:

- Frequency of connectivity, time and place from which students are connected,
- Type of resources and frequency of use thereof, for each student,
- Frequency of access and use of social networks, and quality positive or negative in their interactions.
- Performance in school activities.
- Timely attendance to face-to-face classes
- Attitude in face-to-face classes

We present the analysis of social networks and from data generated in face-to-face class focused on each student to enrich his/her profile and identify patterns of interactions that impact on learning. Moreover, the student-centered approach identifies colleagues who support that student's learning. This method has also the potential to help identify groups within the network, which can support learning processes, such as communities and affinity groups.

Resources:

Dai Griffiths, University of Bolton
Development of a VLE Recipe for xAPI: process and implications

Development of a VLE Recipe for xAPI: process and implications

Dai Griffiths1, David Sherlock2, Alan Paull2
1University of Bolton, Associate Member of Cetis LLP 2Cetis LLP

Purpose: The Jisc Effective Learning Analytics Initiative is “working in collaboration to build a learning analytics service for the sector”, with “over 50 universities and colleges signed up to the initial phases of the implementation” (Jisc, 2017). Cetis LLP was awarded a contract by Jisc to support the development of xAPI recipes for the Initiative. This paper describes the work carried out and its implications.

Design: Data inputs to the Effective Learning Analytics system comes from two sources. Firstly, data is gathered from institutional systems, which maintain records of students’ identity, courses, assessment results, etc. The requirements of the UK Higher Education Statistics Agency (HESA, n.d.) provide some coherence, but there remain inconsistencies which are barriers to a sector wide analytics service. Consequently, Cetis LLP were asked to work on a Universal Data Definition (UDD). Readers interested in this work can consult the Jisc Learning Analytics Unified Data Definitions, currently in version 1.3 (see ‘Resources’ below).

Secondly, data is gathered from the interactions between learners and institutional systems, particularly Moodle and Blackboard, and xAPI is used to ensure that this data can be consumed reliably by the analytics systems. To this end, Cetis LLP has worked with Jisc to define a set of xAPI recipes, which is now available in version 1.0 (see
Results: Release 1.0 of the VLE recipe, August 2017, consists of a set of platform-independent statement templates that send data to the Jisc Learning Record Warehouse. Full statement examples are included, and the data needed to create the statement is identified. The statement templates are:

- Logged in
- Logged out
- VLE resource viewed
- Assignment graded
- Assignment submitted

‘Forum contribution’ and ‘Library loan’ are scheduled for 1.1. Examples for Blackboard and Moodle are provided. As far as possible all entities are the same across statements. To this end, a common vocabulary was developed, with IRIs and definitions for verbs, activity types, etc, as well as for extensions used in the recipes. A set of common structures represents actors, verbs, objects, contexts and results. Work has also started on recipes for ‘Attendance’ and ‘Mobile App Usage’, with a single statement provided in each recipe.

Implications: When the team has been asked to provide an xAPI statement for a particular purpose, the specification has proved sufficiently powerful and flexible, with clear guidance on how to construct an appropriate statement. We have seen no technical problems to cause us to doubt Ben Betts of HT2 Labs, who asserted that “the adoption rate of xAPI is probably unprecedented in our industry” (Betts, 2017). We also note the excellent work underway in developing the necessary infrastructure, for example the Apereo Learning Analytics Initiative (see resources). Our uncertainties, however, have emerged from engaging with vendors, institutions, and analysts, who have a wide range of priorities and perspectives. It is relatively easy for vendors to generate the xAPI compliant JSON from their applications, and many have done so, but it is more complex to work with stakeholders to establish what this data represents, and how it should be processed. Indeed, the relatively small number of recipes which we have developed in v1.0 hides the richness of the conversations informing the design, as shown by the fact that in the first 12 months of the project the Cetis LLP team resolved 96 issues and made 302 commits on GitHub related to the xAPI work.

