Workshop: Methodological Bases for the Measurement of Learning in Learning Analytics

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ABSTRACT: This Workshop focuses on the methodology of learning analytics. It aims to promote communication between two communities of scholars – learning analysts and educational measurement specialists. The argument is that strength will accrue from methodological collaboration across the fields, which share an interest in learning, a commitment to improving practice and a belief in the power of analysis. They may differ in how the construct of learning is understood, and what is understood by the term 'measured'. Different criteria may be applied when assessing quality of data, and the standards of proof required as to the utility and interpretability of outcomes. Different data modeling techniques are used to uncover meaning in data. This workshop will provide opportunities for expert methodologists from both fields to collaborate, in the company of representatives of key stakeholders such policy makers and public officials, in the interests of improving trustworthiness, validity, reliability, utility and interpretability of analytics used in assessment and measurement of learning. A Workshop Report will summarise the opportunities for, and likely outcomes of improve collaboration between the fields, and if warranted, the organisers will lead an initiative for the establishment within SOLAR of an ongoing Special Interest Group on Measurement Analytics.

Keywords: Measurement modeling, methodology, learning analytics, educational measurement, assessment of learning, learning, measurement analytics

1 BACKGROUND:

This Workshop focuses on the methodology of learning analytics, aiming to extend the conversation between two communities of scholars – learning analysts and educational measurement specialists – to the benefit of both. The fields share an interest in learning, a commitment to improving practice and a belief that data can assist understanding of learning. Both fields have an interest in measuring learning. There are also differences, and these provide opportunities for productive collaboration.

The methodology of learning analytics is concerned principally with interrogation and interpretation of digital data harvested from digital educational applications such as LMS platforms or games, or from data collection devices including wearable, audio or video recordings or other data capture devices embedded in the environment. The plethora of learning-related information charts social interactions, eye-gaze

direction, facial expression, and a range of other physical, physiological emotional or neurological indicators. The *process* of learning is traced as well as the outcomes. Learning analysts applies techniques such as social network analyses, data mining, machine learning, semantic analysis and so on.

The field of learning analytics is young and is not without it challenges. There is growing awareness that measures of learning need to be accurate, fair, reliable, valid, and interpretable regardless of whether they are used for prediction, for feedback, or for research (Berger et al. 2017; Milligan, 2015; Prinsloo & Slade, 2017; Ringtved, Milligan, Corrin & Law, 2017). The Leaning Analytics Community Exchange (LACE) recently registered concerns about use of big data in education: data can do harm if used to shape the information or treatment a person, if based on faulty inferences, especially if decisions are made on the basis of automated algorithms. Questions are being raised about the effectiveness of analytics (Ferguson & Clow, 2017). Inferring attributes from a characterisation of statistical categories is insufficient to engender trust in the patterns "found" in raw data.

Educational measurement also has at its core the analysis of large scale quantitative data on learning, but this field is older, and is concerned principally to use data to derive assessments of human attributes that are reliable, valid, have utility, and are interpretable for educationalists (Messick, 1995, Wilson, 2005), It especially focuses on measuring learning-related attributes of learners i.e., what learners know or can do. There is a well-established methodology, underpinned by understandings that data cannot speak for itself, that every relationship found in data is not meaningful, and that some are damaging if used to predict or shape learning. Educational measurement techniques provide a means to cut through the inherent complexity and interrelatedness of educational evidence to distinguish what is meaningful and useful, from what is merely related.

Although not young, educational management is not without its challenges either. Its job of is getting harder. Changes in conceptions of *what* learning should be assessed are evident in reforms of national and international curriculum frameworks, which now routinely supplement the cognitive outcomes of traditional subjects and disciplines with requirements that learners develop complex competencies comprised of knowledge, values, attitudes, skills and beliefs required for effective performance in any field. These traits are difficult to assess using traditional approaches and traditional data forms. Teaching methods are changing too. Digital learning platforms and applications classes are ubiquitous. Greater reliance is placed on automated assessments, and agents. Educational measurement and assessment is increasingly using big data of the kind that learning analysts engage with, and its models, techniques and tools are needing to change at the same time (Mislevy, 2016, Pellegrino, 1999).

