Learning Analytics: Visions of the Future

Conference or Workshop Item

Learning Analytics: Visions of the Future

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ABSTRACT
It is important that the LAK community looks to the future, in order that it can help develop the policies, infrastructure and frameworks that will shape its future direction and activity. Taking as its basis the Visions of the Future study carried out by the Learning Analytics Community Exchange (LACE) project, the panelists will present future scenarios and their implications. The session will include time for the audience to discuss both the findings of the study and actions that could be taken by the LAK community in response to these findings.

Categories and Subject Descriptors
K.3.0 [**Computers and Education**]: General

General Terms
Education, Learning

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Future; LACE project; learning; learning analytics; vision.

1. INTRODUCTION
The LAK15 conference in Poughkeepsie ended with a panel that considered the current state of the field. Four international experts – from Europe, North America and Australasia – discussed the current position of learning analytics and future possibilities.

Simon Buckingham Shum noted that the LAK community must move on from building analytics for the schools and university of 2015 and start to design the fabric of analytics in 2025.

> *The future of learning analytics depends to a large extent on the policy adopted by institutions and governments. Its practice will be greatly shaped by the regulatory framework which is established, the investment decisions made, the infrastructure and specifications which are promoted, and the educational discourse. [1]*

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This is no small challenge, in part because the technology with which we work is changing so fast. 'Typically, we find that the doubling time for different measures – price-performance, bandwidth, capacity – of the capability of information technology is about one year' [4, p56]. Communities are becoming more connected, pedagogies are changing, and educators are looking for new ways to engage students. Some already believe that 'existing solutions don't address the most urgent needs in education' [5].

The fast pace of change means that if, in April 2006, we had begun developing learning analytics for 2016, we might not have planned specifically for learning with and through social networks (Twitter was launched in July 2006), with smartphones (the first iPhone was released in 2007), or learning at scale (the term MOOC was coined in 2008). However, by consulting with experts, we might have come pretty close by taking into account existing work on networked learning [3], mobile learning [6] and connectivism [7].

It is important that our community looks to the future, because the future of learning analytics will depend to a large extent, as Buckingham Shum noted, on policies adopted by external bodies. Its practice will be moulded by regulatory frameworks that are established externally, the investment decisions made by others, the infrastructure and specifications that are promoted across the world, and the educational discourse that is employed. By developing a clear view of what is desirable and feasible in the future – and what we need to avoid – we can equip ourselves to make policy recommendations, to advise funders, and to take a leading role in shaping the frameworks, the infrastructure, the specifications and the discourse with which we shall be working.

This panel will report on the Visions of the Future that have been developed by the Learning Analytics Community Exchange (LACE) project with the input of our community, and will also outline how these are being fed into policy recommendations in Europe. Following short presentations from the panelists, audience members will be encouraged to comment on and critique the scenarios that have been developed, to talk about what the future looks like from their perspective, and to discuss what the LAK community needs to prioritise in the future.

2. ENVISIONING THE FUTURE
The LACE project brings together key European players in the field of learning analytics and educational data mining [2]. One of the project's main activities is the exploration of plausible futures for learning analytics and educational data mining. The aim has been to consult widely, assess differences of opinion about the feasibility and desirability of possible future states, and thus inform future research and policy agendas.

'The Implications and Opportunities of Learning Analytics for European Educational Policy' (LAEP) has joined LACE in this work. The LAEP project is examining the current state of learning analytics, as well as the prospects for the field in the next 10-15 years, in order to provide recommendations for European education policy to guide and support the take-up and adaptation of learning analytics to enhance education in Europe.

The work of the two projects has included literature review, review of practice, expert consultation, workshops and a survey. Together these have formed part of a Policy Delphi approach

3. POLICY DELPHI

The Delphi method was developed in the 1950s, originally to forecast the impact of technology on warfare. The method involves repeated individual questioning of experts. The goal is to reduce the range of responses and arrive at something close to expert consensus. Underlying assumptions of the method are that group judgments are more valid than individual judgments, and that coordinated activities can develop a group judgment.

Turoff instigated a major offshoot of the method in the 1970s.

> *Delphi as it originally was introduced and practiced tended to deal with technical topics and seek a consensus among homogeneous groups of experts. The Policy Delphi, on the other hand, seeks to generate the strongest possible opposing views on the potential resolutions of a major policy issue.* [8, p80]

A Policy Delphi does not seek consensus, but rather to understand diverse views of the preferred future. Turoff argues that, when confronted by a question of policy, analysis and research 'can do no more than supply a factual basis for advocacy'. The future will depend on policy decisions and, Turoff argues, 'the decision maker is not interested in having a group generate his decision; but rather, have an informed group present all the options and supporting evidence for his consideration' [8, 80].

