Exploring Visualizations for Educational Materials

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The topics covered in STEM (Science, Technology, Engineering and Mathematics) disciplines are becoming increasingly complex and interdisciplinary, while teaching practices have largely remained confined to “pen-and-paper” techniques (Victor 2011). For example, Data Modeling brings together a variety of fields such as probability, set theory, linear algebra, statistics, and a range of programming languages, with each one of these using its own set of representations. Equipping students with the conceptual and practical tools necessary to understand modeling methods requires communicating the invisible connections and intuitions built up by experts over years of experience. How can we help bridge this gap of communication? Developments in the field of information visualization show how we might make such invisible connections more visible.

While keeping in mind concepts like the power of representations (Norman 1993) and levels of abstraction (Victor 2011), we implemented a prototype of an online “textbook” that uses visualization techniques to help bridge the gap between instructor’s intuitions and student’s learning. After conducting some interviews with data modeling instructors and practitioners, we decided to focus on the concept of an ‘error function.’ The website was built in HTML and CSS using the Twitter Bootstrap framework. Data visualizations were created in Matlab and edited using Adobe Indesign (Fig.1).

Our goal was not to redesign teaching practices, but to show how information visualization techniques can create rich educational materials for instructors and students. This exploratory interactive “textbook” presents a proof of concept for instructors interested in taking advantage of digital mediums to support learning.

Figure 1 - Animation showing the formation of an error surface

References:
