What do teachers learn about assessment via Co-Design of Game Dashboard

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Abstract: Increased use of educational technologies, such as games and simulations, requires classroom teachers develop new assessment literacies and practices related to understanding data affordances of playful learning environments. In this paper, we discuss how a co-design process that involves teachers to develop dashboards for an educational game can serve as a constructionist model of teacher professional development and report two ways the co-design process shifted teachers' understanding of assessment.

Introduction

Increased use of rich, interactive technologies such as games requires teachers to make sense of student performance from the volumes of data generated. These technologies are often equipped with teacher dashboards that display a variety of data, from low-level descriptive statistics (e.g. how many students in this class have finished Quiz 1) to machine learning driven predictions (e.g. who is likely to fail this class?). The increase of use of games in classrooms thus requires new practices around use of data and assessment. However, little is known about what teachers' assessment practices look like in game-based learning. For example, Nousiainen and colleagues (2018) report that teachers who are using games in classrooms should be able to envision evidence for learning using the collection of process-related data to plan how the game-based activity produces this evidence.

A question arises as to how professional development can support teacher adoption of innovative assessment practices. Co-design has been widely adopted in educational research as a form of design-based research (Penuel et al., 2007) where researchers, students, and teachers are all equal stakeholders who are co-constructing how educational innovations work in a particular place (Datnow et al., 1998). While still nascent, co-design also has been recognized as a form of professional development, especially to introduce innovative practices (Voogt et al., 2015). Teachers' learning from participating in a co-design process can be understood via the lens of constructionism (Papert & Harel, 1991). That is, teachers are actively constructing artifacts in collaboration with the design team, where the design team provides prompts, probes, interactive tools, and prototypes. Through this process, we expect teachers to adopt new insights and practices towards game-based assessment.

Method & Analysis

The research team implemented a 12-month co-design process with 8 practicing teachers (called *design fellows*) to develop analytics models and data visualizations for an online game, *Shadowspect.* The research team facilitated (1) 10 co-design workshops where the design fellows and research team participated in generative to identify and define learning analytics that the teachers value and need to act on, (2) individual think-aloud sessions with various iterations of the prototypes, (3) whole group and individual reflection of the co-design process.

Two researchers conducted thematic analysis (Braun & Clarke, 2014) by reviewing the pre- and post-interviews. The guiding question was, "*How were teachers thinking about the connection between assessment and student learning, and how did the co-design process play a role in shaping their understanding?*" Working independently, descriptive codes were generated; they were then reviewed together to either combine codes, generate new themes, or to reassess whether a new code might need to be applied to the original data.

Preliminary Findings

In general, teachers came into the co-design process with similar assumptions about assessment. The teachers reported utilizing assessment tools that showed what students could do in-the-moment through brief questions that reviewed material at the start or end of class. The digital tools teachers reportedly used did not encourage diving into the data. After participating in the co-design process, teachers demonstrated their thinking about assessment shifted in two key ways: (1) from skill/knowledge demonstration to process oriented and (2) from algorithms as "truth" in a black box to algorithms as products of human work that can be critiqued.

Themes	Pre-process perception and examples	Post-process perception and examples
Demonstration to Process	Teachers were primarily concerned with whether students demonstrated evidence for what they know by answering questions correctly, completely, and efficiently during assessment.	Teachers were encouraged to seek alternative representations of student thinking and process. Teacher 3 remarked a shift towards looking to see "if the process is sound and there's just a minor mistake that's affecting them from getting an end result." Teacher 2 further explained that "showing mathematical thinking is not just showing step by step processing, that's like procedural thinking."
Algorithms: Black Box to Human Product	Teachers did not consider algorithms as something that can be critiqued. Teacher 1 saw the algorithms associated with learning platforms as being able to calculate a "truth": "I trust a calculator, so I trust this program too."	Teacher 1 pivoted in their exit interview to describe algorithms as a product of "choosing what it is that fits into the measurement." Teacher 4 elaborated how describing algorithms as choices breaks them out of obscurity, "unboxing of what's kind of happening." They go on to describe that, "there usually isn't a great support system around it unless it's other teachers," demonstrating how important it is that designers are able to explain the inner workings of the algorithm. Teacher 5 summarizes this ultimate connection between algorithm and designer as ultimately being important for use: "I'm very willing to take a lot of these algorithms on faith as long as I have a kind of higher-level faith in the people who have made the product."

Discussions and Implications

This study provides an opportunity to investigate how a co-design process can help teachers to learn emerging practices for assessment and critically reflect on conventional assumptions for assessment and common tools. Creating opportunities for teachers to play with their own understanding of students alongside dashboard prototypes supported the change in perspectives.

While this analysis focuses on the bookends of the co-design experience, further investigation into this data will allow the research team to construct an understanding of which activities led to the greatest shift in teacher thinking as well as further theorizing how to design a co-design process to support teachers' learning. Furthermore, this work of co-design as a constructionist activity can be expanded into other domains to identify its value beyond that of student assessment and data collection.

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