

# A Tutorial on Data Storytelling Techniques for Learning Analytics Dashboards

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**ABSTRACT:** 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. Jivet, Scheffel, Drachsler, & Specht, 2017; 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, 2017), and the disalignment between teachers/students' needs and the learning analytics interfaces.

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.

This tutorial focuses on data storytelling, the ability to convey data not just in numbers or charts, but as a narrative that the audience can comprehend using storytelling foundations (e.g. plots, twists and calls to action; Lee, Riche, Isenberg and Carpendale (2015)). Data storytelling (DS), which builds on classic InfoVis guidelines (Tufté & Schmiege 1985), is a structured approach for communicating data insights, and it involves a combination of three key elements: *data*, *visuals*, and *narrative* (Dykes 2015). Narrative helps explain what the data and visualizations are conveying and why particular insights are important. Prior work on LA community has explored how these DS elements play an important role in supporting the understanding of complex learning data and how these elements drive teacher's attention when aligned to expected outcomes or learning goals (Echeverria et al. 2018a, 2018b). In short, this tutorial brings a practical approach for applying 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). This tutorial will enable researchers and practitioners to apply data storytelling techniques into their practice when designing learning dashboards.

Main activities of this tutorial will include: (1) an introduction to data storytelling tools and methods, (2) a hands-on activity for designing 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. Finally, it is also expected to build a community, particularly for educational data storytelling research.

## 2 PROGRAM

### 2.1 Schedule

The following activities have been planned for a half-day tutorial:

1. Introductions (30 mins)
2. Presentation: data storytelling (40 mins)
3. Discussion (20 mins)
4. Break - social gathering (15 mins)
5. Guided activity (Part 1): working with data visualizations and data storytelling (40 mins)
  - a. Identifying potential stories/insights
  - b. Choosing the visualization that fits your data
  - c. Linking visual elements with stories/insights
6. Lunch - networking (40 mins)
7. Guided activity (Part 2): working with data visualizations and data storytelling (40 mins)
  - a. Linking visual elements with stories/insights
  - b. Presentations
8. Concluding remarks (15 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 tutorial.

## 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 tutorial 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 and networking (i.e. gather.town).

Two types of participation are expected for the guided activity: 1) participants will bring some sort of visualization or dashboard (it can be a low-fidelity prototype) to work on; or 2) we will provide some examples they can work on.

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