The advantages of methodological collaboration between these two fields have been remarked in both the learning analytics community, and the educational measurement community (Drasgow, 2016; He et al., 2016). There are advantages in exploring differences between the fields in assumptions about the nature of learning and how learning can be indicated and understood, even in what is understood by the term 'measured'. Different assumptions may apply to consideration of matters of data adequacy, and control, and the standards of proof required as to the utility and interpretability of findings. The fields use different statistical techniques for data modeling, and for uncovering meaning in the data. There is, however, already evidence that collaboration between the two fields can prove productive, including the emergence of

teams combining methodologies to good effect (Milligan, 2015; Griffin & Care, 2015; Shute & Ventura 2009)

2. PURPOSE OF THE WORKSHOP

In this context, the aim of this workshop is to extend the methodological collaboration between the learning analytics community and the educational measurement community, by convening a group of methodology-focused researchers, and other key stakeholders interested in the measurement of learning, to discuss and assist productive collaboration.

If the discussion warrants, the organisers will present an argument for the establishment of an ongoing Special Interest Group on Measurement Analytics, within SOLAR, aimed at stimulating methodological collaboration within the learning analytic and measurement communities. Organisers will seek to engage participation with measurement-focussed organisations such as the National Council for Measurement in Education.

3. WORKSHOP ORGANISATION

A full day workshop is expected to attract about 50 participants. Participation is sought from a range of interest groups, including, inter alia: DesignLAK16 and DesignLAK 17 participants; learning analytics researchers and practitioners; ASCILITE learning analytics and e-assessment SIGs; and the National Council of Educational Measurement. It is also expected to involve a number of advisors to policy makers and public officials with an interest in the validity, reliability, utility and interpretability of analytics for assessment and measurement in education. The workshop space is arranged round tables seating approximately 6 people. Equipment includes butchers paper and pens on each table, a lectern and data projection equipment that manages BYOG devices. Wifi is required.

1.1 Pre-workshop planning

A Workshop website will facilitate discussion and interaction of the developing community. A twitter hash tag and mailing list will be established to facilitate communication. A call for abstracts of 400 – 500 words explaining methodology and showcasing the methodological feature of work. will be directed to invited expert methodologists working on the measurement of learning, within or across the two fields. The call will also be open to the general LAK community. The workshop organisers will review submissions, leading to selection of up to 8-10 case studies of methodological approaches. Organisers will also invite a panel of discussants expert in methodology in each of the fields of learning analytics and/or educational measurement.

1.2 The workshop design

The bulk of the day will be organised around three main working sessions, each comprising three different elements and employing the technique of World Café[1] to facilitate knowledge building and networking. Each working session will include two or three of the presenters explaining the methodological approach, and the working principles about learning that lie behind it. The invited expert discussants will provide commentary on the presentations, teasing out opportunities for building on the perspectives of each field. They are likely to focus on: assumptions about the nature of learning and how learning can be indicated and understood; the purposes of measurement and what is understood by the term 'measured'; the standards adopted in relation to data adequacy and control; assumptions about what constitutes proof of utility and interpretability of findings; the means used to uncover meaning in the data; and the appropriateness of data modeling approaches. All participants will then actively engage in knowledge building, collaboratively synthesising a set of 'best practice' methodological principles derived from the presentations and discussant inputs.

1.3 Outcomes

A range of workshop outcomes is envisaged. First, presenters will be invited to publish their presentation abstracts on the workshop website in the weeks before the workshop. Second, presenters will be encouraged to present their finalised papers in the Companion Proceedings. Third, a Workshop Report and paper will be prepared by the workshop organisers, summarising the opportunities and likely outcomes of improve collaboration between the fields of learning analytics and educational measurement. Fourth if warranted, and to maintain momentum, the organisers will develop a proposal for SOLAR to establish a SIG in the area.

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