Learning analytics in times of COVID-19: Opportunity from crisis

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Preface to the Conference Proceedings

The ninth[1] edition of the Learning Analytics Summer Institute Spain 2021, LASI Spain 2021[2]), organized by the Universitat Pompeu Fabra, Universitat Oberta de Catalunya and SNOLA[3] (Spanish Network of Learning Analytics), was held in Barcelona on July 7th through 9th, 2021. The Learning Analytics Summer Institute Spain is part of the global LASI network[4], conceived as a platform to catalyze educators, technologists,

[1] The previous editions of LASI Spain as official LASI-local event include the following:

- LASI Spain 2013 in Madrid: http://www.emadridnet.org/index.php/es/eventos2/312-seminario-emadrid-learning-analytics-summer-institue
- LASI Spain 2014 in Madrid: https://canal.uned.es/serial/index/id/1303
- LASI Spain 2015 in Bilbao: https://blogs.deusto.es/lasi2015Bilbao
- LASI Spain 2016 in Bilbao: http://lasi16.snola.es
- LASI Spain 2017 in Madrid: http://lasi17.snola.es
- LASI Spain 2018 in León: http://lasi18.snola.es
- LASI Spain 2019 in Vigo: http://lasi19.snola.es
- LASI Spain 2020 in Valladolid: http://lasi20.snola.es

[2] https://lasi21.snola.es
[3] https://snola.es
[4] https://www.solaresearch.org/events/lasi

researchers, enterprise and policymakers around shaping the next generation of learning infrastructures to truly serve the needs now facing the education sector.

The main theme of LASI Spain 2021 aimed at addressing the aftermath of the COVID-19 pandemic and its effects on research on education in general and, more particularly, on learning analytics. More than one year after the declaration of COVID-19 as a world pandemic by the World Health Organization, there is no doubt that the virus outbreak has changed the landscape of education. Instructors from educational institutions across different levels (K-12, Higher Education) had to shift to emergency remote teaching overnight. In most cases, this change has entailed (forceful) adoption of blended learning and online learning approaches. However, the benefits and adequacy of these approaches to the "new normal" generally comes at a cost: as learning moves to virtual spaces, student tracking becomes a difficult task for instructors, which might hinder the effectiveness of the teaching and learning process. Some may declare a crisis of the educational system caused by disengagement and ineffective instruction arising from emergency remote teaching, but the new situation can also be seen as an opportunity for learning analytics to enhance learning. In a world where education is increasingly delivered using digital media in online spaces or hybrid teaching modes, learning analytics finds the ideal context of application. The challenge remains to seize this opportunity and prove its effectiveness in improving teaching and learning.

LASI Spain 2021 was held in hybrid mode (with both on-site and remote attendees). Nearly ninety researchers from all over the world joined the different sessions and workshops; most researchers on-site had Spanish affiliations, and around one-quarter of remote attendees were international, including researchers from 17 different countries. The conference program included two keynotes by international experts in the field of learning analytics, two workshops, two sessions of paper presentations, one round table and the doctoral consortium.

The keynotes of LASI Spain 2021 offered a view of trends on learning analytics and the impact of learning analytics practices based on actual experiences, including how learning analytics practices have had to adapt to the educational changes caused by the outbreak of the COVID-19 pandemic. In particular, the keynotes of LASI Spain 2021 were as follows:

- In *"Augmenting Feedback for Transversal Skills with Multimodal Learning Analytics"*, Xavier Ochoa (New Your University) explored how the intersection of learning analytics, artificial intelligence and low-cost IoT is fueling the emergence of a new breed of educational solutions. These solutions promise to change the "learn-by-exposure" approach that has traditionally been used with soft or transversal skills to a new paradigm of "deliberate-practice", akin to the one used in most disciplinary skills. The keynote discussed the opportunities, challenges and risk of automatically generating actionable metrics to help students acquire 21st century skills and considered the current state-of-the-art and the current trends in this exciting new application of multimodal learning analytics. The keynote did a particular focus on how to provide automatic feedback for the development of communication and teamwork skills. Dr. Ochoa argued in favor of the development of augmented learning

analytics, where real-time automatic feedback can be used not as a replacement but rather as an element to facilitate the learning of students and the teaching of instructors.

- In *"Learning Analytics Impact"*, Barbara Wasson (Universitetet i Bergen) explores why after more than a decade learning analytics still must make a major impact on education. Prof. Wasson analyzed the chances of learning analytics to achieve impact on education practice nowadays, illustrated by recent experiences, including a project in which learning analytics was used to give response to challenges caused by the COVID-19 pandemic and another project focused on the development of the infrastructure for learning analytics in a Norwegian Municipality. The keynote highlighted the challenges involved in the data capture from learning systems and how they can be processed and provided to end-users for making a real impact on education.

