Converging Data Storytelling Narratives and Learning Analytics Dashboards

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ABSTRACT: Data Storytelling (DS) in Learning Analytics (LA) has proven as an effective approach to communicating insights to non-data experts (e.g., students and teachers). DS brings the promise to incorporate narratives into LA interfaces (e.g., dashboards) to facilitate the provision of direct feedback and pedagogical explanations. The LA community has researched Data Storytelling principles and techniques to support educational stakeholders in interpreting their teaching and learning progress. However, given the relevance of the story narrative, challenges arise to provide unbiased, fair, and meaningful stories without misleading the communication of insights. This workshop aims to explore the formal and practical challenges and opportunities of DS by engaging in discussions with the LA community. In this workshop, we expect to spark discussion on these main topics: What methods and methodologies of DS from other domains are suitable for LA? How to evaluate the impact of DS in LA? How can we automate the process of generating fair and unbiased data stories to facilitate sense-making and effectively communicate insights? This workshop will bring together storytelling researchers and practitioners, whose data storytelling in LA is a special case, to clarify and converge on the future of DS in LA related to their challenges and opportunities.

Keywords: educational data storytelling, explainable dashboards, visual learning analytics

1 Workshop Background

1.1 Motivation

There is a growing interest in creating Learning Analytics (LA) interfaces (e.g., dashboards, visualizations, or reports) to support educational stakeholders in monitoring learning tasks (Salas-Pilco et al., 2022). However, recent literature reviews and empirical studies report that most of these LA interfaces have serious limitations, such as showing visualizations that are difficult to understand by non data experts (Corrin & de Barba, 2015; Herodotou et al., 2019), lack of effectiveness in communicating insights (Bodily et al., 2017), and failing to align with educators' pedagogical needs (Kaliisa et al., 2022; Sergis et al., 2017).

Commonly current research and design approaches adopted to create LA interfaces are generating interfaces that are often hard to interpret in a timely manner (Duval, 2011). With the increasing amount of complex data traces captured (in online and physical spaces), there is a need for compelling ways to distill information into meaningful, memorable, and engaging insights (Dominyk,

2022). One of the strategies to address these challenges is the improvement of the *explanatory design features* of current LA interfaces. Data storytelling (DS) techniques and principles provide a way to include narrative and elements to explain and connect the learning design goals with visual elements aiming at guiding the user's attention to relevant insights. For instance, Echeverria et al. (2018) demonstrated the potential of enhancing visualisations with DS visual elements (e.g., title, highlights, shaded areas) in helping teachers explore visualisations with less effort. Similarly, Martinez-Maldonado et al. (2020) demonstrated the promise of using a layered storytelling approach to communicate insights on team performance. Following a similar layered approach, Fernandez-Nieto et al. (2021) crafted data stories to promote students' reflections. Their work demonstrated that learner data stories were useful for students to identify potential improvements and errors they performed while enacting clinical simulations. One of the most recent works on DS is presented by Pozdniakov et al. (2023). The authors evaluated the impact of teachers' visualisation literacy on their interactions with LA dashboards, and found that teachers with low visualisation literacy especially benefited from DS-based visual guidance. While these prior works have demonstrated how DS can benefit teachers and students when interpreting data from LA interfaces, there are still challenges and opportunities to explore in terms of DS automation, ethics, fairness, scalability, and impact (Fernandez-Nieto et al., 2021; Martinez-Maldonado et al., 2020; Zdanovic et al., 2022).

This workshop aims to explore formal and practical approaches to actively increase DS adoption and impact in the LA community. Thus, this workshop will provide a scenario for participants to reflect and critically discuss the following aspects: What methods and methodologies of DS from other domains are suitable for LA? How can researchers effectively evaluate the impact of DS in LA? How can we automate the process of generating fair and unbiased data stories? To start, the organisers of the workshop will provide a review of lessons learnt from using DS to support stakeholders' interpretations of visual interfaces from the current literature in LA and other research fields such as Information Visualization (InfoVis) and Human-Computer Interaction (HCI). This review will be a starting point to open the discussion with participants regarding challenges (e.g., automate DS according to particular needs) and opportunities (e.g., the use of AI to generate narratives to support interpretations) of DS to effectively support educational stakeholders to make sense of their data traces and make them actionable to improve their practice.

