



Cross-LAK 2016

Proceedings of the first international workshop on

Learning Analytics Across Physical and Digital Spaces (with a special section on workplaces)

This workshop was co-located with the
6th International **Conference on Learning Analytics & Knowledge (LAK'16)**,
which took place from **April 25 to 29**
in the University of Edinburgh, Scotland, UK

Organised by:

Roberto Martinez-Maldonado,
Davinia Hernandez-Leo,
Abelardo Pardo,
Dan Suthers,
Kirsty Kitto,
Sven Charleer,
Naif Radi Aljohani
and
Hiroaki Ogata

Contents

POSITION PAPERS¹

<i>Introduction to Cross LAK 2016: Learning Analytics Across Spaces</i>	<i>1</i>
<i>Profiling High-achieving Students for E-book-based Learning Analytics</i>	<i>5</i>
<i>One Competency Data Model to Bind Them All</i>	<i>10</i>
<i>Toward the integration of monitoring in the orchestration of across-spaces learning situations</i>	<i>15</i>
<i>Automatic Generation of Personalized Review Materials Based on Across-Learning-System Analysis.....</i>	<i>22</i>
<i>Learning Activity Features of High Performance Students</i>	<i>28</i>
<i>Learning Pulse: Using Wearable Biosensors and Learning Analytics to Investigate and Predict Learning Success in Self-regulated Learning</i>	<i>34</i>
<i>Opening the Black Box of Practice-Based Learning: Human- Centred Design of Learning Analytics</i>	<i>40</i>
<i>Orchestrating 21st Century Learning Ecosystems using Analytics</i>	<i>47</i>
<i>Towards a distributed framework to analyze multimodal data</i>	<i>52</i>
<i>Exploring the Impact of a Tabletop-Generated Group Work Feedback on Students' Collaborative Skills</i>	<i>58</i>

PANEL PAPERS¹

<i>Web-based Interactive and Visual Data Analysis for Ubiquitous Learning Analytics.....</i>	<i>65</i>
<i>Seeing Learning Analytics Tools as Orchestration Technologies: Towards Supporting Learning Activities across Physical and Digital Spaces</i>	<i>70</i>
<i>Towards integrated learning design with across-spaces learning analytics: a flipped classroom example.....</i>	<i>74</i>

SPECIAL SECTION ON WORKPLACES²

<i>Visualizing workplace learning data with the SSS Dashboard</i>	<i>79</i>
<i>Learning Analytics and Open Learning Modelling for Professional Competence Development of Firefighters and Future Healthcare Leaders</i>	<i>87</i>
<i>Workplace Learning Analytics for Facilitation in European Public Employment Services... ..</i>	<i>91</i>
<i>Data Analysis of Workplace Learning with BOOST</i>	<i>98</i>

¹Download individual papers from the workshop website: <https://sites.google.com/site/crosslak2016/program>

²Download individual papers from <http://learning-layers.eu/laforwork>

Preface

Students' learning commonly occurs in spaces and at moments that go beyond formal education, and this learning is not constrained to a single physical or digital environment. Educational providers deploy a variety of educational resources in both online and face-to-face settings. These technologies allow learners to get remote access to educational resources from different physical spaces (ubiquitous learning support) or to enrich their learning experiences in the classroom in ways that were not previously possible (face-to-face learning support).

It is of high relevance to the LAK community to explore blended learning scenarios where students can interact at diverse digital and physical learning spaces. The challenge is to find the best approaches that can be applied to automatically capture traces of students' activity, and understand how learning analytics techniques can be used in heterogeneous contexts.

The aim of this workshop was to gather the sub-community of LAK researchers, learning scientists and researchers from other communities, interested in ubiquitous, mobile and/or face-to-face learning analytics. An overarching concern was how to integrate and coordinate learning analytics to provide continued support to learning across digital and physical spaces. The goals of the workshop were to share approaches and identify a set of **guidelines** to design and connect Learning Analytics solutions according to the pedagogical needs and contextual constraints of practitioners.

The papers presented in this workshop proceedings book present a wide variety of cases of learning analytics solutions aligned in different ways to the following four themes:

- Learning analytics across digital spaces
- Learning analytics bridging physical and digital spaces
- Mobile and ubiquitous learning analytics
- Data integration of heterogeneous learning data sources

A total of 14 papers were submitted and accepted. A blind review process was followed to assure the quality of the papers and their relevance to the workshop. An international program committee was conformed to perform the revision process. Program committee:

Alejandra Martinez-Mones (Universidad de Valladolid, Spain)
Bertrand Schneider (Stanford University, USA)
Cynthia D'Angelo (SRI International, USA)
Juan Alberto Muñoz (Universidad de Valladolid, Spain)
Joris Klerkx (KU Leuven, Belgium)
Kate Thompson (Griffith University, Australia)
Mandy Lupton (Queensland University of Technology, Australia)
María Jesús Rodríguez Triana (EPFL, Switzerland)
Mar Pérez-Sanagustín (Pontificia Universidad Católica de Chile)
Patricia Santos (University of the West of England, UK)
Simon Buckingham Shum (University of Technology Sydney, Australia)
Víctor H. Menéndez Domínguez (Universidad Autónoma de Yucatán, México)
Erik Duval (KU Leuven, Belgium)
Maarten de Laat (Open Universiteit Nederland, The Netherlands)

The Cross-LAK workshop organisers

Special section about learning analytics in the workplace

By Tobias Ley

An area of research that especially focuses on learning analytics across contexts and spaces is learning analytics for the workplace. Whereas Learning Analytics in educational settings very often follow a particular pedagogical design, workplace learning is much more driven by demands of work tasks or intrinsic interests of the learner, by self-directed exploration and social exchange that is tightly connected to processes and the places

of work. Hence, learning interactions at the workplace are to a large extent informal, not embedded into a pedagogical scenario and cover a multitude of different physical and virtual contexts.

The papers in this special section therefore focus especially on workplace and professional contexts. Experiences with learning analytics come from Health Care (Ruiz-Calleja et al. and Hansen et al.), from emergency services (Hansen et al.), public employment services (Attwell et al.), construction (Ruiz-Calleja et al.) and micro enterprises (Kravcik et al.). One common challenge that all papers outlined for learning analytics in workplace settings was the flexibility of work arrangements, places and processes. This needs a flexible technological architecture and a good understanding of the interaction of formal and informal learning processes. Two papers (Kravcik et al. and Hansen et al.) followed what is usually considered a top-down strategy, for instance, by deriving competences or learning indicators from business or training goals. The other two (Ruiz-Calleja et al. and Attwell et al.) followed a bottom-up strategy mainly building on social learning and informal knowledge sharing. All papers also brought up the special challenge to integrate learning systems and analytics in work practices.

The four papers listed in this section were part of the Learning Analytics for Workplace and Professional Learning Workshop, which was organised by: Tobias Ley, Ralf Klamma, Stefanie Lindstaedt and Fridolin Wild, also for Lak' 16. <http://learning-layers.eu/laforwork/>