We have developed a recipe for use with VLEs, i.e. “a way of expressing how a common type of learning activity could be syntactically represented” (ADL 2016, p.19). We have also provided a vocabulary, which has been the focus for much of the discussion with institutions and vendors. ADL (2016, p.19) associates vocabularies with profiles, rather than recipes, and our experience suggests that the development of effective, shareable vocabularies and profiles will be critical to the further adoption of xAPI. There are, as yet, few profiles and vocabularies available as examples. Moreover, the development of profiles is complex. Firstly, the flexibility of xAPI leads to a temptation to create new statements for every stakeholder request, and to stretch the specification to facilitate analysis. Secondly, Jisc have shown exemplary commitment to working with the community of adopters. Nevertheless, in any product development process, there is limited time to discuss each profile decision with unlimited stakeholders. There is no established method for reconciling the needs of stakeholders. We invented the process as we went along, starting in Google Docs, and then moving to GitHub, and felt the need for guidelines. Some of our stakeholders requested queries for the high-level concept ‘intervene’; others wanted to distinguish between interventions (e.g. automated interventions, email interventions, and face-to-face interventions), and when a student was passive recipient of an activity. In practice, we might expect that many stakeholders would like to query at both levels, requiring nesting. The specification is clear that “A SubStatement MUST NOT contain a SubStatement of its own, i.e., cannot be nested” (ADL, 2012). It is possible to add information to the context property, “such as the instructor for an experience, if this experience happened as part of a team-based Activity, or how an experience fits into some broader activity.” (ADL, 2012). However, this approach would lead to the development of ad hoc ontologies of activities for each profile, which would be hard to inspect or share. ADL recognised this problem in the Companion Specification for xAPI Vocabularies (see resources), recommending a Linked Data representation of the relationship between vocabulary items. At the end of 2016 Cetis LLP recommended this approach for future Jisc work. Many details about how to approach this remained, however, unclear. Since then, ADL and DISC have created a profiles specification to “improve practices for creating Profiles”, making use of Linked Data (ADL, 2017). Our experience indicates that this is a necessary step with the potential to greatly increase adoption of xAPI.

Acknowledgments: The work described in this paper was funded by Jisc. We would also like to acknowledge the support and contributions of the Jisc team throughout the project.
Purpose: This presentation introduces the ‘learning in the wild’ coding schema, an approach developed for learning analytics research and scholars interested in better understanding the different types of discourse, exploratory talk, and conversational dialogue happening on social media. It considers how learner-participants (‘Redditors’) are leveraging subreddit communities to facilitate self-directed informal learning practices on the Reddit social networking site. Reddit is an online news sharing site that is commonly referred to as ‘the front page of the Internet’ for the way it presents headlines and how crowd-based online voting raises the profile of news or other information to a front page equivalent. Reddit has become increasingly popular since its launch in 2005, and now maintains a relative stronghold as the go-to, self-organized community site for people interested in current affairs, social commentary and Internet subcultures. The presentation reports on the development of a coding schema for content analysis of informal learning on social media derived by examining the kinds of learning happening on Reddit, and shares results on the kinds and distribution of learning practices found in four ‘Ask’ subreddit communities (‘AskHistorians’, ‘Ask_Politics’, ‘askscience’, ‘AskAcademia’). The research brings attention to the new types of collaborative knowledge, ideas and resources being shared and supported outside the confines of traditional education and professional environments.
**Design:** In developing our coding schema, we followed on Ferguson and Buckingham Shum in their work of identifying elements of *exploratory dialogue* in a manner suitable for machine learning [1, 2]. Like Ferguson and her colleagues, we build on Mercer’s exploratory talk because it represents the kind of constructive, collaborative interaction that reflects adult, interactive learning and is likely to advance both individual and group knowledge [2, 4, 7]. A focus on exploratory learner dialogue fits well with Reddit because the platform maintains a user-generated participatory online culture through its informal, openly accessible, group-based subreddit communities [8].

