Writing Analytics Literacy – Bridging from Research to Practice

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ABSTRACT
There is untapped potential in achieving the full impact of learning analytics through the integration of tools into practical pedagogic contexts. To meet this potential, more work must be conducted to support educators in developing learning analytics literacy. The proposed workshop addresses this need by building capacity in the learning analytics community and developing an approach to resourcing for building 'writing analytics literacy'.

CCS Concepts
• Computing methodologies~Natural language processing • Applied computing~Education • Applied computing~Computer-assisted instruction • *Applied computing~Interactive learning environments* • *Human-centered computing* • Social and professional topics~Computing literacy

Keywords
Learning analytics, writing analytics, analytics for action, practitioner knowledge, learning analytics literacy, automated writing evaluation

1. INTRODUCTION
The ability to communicate via writing is a key to literacy, central to participation in society, and thus central to all educational contexts [6, 7]. There is a long standing interest in the development and use of natural language processing (NLP) tools to analyze this writing [e.g., 5, 8], with tools emerging from the research and commercial spaces to support formative assessments of student writing.

Writing Analytics is a developing sub-domain of learning analytics with a specific focus on supporting writing practices. Research in this field has the potential to improve formative feedback in writing exercises and to provide insights to both educators and students (see previous workshop [1]). Despite this strong potential, adoption of writing analytics tools has not been widespread.

1.1 Writing Analytics Literacy
There is untapped potential in supporting educators to make effective use of such tools. However, 'writing analytics literacy' in this sense must go beyond simply knowing how to use tools or access results through simple user interfaces, and beyond tools that simply output numeric information absent actionable feedback. Rather, there is a need to engage educators with resources that support them in designing meaningful tasks, selecting appropriate tools to support those tasks, and interpreting the data arising from them. To do this, educators must consider the desired outcomes of assigned tasks (e.g., demonstrate knowledge of key topics, use correct citation, use creative language), and understand the potential – and pitfalls – of NLP to address those needs. We thus see *writing analytics literacy* as positioning analytics and writing-assessment literacies synergistically. Through building such literacies, we aim to:

1. Develop a synergistic model of writing analytics literacy and writing assessment literacy
2. Engage practitioners in thinking about (and researching) how writing assignments in their teaching might provide meaningful data for learning insights
3. Develop student's writing analytics literacy (and, by extension, their writing) through interaction with appropriate tools

Developing these literacies will require a multi-faceted approach, including continued development of research technologies, and innovation around new approaches to writing instruction. For these endeavors to have impact, practitioners must integrate them into pedagogic contexts in which they guide action [2].

Learners have a number of challenges in interpreting analytics for action [12]: They must connect the analytics to the processes and overall goals of the learning task (contextual issues); they must evaluate the quality of the analytic, understanding how it is developed and how it can inform their learning (trust issues); they must select to which information to attend – present, and absent from the analytic – and where to devote time (priority issues); and they must decide how – as an individual – to respond to analytics and what they represent (individual issues) [12].

Learners must make decisions based on these interpretations. Thus, analytics must [12]: present possible options, empowering learners to decide; provide actionable information for students to *do* something with the information; afford autonomy to students,

such that analytics help them identify their own learning patterns, rather than relying on the analytic for this information [12].

Wise et al. propose the 'align design framework', in which educators *integrate* analytics as "an integral element in the learning process tied to their goals, expectations, and planned learning process" [12], with students given *agency* to "engage with analytics as a tool to inform their actions, as opposed to analytics being something with which students must comply" [12]. These principles frame the activity, with context added through a *reference frame* that provides an action-oriented comparator for the interpretation of the analytic, with a principle of *dialogue/audience* describing discussion around students' learning goals and processes. For these design-implementations to be achieved, there is a need to support educators in connecting analytic design, pedagogy, and theory [4, 13].

1.2 Learning Analytics Carpentry (LAC)

Other increasingly data-driven fields have grappled with developing both researcher and practitioner knowledge. Data Carpentry workshops (http://www.datacarpentry.org/), developed based on Software Carpentry bootcamps [11] (http://software-carpentry.org/) are short workshops designed to teach "basic concepts, skills, and tools for working with data so researchers can get more done in less time and with less pain" [9]. They are designed to give novices the starting toolkit to begin working programmatically with data in their own research. Data carpentry sessions focus on example data sets targeted at particular domains of relevance to the learners, with no prior-knowledge assumed.

For example, from an *R* Hackathon in population genetics, a community website has been developed of vignettes [3], with proposals for 'a collaborative training infrastructure for bioinformatics' including openly-co-developed resources and a carpentry-based teaching model that blends formal and informal elements with ongoing peer support [10].

We propose to adopt a 'learning analytics carpentry' model, to (1) develop capability among LAK researchers in the analysis of writing data; (2) connect this knowledge to practitioner contexts; (3) begin to build resources for writing analytics carpentry based learning

Existing work in this area (e.g., the 2014 EdX 'Data, Analytics and Learning', the 2016 LASI 'topic modeling' workshop, etc.) has focused on building researcher confidence in particular techniques, with a primary focus on the analytic rather than integration. The proposed workshop aims to develop resources that will both build capacity in learning analytic techniques, and the targeting of those analytics at particular pedagogic contexts.

2. WORKSHOP OBJECTIVES

Workshop attendees will contribute one or more of the following:

1. A tool that has been developed, along with resources describing particular pedagogic contexts in which it might be integrated
2. Documentation of a specific learning context in which writing analytics could be applied
3. Data that could be analyzed with the provided tools, (in addition, completing an in-workshop pedagogically meaningful activity to produce 'live' data).

The workshop will be targeted at:

1. Providing a tutorial regarding key tools for writing analytics research and practice, highlighting existing tools, resources, and practices
2. Building a resource bank of sample datasets from which learning vignettes might be developed
3. Creating a 'wish list' of resources to support practitioners in their learning analytics literacy around writing, including developing a framework describing the kinds of pedagogic contexts in which particular tools might be integrated.

The workshop thus proposes to provide both hands-on tutorial elements, and resource-creation.

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