Topics of interest include data storytelling work, which encompasses case studies, interactive visualisations, and narrative-driven stories. These are detailed as follows:

- Data storytelling for impact: How can data storytelling be used to communicate learning insights and inform students/teachers actions?
- Developing and evaluating methods and methodologies of data storytelling: What are the most effective ways to tell learning/teaching stories with data?
- Evaluating and measuring the impact of data storytelling approaches on learning outcomes: How can we measure the effectiveness of data storytelling in different learning contexts?
- Designing and implementing automated data storytelling tools and techniques: Can we develop tools and techniques to automate the process of creating learning/teaching stories?
- Addressing bias and fairness in data storytelling approaches: How can we ensure that learning/teaching stories are fair and accurate representations of reality?

1.2 Objectives and Outcomes

The main objective of this workshop will be to continue promoting research and practice that looks at the intersection of learning analytics and data storytelling. Particularly, the aims of this workshop includes: 1) enable researchers and practitioners to explore the challenges and opportunities that DS may incorporate to their practices when designing LA dashboards, and 2) have a holistic view of formal and practical work that are currently used in the LA community to incorporate DS into their designs and practices.

Our workshop included a call for papers for researchers to share their current work on DS in LA, aiming to enable further discussions. The workshop website information, program, and accepted papers has been published and is available at: DS-LAK24 Website. The website will: 1. support pre-workshop data gathering and provide planning materials; 2. facilitate the collection of materials and document the interactions of groups attending the workshop; and 3. aid in the ongoing dissemination of information and support group activities. The goal is for the workshop to be an ongoing event. In this case, the website will serve as a continuous hub for activities year after year, contributing to the building of field memory.

2 Workshop Details

2.1 Proposed Half-Day Workshop Schedule

2.2.1 Contextualising existing methods and methodologies for DS: 1 hours

In the first activity of this workshop the organisers will introduce current work on DS in LA and other research fields such as Information Visualisation and Human-Centered Design. After the initial opening presentation, we will encourage active participation in small groups for participants to share their perceptions and motivations in terms of the existing DS research and what challenges and opportunities they foresee.

2.2.2 Methods and Methodologies for DS in LA Dashboards: 2 hours

This workshop activity will include 5-minute presentations of current methodological and technical approaches of the use of DS to improve LA interfaces submitted to this workshop (in the form of short papers). Each presenter will explain their technical or methodological approaches and indicate the challenges they have faced running their studies. A variety of research will be welcome during these sessions including: uses or definitions of DS frameworks for LA, studies evaluating LA interfaces enhanced with DS, technical approaches to implementing DS-based LA dashboards and interfaces, or work in progress in general (e.g., LA Dashboards or visual interfaces prototypes using DS).

2.2.3 Reflections and Roadmap: 1 hour

The last part of the workshop will focus on reflecting on the work presented during the session and defining strategies to increase active use of DS in LA research and design practices. As a result of this

session, a list of challenges and opportunities will be identified and used to co-create a roadmap to define priorities and main challenges for the DS LA community.

3 Participants recruitment and Dissemination

This is an open workshop. Participants will be required to register to attend the workshop. We expect at least 20 participants to attend the workshop. Our strategy to recruit participants includes: i) contacting previous participants to the DS tutorial/workshop, ii) engaging with the broader educational community through social media (i.e., Facebook, Xtwitter, LinkedIn, Mastodon), and iii) broadcasting the invitation within the LA community (e.g., SoLAR and Gmail groups). In addition, we will create a webpage with all the relevant information about the workshop.

Finally, to increase the number of participants to attend in person to the conference we plan to promote a call for papers to be published in the CEUR[1] Workshop Proceedings.

4 Material and equipment

No special equipment is needed for this workshop. Authors of this workshop will act as mentors and will provide assistance during the hands-on activities.

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