The process of developing the coding schema comprised three stages, with Ferguson et al.’s (2013) cue phrase framework comprising seven of the nine categories in Version 1. We used DiscoverText, a cloud-based text-analysis software program [9] that allowed assigning multiple coders to the same dataset. The first cycle of coding was undertaken on a dataset of 1% of 2015 subreddit posts (excluding parent submissions) from each of ‘Ask_Politics’ (n=189), ‘AskAcademia’ (n=197) and ‘askscience’ (n=163). Each sample was coded by three coders. Krippendorf’s alpha statistics on intercoder reliability showed a relatively low agreement among coders (‘Ask_Politics’ 0.16, ‘AskAcademia’ 0.2 and ‘askscience’ 0.22). Through a process of iterative refinement, stages 2 and 3 focused on resolving inconsistencies and improving the coding schema.

Version 3 (our final version) of our coding schema is a significant departure from Ferguson et al. (see Table 1). In this third cycle of refinement, we simplified the categories to facilitate coders’ use of the codes, standardize multi-coder agreement, and address more specifically the types of exploratory learning dialogue that we were observing on Reddit. Version 3 captures two trends observed in reading Reddit comments: the positive expressions and supportive dialogue and information provision that pull participants toward each other and foster topic-specific discussions, and the more negative exchanges that monitor and sanction behaviour, silence participants, and can stifle online learner dialogue.

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
<th>Linguistic Dialogue Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explanation with Disagreement</td>
<td>Expresses a NEGATIVE take on the content of the previous comment by adding new ideas or facts to discussion thread.</td>
<td>‘But’, ‘I disagree’, ‘not sure’, ‘not exactly’ with explanation/ judgment/ reasoning/ etc.</td>
</tr>
<tr>
<td>2. Explanation with Agreement</td>
<td>Expresses a POSITIVE take on the content of the previous posts by adding new ideas or facts to discussion thread.</td>
<td>‘Indeed’, ‘also’, ‘I agree’, with explanation/ judgment/ reasoning/ etc.</td>
</tr>
<tr>
<td>3. Explanation with Neutral Presentation</td>
<td>Expresses a NEUTRAL explanation/judgment/reasoning/etc. with neither negative nor positive reference to the content of the previous comments, nor necessarily any reference to previous comments.</td>
<td>Comments with non-judgmental language. Advice, brainstorming and first hand experiences are framed neutrally. ‘I can understand’, ‘interesting’, ‘depends on...’ or statement responses.</td>
</tr>
<tr>
<td>4. Socializing with Negative Intent</td>
<td>Socializing that expresses negative affect through tone, words, insults, expletives intended as abusive.</td>
<td>‘no’, ‘you’re an idiot’, ‘this has been explained multiple times’</td>
</tr>
<tr>
<td>5. Socializing with Positive Intent</td>
<td>Socializing that expresses positive affect tone, words, praise, humor, irony intended in a positive way.</td>
<td>‘thanks’, ‘great feedback’, ‘you’re correct’</td>
</tr>
<tr>
<td>6. Information Seeking</td>
<td>Comments asking questions or soliciting opinions, resources, etc. (‘Does anyone know ...?’ ‘How does this work?’). This does not include questions answered rhetorically within the comment, e.g., if a question is asked and answered.</td>
<td>‘First you have to think what happens if ...?’ and then you can see what happens’, ‘does anyone know’, ‘can anyone explain’</td>
</tr>
<tr>
<td>7. Providing Resources</td>
<td>Comments that include direct reference to a URL, book, article, etc.; comments that call upon a well-known theory or the name of a well-known figure.</td>
<td>Link to resource copied (book, URL, article, audio/video file). Referencing theory/theorists, scholar or public work (Einstein, Newton, Freud).</td>
</tr>
</tbody>
</table>
Subreddit Rules and Norms

Comments on topics such as what is the appropriate sub-reddit for a particular discussion, what language is appropriate to use, how to back up claims by using resources, etc.

‘See/don’t forget subreddit link’, ‘this post doesn’t belong here’, upvote/downvote mentions, acknowledging OP redditors, and bots.

Results: We will show the utility of our coding schema when studying unstructured, informal learning processes through analysis of four ‘Ask’ subreddit communities. Results of our coding test for Version 3 showed a more acceptable level of agreement (Krippendorf’s alpha) between coders: ‘Ask_Politics’ 0.52, ‘AskAcademia’ 0.64 and ‘askscience’ 0.67. In preparation for our validation processes, we also tested the final version of the coding schema with ‘AskHistorians’ 2015 subreddit sample (n=267) and recorded an alpha of 0.57. While these values are considered of moderate agreement, they are much stronger than in Version 1 of our coding schema (see Design). Three independent coders were then used to test the validity of the schema on a larger, more recent dataset (2016 ‘AskHistorians’ sample) and recorded an alpha of 0.76 (79% intercoder agreement). We regard this alpha level to be acceptable, when considering that we allowed multiple codes (maximum 3) per comment. For exploratory studies like ours, alpha levels between 0.67 and 0.80 are considered reliable enough to draw out and develop cautionary

Conclusions [2, 5, 6].

The results also show that our coding schema can capture subtle nuances in the way people converse across different subreddits (see Table 2). Distribution results from ‘AskHistorians’ and ‘askscience’ show that online conversations and social learning processes connect people, Q&A transactional dialogue and external resources. In both cases, we found subreddit community norms to promote civility, collaboration and participatory dialogue, which help encourage self-directed learning practices. The ‘ask_Politics’ distribution results conversely shows a greater proportion of comments with negative socializing, disagreement and debate which may influence processes of learning (and even unlearning). In contrast to these subject-led subreddits, the professionally-focused ‘AskAcademia’ subreddit highlights a new range of self-directed learner practices that do not necessarily have a curricula/subject counterpart. Comments in this subreddit were found to be more neutral, supportive, reflective and socially positive; appealing to budding academics by focusing on personal needs.

Table 2. Coding Results*

<table>
<thead>
<tr>
<th>Year</th>
<th>ask_Politics</th>
<th>askAcademia</th>
<th>askscience</th>
<th>askHistorian</th>
<th>askHistorian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>190</td>
<td>198</td>
<td>164</td>
<td>267</td>
<td>1,227</td>
</tr>
<tr>
<td>1.Explanation with Disagreement</td>
<td>91 (48%)</td>
<td>21 (11%)</td>
<td>16 (10%)</td>
<td>34 (13%)</td>
<td>71 (6%)</td>
</tr>
<tr>
<td>2.Explanation with Agreement</td>
<td>11 (6%)</td>
<td>20 (10%)</td>
<td>10 (6%)</td>
<td>4 (1%)</td>
<td>45 (4%)</td>
</tr>
<tr>
<td>3.Explanation with Neutral Presentation</td>
<td>45 (24%)</td>
<td>102 (52%)</td>
<td>100 (61%)</td>
<td>67 (25%)</td>
<td>592 (48%)</td>
</tr>
<tr>
<td>4.Socializing with Negative Intent</td>
<td>37 (19%)</td>
<td>5 (3%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>4 (0%)</td>
</tr>
<tr>
<td>5.Socializing with Positive Intent</td>
<td>2 (1%)</td>
<td>44 (22%)</td>
<td>19 (12%)</td>
<td>31 (12%)</td>
<td>204 (17%)</td>
</tr>
<tr>
<td>6.Information Seeking</td>
<td>22 (12%)</td>
<td>13 (7%)</td>
<td>23 (14%)</td>
<td>29 (11%)</td>
<td>274 (22%)</td>
</tr>
<tr>
<td>7.Providing Resources</td>
<td>20 (11%)</td>
<td>13 (7%)</td>
<td>33 (20%)</td>
<td>64 (24%)</td>
<td>260 (21%)</td>
</tr>
<tr>
<td>8.Subreddit Rules and Norms</td>
<td>3 (2%)</td>
<td>6 (3%)</td>
<td>2 (1%)</td>
<td>0 (0%)</td>
<td>66 (5%)</td>
</tr>
</tbody>
</table>

*Note: For the 2015 ‘training’ datasets, the counts represent an agreement between two or more independent coders. Comments where two or more coders did not agree were not counted or included. For the 2016 validation dataset, the counts represent an agreement between two or more independent coders. Percentages may be higher than 100% when coders have assigned multiple (maximum three) codes per comment.
Implications: The research reasserts the potential of social media sites such as Reddit to support self-motivated learners and sustain communities of practice. In doing so, we highlight different spheres of knowledge, informal learning practices and exploratory dialogue that occur in online settings, outside of traditional classroom environments [3]. We intend to expand this research agenda, first with a larger sample of subreddits, and then across other social media platforms (e.g. Twitter, Facebook, LinkedIn). By detailing our process of coding schema refinement, we invite other scholars to apply the coding schema to their research on informal learning in open, online environments. Upon further validation, we intend to integrate automatic machine learning to our research with the goal of improving models for learning analytics.

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Resources:

**Workshop 1 Changing business model of education**

**Theme 1: Changing business model of education**

The ongoing rise of higher education (HE) costs and related tuitions, growing dissatisfaction of students about their ROI, and the increasing pressure on institutions and governments to reform higher education systems have undermined traditional HE business models. In fact, one may question whether there is a common understanding of HE business models among the various stakeholders of HE such as students, tutors, staff, faculty, boards of management and trustees. Analysing and more importantly modernizing the business model is a major challenge for the HE sector. How to evolve from traditional HE systems with formalized decision making and separated governance towards a more networked data-savvy organization while at the same time improving the outcome? To what extent are these developments confined to HE or do they also have important implications for other sectors in education?

**Issue 1: Innovating the business model of data-driven higher education**

The existing business models in HE reward spending rather than cost-efficiency because of the significant complexity of cost analysis and uncertainty of potential benefits of cost-cuttings. The philosophy here is that in order to make effective changes, we need to understand how the different activities drive spending and revenues and how they influence learning goals. The approach requires transparency and inter-institutional collaboration to aggregate activity-based cost and results data which reveal competition- and reputation-sensitive patterns. The patterns need to be managed in order to embrace the sector-wide collaboration required for the development of constantly evolving business models.
Issue 2: Affordable and sustainable LA services
Gartner (2016) reports that despite all these benefits and the potential to provide answers to key challenges in education, only a small number of HE institutions engage in institutionally scoped LA. The same study also reveals that LA has nontrivial positive effects on student outcomes, that have the potential to avoid further financial losses of the sector. However, HE organisations still concentrate on institutional (administrational) analytics, rather than focussing on learning and education. This is surprising in light of the fact that besides privacy issues “Affordability is the biggest barrier to implementing learning analytics. However, the costs of losing/replacing students, as well as the costs of declining government support due to unmet goals, vastly exceed any investment made in learning analytics solutions.” (Gartner report, p.1)

Issue 3: Formalised decision making in the era of data-driven education
LA dashboards are more and more common in teaching and learning and help the work of teachers and students. Dashboards using data from student administrative systems and other financial and administrative (e.g. HR, logistics) systems have been widely used in educational institutions to make decisions. However, success in learning is one of the key output of education, and this type of data and analytics should be represented also in managerial decision support.

Workshop 2 Presenting learning analytics to stakeholders of education
Isn’t it safer to do nothing? How do we present Learning Analytics to stakeholders to optimise the chances of safely navigating this difficult to understand technology-driven paradigm shift when such processes require significant cognitive and financial investments?
Big Business is thriving on Big data. New opportunities are arising; data scientists are as rare as unicorns, and with every opportunity, there are risks such as increasing specific occupational gender imbalances, the desolation of traditional jobs and the replacement of human judgement by AI with their hidden and hard to explain biases. One can make the argument that the educational sector is not adapting fast enough to incorporate the dominance of data and embrace a data-driven mentality as expressed through Academic and Learning Analytics.