Consequently, as the LACE project plays the role of the informed group in this case, it has carried out a Policy Delphi.

3.1 Implementing the Policy Delphi

The aim of this Policy Delphi is the systematic solicitation and collation of informed judgments on visions of learning analytics in 2025. Its objectives are: to explore or expose underlying assumptions or information leading to differing judgments on learning analytics, and to correlate informed judgments on the topic of learning analytics.

The first phase of the Policy Delphi drew on the expertise of LACE consortium members to develop visions of learning analytics in 2025 in the form of short scenarios. Following a matrix analysis, these visions were selected to provide good coverage for (a) relevance to stakeholders, and (b) the underlying themes of technology, privacy and ethics, and pedagogy.

The second phase involved an online survey of designated experts, and volunteers who responded to the publicity generated by LACE. The experts were drawn from the three focus domains of application of LACE (schools, higher education, the workplace) and the three principal contributing discourses of learning analytics (technology, privacy and ethics, pedagogy).

The third phase focused on input from stakeholders. Following analysis of earlier results, the scenarios with their desirability and feasibility ratings were shared with stakeholders, who added their responses. The results of this phase fed into an analysis of what is feasible and desirable, and of what would need to change to make any of these visions a reality.

The final phase was strategic analysis of findings. This was designed to clarify any disagreements between experts and the stakeholders, and to identify gaps between current infrastructure and practice and those that will be required for the future.

The initial phase of the Policy Delphi developed eight scenarios, which formed the basis for all subsequent phases. These scenarios are set out in Section 4.

4. LEARNING ANALYTICS IN 2025

Each of the eight scenarios begins with a short summary and then briefly contrasts the situation in 2015 with the envisaged scenario in 2025. The body of the scenario sets out this vision, and some of its possible implications, in more detail.

4.1 Classrooms monitor environment

In 2025, classrooms monitor the physical environment to support learning and teaching

In 2015, learning analytics were mainly used to support online learning. By 2025, they can be used to support most teaching and learning activities, wherever these take place. Furniture, pens, writing pads – almost any tool used during learning – can be fitted with sensors. These can record many sorts of information, including tilt, force and position. Video cameras using facial recognition are able to track individuals as they learn. These cameras monitor movements, and record exactly how learners work with and manipulate objects. All this information is used to monitor learners' progress. Individuals are supported in learning a wide range of physical skills. Teachers are alerted to signs of individual learner's boredom, confusion, and deviation from task. Teachers and managers are able to monitor social interactions, and to identify where they should nurture socialisation and cooperative behaviour.

4.2 Personal data tracking

In 2025, personal data tracking supports learning

In 2015, people were beginning to wear devices such as heart-rate monitors and run-trackers as they went about their daily lives. By 2025, sophisticated sensors can gather personal information about factors such as posture, attention, rest, stress, blood sugar, and metabolic rate. People collect this information about their activities, and feed it into programmes of their choice that provide recommendations on how to act in ways that improve their learning. Learners can download the statistics and data that are associated with successful learning in a certain area. Aligning personal data with these 'ideal' sets is claimed to help people to master skills as diverse as swimming, driving, carrying out surgery and passing examinations. Academic stars sell programmes using this data to optimise learning for different ages and courses. Business gurus market similar programmes for topics such as presentation skills and workload management. Some learners create and share their own data analysis programmes, which provide recommendations that often include the consumption of high-energy foods and stimulants. The majority of high-school and university students follow self-monitoring programmes, and discuss the merits of these on social media.

4.3 Analytics are rarely used

In 2025, analytics are rarely used in education

In 2015, many people hoped that analytics would be able to improve teaching and learning and the environments where these take place. However, in 2025, it is clear that there are many problems. Courses that are automated by analytics are seen as inferior, and learners have realised that they can game the system. There have been major leaks of sensitive personal data, and it is clear that, even where this has not happened, many companies have misused the data generated by their analytics. Many governments have ruled that individuals are the sole owners of the data they generate. All use of data for educational purposes now has to be approved not only by the learner but also by new inspectorates. In practice this has meant that use of analytics is restricted to summative assessment carried out by government agencies. A consensus has emerged in educational policy: the move away from learning analytics is not only ethically desirable it is also educationally effective.