The roundtable, under the title "Adoption of learning analytics in Higher Education in Spain", and moderated by Teresa Sancho (Universitat Oberta de Catalunya), discussed the current situation of learning analytics in Spanish Higher Education Institutions with guests offering different perspectives of the situation: Martí Casadesús (Director of AQU, the Catalan University Quality Assurance Agency), José Luis Aznarte Mellado (Vice-rector of Intelligent Data Management at Universidad Nacional de Educación a Distancia) and Alejandra Monés Martínez (Universidad de Valladolid). The starting point of the panel was that the plethora and availability of data in higher education institutions lay out the foundations of significant change in teaching, management and research. This data-driven approach shifts organizations towards change, which requires a profound transformation of the institution's culture and involves the emergence of new challenges. Some examples of this kind of transformation are data governance or data literacy issues. In this sense, it was argued that learning analytics should be directly linked to progress and improvement in teaching quality. The conclusions of the roundtable can be summarized in the following five statements:

— The Spanish university system has the proper conditions to adopt the perspective of learning analytics in a systematic way.
— In the short-term, the effort should focus on improving the teaching practice and student support.
— A framework to foster innovation and data ethics is necessary for the success of learning analytics in universities.
— Learning analytics can (and probably should) be used for the assessment of teaching practices and the evaluation of new teaching and learning models.
— In the future, learning analytics should be oriented to achieved personalized training in a secure and ethical framework.

The workshops at LASI Spain 2021 were focused on the human aspects of learning analytics. In "Well-being and Learning Analytics", Eyad Hakami, Khadija El Aadmi, Davinia Hernández-Leo and Patricia Santos developed a 90-minutes co-design workshop in which participants used well-being indicators and learning analytics scenarios to address questions such as 'what data sources are useful for detecting well-being

issues related to the usage of educational technologies?' or 'how can LA inform the design and redesign processes of learning technologies for better well-being impact?

In "Human-Centred Learning Analytics", Yannis Dimitriadis, Patricia Santos, Khadija El Aadmi, Kostas Michos, Davinia Hernández-Leo and Alejandra Martínez introduced participants to the idea of Human-Centred Learning Analytics (HCLA), a term that refers to the body of knowledge and practice from design communities, such as participatory design and co-design, into data-intensive educational contexts. The activities developed in the workshop facilitated reflection and collaborative knowledge construction about HCLA. These proceedings include a paper summarizing the focus and outcomes of the workshop, "*Workshop on Human-Centred Learning Analytics: A critical analysis based on the discussion of two case studies*" (Khadija El Aadmi-Laamech, Yannis Dimitriadis, Patricia Santos, Davinia Hernández-Leo, Konstantinos Michos and Alejandra Martínez-Monés).

There was also room in LASI Spain 2021 for the presentation of results of academic research, with a total of seven research studies selected from the open call for papers after triple-blinded peer review. The papers were presented in two different sessions; the remainder of this preface presents an overview of these articles:

"Does failing the first assessment affect withdrawal decisions at course level? An empirical evidence" (Juan Antonio Martínez-Carrascal and Teresa Sancho-Vinuesa) studies the influence of outcomes (grades) from the first exam in an online course on student dropout and withdrawal. In their study, and using survival analysis techniques, the authors show that low grades in the first exam highly increases the risk of dropout and hint at the specific time periods when dropout rises drastically.

"What makes a maze-based programming challenge difficult?" (Ioanna Kanellopoulou, Pablo Garaizar and Mariluz Guenaga) describes the use of mazes to teach computational thinking. The study identifies different characteristics that affect student learning, such as their success rate or the time needed to solve the challenges. More particularly, the study focuses on the variables that make a challenge difficult for students. The study analyzes log-data from the Kodetu platform. The study identifies variables that do not have an influence on the difficulty of the problem, such as maze loops, and others that do, such as loops and conditional blocks.

"Lempel: Developing the pattern recognition skill in Computational Thinking through an online educational game" (Ekaitz Polledo, Pablo Garaizar and Mariluz Guenaga) studies the development of the computational thinking skill of pattern recognition using an educational online game, Lempel. The study focuses on the description of the game and its technical implementation and does a primary exploration of the performance of the participants in the game based on data collected from the system logs.

"Monitoring Students' Self-Regulation as a Basis for an Early Warning System" (Martín Liz-Domínguez, Manuel Caeiro Rodríguez, Martin Llamas-Nistal and Fernando Mikic) is a work-in-progress paper that presents the first steps in an early warning system based on students' self-regulation learning (SRL) profile. The research aims at connecting self-reported and trace data to improve understanding of SRL and creation of SRL profiles.

"Comparing Supervised Machine Learning Approaches to Automatically Code Learning Designs in Mobile Learning" (Gerti Pishtari, Luis P. Prieto, María Jesús Rodríguez-Triana and Roberto Martínez-Maldonado) compares different supervised machine learning models (SML) and features extraction techniques to automatically code datasets of learning designs for m-learning, guided by theoretical models.

"Following up the progress of doctoral students and advisors' workload through data visualizations: a case study in a PhD program" (Andrea Vázquez-Ingelmo, Alicia García-Holgado, Helena Hernández-Payo, Francisco José García-Peñalvo and Roberto Theron) presents a data visualization of PhD students' progress to facilitate decision-making, including the methodology and elicitation of requirements, definition of user roles and a detailed analysis of the usability of the system based on the results of a survey using the SUS scale. The authors illustrate this process using a case study on a PhD Programme at Universidad de Salamanca.

"Towards socially shared regulation within CSCL scripts: mirroring group participation in PyramidApp" (Emily Theophilou, Ishari Amarasinghe, Davinia Hernández-Leo, René Alejandro Lobo and Francisco Crespi) proposes the implementation of a social awareness feature within PyramidApp to promote socially shared regulation by offering group members a mirror indicating their levels of participation and comparing them to average levels of participation of a whole group. Preliminary results show different participation levels across groups.

Acknowledgements

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