Issue 1: The lack of support for Evangelists
There are many LA deployment models, either driven by top-down leadership or bottom-up or a combination. Each model requires a significant degree of evangelism as there is on average a great distance between our, Higher Ed’s current status and that of the degree of adoption by data-driven businesses. Key issues in need of being addressed include (but are not limited to) leader/evangelist empowerment, engaging the research community, and leveraging/expanding evidence hubs such as LACE.

Issue 2: The inability to work well together across competing organisations to improve the quality of education for all
We like to think that we are unique, are we just being inefficient? We can argue that the deployment of LA is indeed just a bundle of commonly accepted learning strategies, best practices and design criteria captured with implementation. Reviewing uniqueness, we need to divide that which is exclusive to our organisations and that we could and should we share. Cost-effective, high-quality Education through the promotion of standardisation and shared infrastructure. Striving, struggling for one data governance model connecting nationally scaled systems, creating standard practices, benchmarking predictive models, knowing our algorithmic and teaching biases. Working together well celebrating our uniqueness.

Issue 3: The lack of honesty around failure
Without failure, there is no meaningful learning growth. We have many examples; InBloom, the NHS data release to Google, racist algorithms, fake news, counter-intuitive laws, ageism, stakeholder disconnect, organisational culture. However, failing is not an option and reporting failure as well. I would argue that we have lost the ability to take contrary evidence around failed projects or methods and turn it into constructive improvement. We need to work out how we are going to collect, analyse, advertise and incorporate failures for the betterment of further deployment, categorising and dissecting failure as a community. We will need to expand our definitions and learn 100 percent openly.
**Workshop 3 Learning analytics and organisational culture**

Data driven education poses big challenges to stakeholders of education. These challenges are pushing members of such communities into a difficult position, where they need to reconstruct their tasks and activities in order to maintain their function in education. This often means that their own professional identity is at stake (for instance that of teachers). This is the result of 1) a lack of insight in the impact of present educational systems and practices; 2) a lack of resources to provide cost-effective education; 3) a lack of up-to-date learning content and teachers who can competently leverage it to their advantage; and 4) a lack of demonstrated effectiveness of educational programmes and practices. Early adopters of disruptive educational technology are already gearing up and placing the aforementioned issues on the agenda. These organisations have been building their services on educational technology and data for decades, therefore analytics is deeply embedded in their organisational culture. However, these organisations still represent the minority of educational programs and their activities have as of yet not resulted in a major transformation of the educational landscape.

**Issue 1: Train the trainers**
LA will enable the stakeholders of education to have greater understanding of how students learn and what may be done to enhance their learning. This will result in the dynamic development and evidence based validation of new educational products, where students gain more and more control over their learning process and personalized and adaptive online learning environment. Teachers and trainers need to be prepared for this new world of education and their preparations should be driven not only by their individual motivation to adapt, but also organisations, who need to make a sustained effort to help them to develop and succeed.

**Issue 2: Implementation of personalized education on a larger scale**
Personalising learning content to individual needs is one of the key assets of Learning Analytics: it allows focussing resources on the students that need those resources the most efficiently and in a timely fashion. Aligning learning content to personal learning goals, skills, and educational performance includes the rethinking of existing grading and performance systems, where for instance tests and assessments should scaffold learning (e.g. by identifying learning needs) rather than evaluate it (formative vs summative assessment).

**Issue 3: Privacy and ethics related to educational data**
How may we exploit the wealth of information obtained by gathering data with the explicit consent of students and tutors? Coupling data gathered in the class rooms, through sensors, and/or in online courses with other data sources such as social media and student social and educational profiles may be expected to increase the effectiveness of LA, at the risk of simultaneously increasing breaches of privacy and/or ethical standards. All stakeholders, managers, regulators, teachers, students therefore need to be involved and help develop new legislation that does not inhibit but rather facilitates the evolution of LA while at the same time prohibiting misuse.