A tutorial on Data Storytelling for Learning Analytics Dashboards

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ABSTRACT: From a human-centered perspective, supporting educational stakeholders to interpret dashboards and visualizations poses critical design challenges that may often be trivialized. Teachers' and students' interpretation of visualized data is essentially the construction of a narrative about the learning process. Applying data storytelling techniques to design these visualizations can support the generation of insights derived from educational data by aligning the intended learning design, goals and outcomes with visual elements. The aim of this tutorial is to introduce participants to embrace data storytelling techniques into the design of visualizations and dashboards that can communicate meaningful insights.

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

1 WORKSHOP BACKGROUND

1.1 Motivation

Although *learning dashboards* and other visual learning analytics (LA) have received significant traction in recent years (Bodily & Verbert, 2017; Schwendimann et al., 2017), there have also been numerous reports pointing to the limitations and possible pitfalls of rolling out these products without further research and development work (e.g. Aguilar, 2016; Corrin & de Barba, 2015; Jivet, Scheffel, Drachsler, & Specht, 2017; Reimers & Neovesky, 2015; Teasley, 2017). Some of these limitations points to the absence of design choice justifications (Bodily & Verbert, 2017), poor evidence of grounding on educational theory (Jivet, Scheffel, Specht, & Drachsler, 2018), and the disaligment between teachers/students' needs and the learning analytics interfaces (Reimers & Neovesky, 2015).

In parallel to these limitations, researchers and designers can easily overlook the learning context and the audience for whom these visualisations have been created (Schwendimann, et al. 2017). Sometimes, designers and researchers want to communicate multiple insights or dimensions of data about students' experience. The conventional approaches adopted by researchers and designers can lead to the design of overly complex visualisations that are often hard to interpret (Duval 2011) especially "at a glance". Moreover, teachers and students are commonly encouraged to interpret these visualisations in a limited time due to other activities

happening at the same time and, even if the data can be interpreted correctly, they may fail to understand how to act upon such data, failing to adapt their behaviour (Greller & Drachsler 2012). A major challenge for learning analytics researchers and developers is to support the discovery and communication of insights, for students and teachers not needing to play the role of data analysts, at the risk of gaining no insight.

Prior works in the LA community have investigated methods for: 1) guiding the design of human-centred learning analytics visualizations from cognitive and visualization science perspectives [REF]; and 2) using data storytelling techniques to connect the learning design goals with visual elements aiming at guiding user's attention [REF]. In order to meet the intended purpose of learning analytics visualizations, design choices should be informed through human-centred methods, ultimately aimed to support complex human cognition and inform the design of visualizations. This is achieved by demonstrating that, depending on the approaches to data visualization, attention and cognition may be facilitated or impaired [REFs]. Furthermore, data storytelling, which builds on classic InfoVis guidelines (Tufte & Schmieg 1985) and narrative storytelling foundations (e.g. plots, twists and calls to action; Lee, Riche, Isenberg and Carpendale (2015)), is aimed at communicating insights through the combination of *data*, *visuals,* and *narrative* (Dykes 2015). Building upon these two perspectives, our aim is to leverage both, human-centred design processes and the applicability of data storytelling principles to address the analytical challenge of visualizing complex and heterogeneous data, and facilitating the communication of insights.

1.2 Objectives

One of the key goals of this interactive tutorial is to bring researchers, practitioners, and other educational stakeholders into a design space to provide a set of tools/methods for handcrafting visualizations that are relevant to the context by guiding the user's attention to key insights (i.e. derived from the learning design/expected outcomes). Outcomes of this workshop will include (1) an introduction to data storytelling tools and methods, (2) a design of a lo-fi prototype of the participant's visualization or dashboard that includes storytelling elements, and (3) networking opportunities with researchers in the field.

We welcome novice and experts in data storytelling to participate and explore questions such as:

- What is data storytelling and how do we construct these visualizations?
- What are the key aspects of data storytelling for students and teachers?
- What are the challenges for the field?
- How does the field need to respond to these challenges?

2 PROGRAM

2.1 Schedule

The following activities have been planned for a full-day workshop:

1. Mini-lecture: data visualizations, visual cognition and visual attention (40 mins)
2. Mini-lecture: data storytelling (40 mins)
3. Mini-lecture: designing for learning dashboards (40 mins)
4. Discussion - social gathering (30 mins)
5. Tutorial: working with data visualizations and data storytelling (1 hr)
   a. Identifying potential stories/insights
   b. Choosing the visualisation that fits your data
   c. Linking visual elements with stories/insights
6. Hands-on activity: designing a visual data storytelling dashboard using your own dashboard/visualisation/graph (1 hr)
   a. Participants will be able to work in their own visualization/dashboard. We will group participants according to their interests and/or background.
7. Presentations (30 mins)
8. Concluding remarks (30 mins)

2.2 Participants and recruitment

This is an open tutorial. Participants will be required to register to attend the workshop.

We expect at least 20 participants to attend the workshop. We plan to recruit participants through social media (i.e. facebook, twitter). In addition we will create a webpage with all relevant information about the workshop.

2.3 Materials and equipment

- Now that the conference has moved to an online format, we will provide prior material in advance for participants. This will help participants to revise the material in advance if they are not able to participate in any part of the tutorial due to time differences.
- Zoom or any other video conferencing system will be used as a means of communication.
- Authors of this workshop will act as mentors and will provide assistance during hands-on activities.
- We will use different online tools to work collaboratively (i.e. miro, google slides) and additional tools to provide social presence (i.e. gather.town).
- It is expected that participants bring some sort of visualization or dashboard (it can be a low-fidelity prototype) to work on, as we will have a hands-on activity using the material they will bring.

REFERENCES

Use the JLA_BODY_REFERENCE style.
APA referencing style *http://guides.library.uwa.edu.au/c.php?g=324904&p=2809540*

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