Making the Design of CSCL Analytics Interfaces a Co-design Process: The Case of Multimodal Teamwork in Healthcare

Roberto Martinez-Maldonado, Vanessa Echeverria, Doug Elliott, Carmen Axisa, Tamara Power, and Simon Buckingham Shum
roberto.martinez-maldonado@uts.edu.au, vanessa.echeverria@uts.edu.au, doug.elliott@uts.edu.au, carmen.axisa@uts.edu.au, tamara.power@uts.edu.au, simon.buckinghamshum@uts.edu.au
University of Technology Sydney, Australia

Abstract: Multimodal Learning Analytics innovations offer exciting opportunities for Computer-Supported Collaborative Learning (CSCL) practice and research, but they also make more evident the need to make the design of analytics tool into a horizontal, co-design process. The emergence of new algorithms and sensors can be a major breakthrough in the way CSCL research is conducted and automated feedback is provided. However, there still is a lack of research on how these innovations can be used by teachers and learners, as most existing systems are restricted to experimental research setups. This poster paper sheds light on the first steps that can be made towards making the design of CSCL analytics interfaces a co-design process where teachers, learners and other stakeholders become design partners.

Introduction and related work

The emergence of new algorithms and sensors that can track activity in both physical and digital spaces are making collocated activity visible and available for computational analysis, particularly for open-ended, unrestricted tasks that are closer to the kinds of activities that learners commonly face in professional placements (Blikstein and Worsley, 2018). This can be a major breakthrough in the way Computer-Supported Collaborative Learning (CSCL) research is conducted and automated feedback is provided. Moreover, there is a recent intention within the CSCL community to consider the physical and embodied characteristics of learners, the learning environment and the interactions that occur with and within this environment (as highlighted in the CSCL 2019 conference theme). There is currently however a lack of research on how Multimodal Learning Analytics (MMLA) innovations can support reflection and decision-making (Shankar et al., 2018), as most existing systems are restricted to experimental setups (Ochoa, 2017).

Design challenges for CSCL and Multimodal Learning Analytics

There is a small but growing interest in building a new generation of monitoring, awareness and reflection tools for f2f learning activities (see review in Rodríguez-Triana et al., 2017). A promising way to achieve this is to capture behavioural traces from co-present activities using sensors and logging capabilities of educational interfaces, analyse them, and create feedback mechanisms to support reflection and evidence-based practice (Blikstein and Worsley, 2018). In contrast to the significant effort that has been invested in automatically mining digital traces of online group experiences, where logs can be easily captured, much more needs to be done to invent ways to support f2f collaboration. However, the complexities of embedding yet another type of technology in authentic CSCL contexts may open a range of critical challenges for successful adoption.

We have identified, through our empirical work in the area of MMLA, the following challenges that motivate the need for making the design of effective CSCL interfaces a collaborative, horizontal co-design process (e.g. including teachers and learners throughout the design process, moving beyond initial consultation): 1) representations of multimodal, group data can be inherently complex (Di Mitri et al., 2018) hence the need for making the mapping from low level data to higher-order constructs explicit and transparent to stakeholders to facilitate sense-making (Martinez-Maldonado et al., 2019); 2) critical privacy issues may arise in tracking activity in a collocated setting, compared to fully online group settings, as sensing technologies may unintendingly capture more behavioural data than needed (Krontiris and Maisonneuve, 2011); 3) CSCL analytics interfaces would show data of more than one person hence the need for mechanisms to ensure privacy while endorsing visibility and accountability (Echeverria et al., 2019). Our paper contributes to address these challenges by motivating a five-step elicitation process to *design-for* effective use of CSCL visualisation systems with teachers and/or learners.

First steps towards co-designing effective CSCL interfaces

The overarching aim of our particular MMLA research is to provide automated feedback to nursing students working around patient manikins engaged in clinical simulations. These are commonly run as laboratory sessions in clinical classrooms equipped with 5-6 basic manikins located on hospital beds which produce indicators of a patients' health, respond to actions, and can be programmed to deteriorate over time. We have equipped the

environment and learners with a number of sensors (including microphones, indoor localisation badges and physiological wristbands) to track different aspects of the activity such as determining who is speaking, where nurses are in the space, arousal states and actions performed on the manikin. Quickly we realised that for creating automated feedback mechanisms or interfaces that promote reflection in this particular CSCL setting, a deep understanding of the area of healthcare simulation was needed and close collaboration with educators, learners, professional nurses, and other stakeholders was of utmost importance to craft interfaces that could be effectively used, orchestrated and appropriated by them.

We propose a five-step elicitation process to co-design for the effective use of CSCL systems. This articulates questions for diverse stakeholders that cover orchestration aspects and particular learning analytics co-design constructs into the process steps. Table 1 presents an overview of this process

Table 1: A five-step elicitation process to design for effective use of translucent CSCL systems.

Process step	Description
STEP 1 – WHO: Understand the people who are part of the classroom ecology, by describing the different roles/stakeholders.	This step includes questions to identify the key ***stakeholders*** in the CSCL situation, and the different ***roles*** that are actually active during the (classroom) activity.
STEP 2 – INFLUENCE & POWER: Mapping the influence of all roles on interaction/activity.	This step includes questions about the relationships of power and influence among the stakeholders and roles, including: ***influence*** **on other people**, ***power hierarchy***, ***influence on the learning design and influence on the adoption*** of the MMLA tool.
STEP 3 – QUESTIONING: Define the questions to be answered by the learning analytics solution or hypotheses/expectations that can be tested with evidence.	This step includes questions aimed at identifying the **classroom dynamics** that can be observed in regular classes and the common **questions** or **hypotheses** that can be confirmed or rejected based on evidence captured through the learning analytics.
STEP 4 – TRANSLUCENCE: Define the information different roles require for the classroom activity.	This step includes questions about the **data needs** and mechanisms to make data representations partly visible (translucent), by considering limitations on access and privacy issues.
STEP 5 - DESIGN FOR ORCHESTRATION: Translate the required information that lead to enhanced classroom orchestration.	This step includes questions about what different stakeholders can or cannot **do** with the information, **interaction aspects** and **practical orchestration aspects.**

Concluding remarks

The elicitation process to design for effective use of CSCL analytics systems is work in progress. Future work in this project will provide a template for mapping the outputs of co-design techniques into data representation and system requirements. Future work will also provide guidelines for other CSCL and learning analytics researchers for adapting a more detailed version of the elicitation process outlined above into their projects.

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