4.4 Individuals control their data

In 2025, individuals control their own data

In 2015, it was not clear who owned educational data, and it was often used without learners' knowledge. By 2025, most people are aware of the importance and value of their data. Learners control the type and quantity of personal data that they share, and with whom they share it. This includes information about progress, attendance and exam results, as well as data collected by cameras and sensors. Learners can choose to limit the time for which access is allowed, or they can restrict access to specific organisations and individuals. The tools for making these choices are clearly laid out and easy to use. In the case of children, data decisions are made in consultation with parents or carers. If they do not engage with these tools, then no data is shared and no benefits gained. Most educational institutions recognise this as a potential problem, and run campaigns to raise awareness of the both the risks of thoughtless exposure of data, and the benefits to learners of informed sharing of selected educational data.

4.5 Open systems are widely adopted

In 2025, open systems for learning analytics are widely adopted

In 2015, companies produced a range of learning analytics tools, using different approaches and standards. The algorithms and models that companies use are often protected as intellectual property. By 2025, the 'open learning analytics' established by the Open Learning Analytics Foundation has made a more joined-up approach possible. Educational organisations see learning analytics as a central element of their IT provision. They demand control over these tools, how they run and what they are used for. The tools they select, although they come from different providers, use open algorithms and share data according to an agreed set of standards that facilitate transparency and independent validation. A set of well-tested, accessible and standardised visualisation methods is commonly used, so that learners and teachers can confidently use a range of tools. Institutions can easily work with a range of providers to design learning analytics systems that support their strategic vision.

4.6 Analytics are essential management tools

In 2025, learning analytics systems are essential tools of educational management

In 2015, companies were beginning to develop systems to recommend resources and to predict outcomes. By 2025, these systems are highly developed. A wide range of data about learner behaviour is used to generate good quality, real-time predictions about likely success. Learners, teachers, managers and policymakers all have access to live and accurate information about how well a learner is likely to do. Learners and teachers plan their work on the basis of reliable tools that can produce detailed and personalised recommendations about what should be done to achieve the best learning outcomes. A growing industry offers services to institutions and individuals, advising on how to respond to predictions generated by analytics, and how to take appropriate action in the light of recommendations. Accurate predictive information enables managers and policymakers to expand or contract learning provision before success or failure is evident: you don't have to wait to see if a course is booming or failing, with funding changes happening quickly.

4.7 Analytics support autonomous learning

In 2025, analytics support self-directed autonomous learning

In 2015, people were beginning to assemble datasets that could represent learner's activities. By 2025, these are used on a large scale in teaching, and this has led to the development of enormous datasets containing information about hundreds of thousands of learners. Analysing in detail the progress of such a wide variety of learners has made it possible to provide reliable evidence-based recommendations about the most successful routes to learning, as well as identifying the learning materials and approaches that are most suitable for each individual at each point in their progress. These recommendations are better informed and more reliable than those that can be produced by even the best-trained humans. Learners now spend most of their time working with analytics-driven systems, and the role of teachers has been reduced. The evidence generated by the use of these systems drives education policy.

4.8 Teaching is delegated to computers

In 2025, most teaching is delegated to computers

In 2015, learners in educational institutions and in businesses had to follow a curriculum developed by others. In 2025, they create groups that work together to decide their learning goals and how to achieve these. A 'Learning Trajectory System' uses analytics to support information exchange and group collaborations, and learners receive support from mentors, rather than teachers. Activity towards a learning goal is monitored, and analytics provide individuals with feedback on their learning process. This includes suggestions, including peer learners to contact, experts to approach, relevant content, and ways of developing and demonstrating new skills. Formative assessment is used to guide future progress, taking into account individuals' characteristics, experience and context, replacing exams that show only what students have achieved. Texts and other learning materials are adapted to suit the cultural characteristics of learners, revealed by analysis of their interactions. As a result, learners are personally engaged with their topics, and are motivated by their highly autonomous learning. The competences that they develop are valuable in a society in which collection and analysis of data are the norm. There is also convergence between the learning activities of the education system and the methods used by employees to develop their knowledge and skills.

5. AREAS FOR PANEL DISCUSSION

The Policy Delphi, which is in process at the time of writing, but which will have been completed by the time of the panel discussion, focused on eight scenarios. Each of these is designed to be reasonable, based on what we now know, but also cutting edge. A selection of these scenarios, their development, and reactions to them, will be the basis for presentations by panelists. The focus of presentations identified in this section may therefore change in the light of ongoing research, as the panelists will seek to stimulate audience discussion by highlighting the possible developments that emerge from the strategic analysis.

Dai Griffiths, professor of Educational Cybernetics at the School of Education and Psychology, University of Bolton and project lead on the Visions of the Future study, will provide an introduction. He will outline the study and its motivations, briefly summarizing the visions and how they were developed and studied. He will share links to the visions, and these links will also have been shared widely via social media before the panel starts, giving attendees time to read and consider them in advance if they wish to do so.

Doug Clow, senior lecturer at the UK Open University and member of the Visions of the Future project team, will introduce a scenario that would bring an end to the LAK conferences. Scenario 3 foresees a future in which learning analytics are rarely used. Problematic elements of other visions suggest why this might happen. Doug [who will also be running a Failathon workshop at LAK16] will discuss what could go wrong, and how we as a community can work to avoid these pitfalls.

Andrew Brasher, the main researcher on the Visions of the Future study, will talk about Scenario 4, in which individuals have control over their own data. During workshop discussions, data protection, ethics and privacy emerged as key concerns in relation to all eight of the future scenarios. Andrew will discuss these key areas of concern, and how they might be addressed.

Hendrik Drachsler, principal investigator on the LACE project, will talk about what a full implementation of learning analytics could look like in a decade's time. Scenario 8 suggests that teaching could be delegated to computers, while other scenarios foresee the near ubiquitous collection and analysis of data to support learning and teaching. Hendrik will consider whether roll-out at this scale should be considered utopian or dystopian.

Rebecca Ferguson, senior lecturer at the UK Open University and principal investigator on the LAEP project, will talk about the implications for policy, funding and infrastructure development that arise from these visions. She will discuss ways in which the LAK community can push for the necessary changes to be identified and implemented.

The LACE Policy Delphi was designed to explore or expose underlying assumptions and information leading to differing judgments on learning analytics, and to correlate informed judgments on the topic of learning analytics.

The next stage is to take action based on the findings of the study. The audience will therefore be encouraged to discuss what actions should be taken, how this might be done, and who should be tasked with taking this work forward. An event hashtag will be used to extend the discussion to the wider learning analytics community around the world.

6. ACKNOWLEDGMENTS

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PANEL PARTICIPANTS

Andrew Brasher

Andrew Brasher is a member of the Learning and Teaching Development Team at the Institute of Educational Technology (IET) at The Open University, UK. He works on a range of research and development projects, with the aim of improving practice at the university and elsewhere. He is currently working on a series of European projects: LACE, LAEP, Metis and Maseltov. He is currently the main researcher on the Visions of the Future study.

Doug Clow

Doug Clow is a Senior Lecturer in the Institute of Educational Technology at The Open University (OU), with a particular interest in learning analytics. He has more than 20 years' experience of projects harnessing new technology to improve learning, and brings together technical expertise with management, policy and educational theory. He has published papers at every LAK conference since 2011, was a participant in LASI 2013, 2014 and 2015, and co-organiser of three SoLAR Flare events in the UK. Doug is currently part of a large-scale transformatory analytics programme at The Open University, and is also contributing to the LACE project.

Hendrik Drachsler

Hendrik Drachsler is Associate Professor at the Welten Institute at the Open Universiteit Nederland. His research interests include learning analytics, personalization technologies, recommender systems, mobile devices, and their applications in the fields of technology enhanced learning, science 2.0, and health 2.0. He chairs the EATEL SIG dataTEL and is co-chair of the SIG Learning Analytics of the Dutch umbrella organization SURF. He is primary investigator of the FP7 project LACEproject.eu and a partner in various data-driven research projects for education.

Rebecca Ferguson

Rebecca Ferguson is a Senior Lecturer at The Open University in the UK, focused on educational futures, learning analytics, MOOCs, augmented learning and online social learning. She has been a member of the steering committee of the Society for Learning Analytics Research (SoLAR) and is a Programme Chair of the Practitioner Track at LAK16. She currently leads the LAEP project, which is considering the implications and opportunities of learning analytics for European educational policy, and is a member of the LACE project consortium. She co-chaired the 1st and 2nd International Workshops on Discourse-Centric Learning Analytics, held in Belgium and the US, as well as three SoLAR Flares held in the UK. Rebecca has published extensively on learning analytics and social learning analytics.

Dai Griffiths

David (Dai) Griffiths is a Professor of Educational Cybernetics at the School of Education and Psychology, University of Bolton. He has a background in the arts, but has worked with educational technology for over 20 years. He holds a PhD from Universitat Pompeu Fabra, and has professional experience in both Spain and the UK. He has long experience of international projects in the area of technology-enhanced learning. Dai has worked extensively on the design and standardised representation of learning activities, and he finds that many of the issues raised by this research and development reappear as themes in the learning analytics space. He is particularly interested in the institutional implications of introducing learning analytics, and the consequences for those who teach and learn within it. He was a member of Cetis, working on interoperability in technology enhanced working, and is currently working on a report on interoperability and data sharing in learning analytics for the LACE project.