

Rice University Center for Digital Learning and Scholarship

Introduction

An old argument has reemerged: recent advances in technology have the potential to fundamentally alter how teachers teach, and how students learn.

Simultaneously, we have witnessed the growth of a new tech bubble—educational technology—as entrepreneurs, venture and hedge funds, and philanthropists rush to create the latest and greatest tool (Cavanagh, 2013; Davis, 2013).

There are still major barriers that limit technology's potential impact on K-12 classrooms:

- Teacher technology content knowledge
- Teacher beliefs and attitudes
- Time
- Access to technology

Technology design: “Tools risk being at best underused and at worst irrelevant if educational technology designers do not take into account the needs of educators and how they adapt technology to meet their local needs” (Cho & Wayman, in press; Means, Padilla, DeBarger, & Bakia, 2009).

Objectives

This study had two objectives:

1. To uncover how teachers use, *perceive* their use, and feel about one specific K-12 science curriculum program and data dashboard
2. To document and discuss the roles of master science teachers in revising and improving the curriculum and dashboard

Literature Review

Technology in education: Can edtech live up to its hype?

- Benefits are contingent on how technologies are used
- Barriers to use:
 - Time to integrate technology
 - Training and knowledge about technology
 - Access to technology in and out of the classroom
- End users and edtech designers are not always on the same page
 - Intended vs. actual use—**sensemaking** (Weick, 1995; Coburn, 2001; Datnow, 2006; Palmer & Snodgrass Rangel, 2011) and **interpretive flexibility** (Cho & Wayman, in press)
- Where does that leave us?
 - Design-based research (Barab & Squire, 2004; Cobb, diSessa, Lehrer, & Schauble, 2003)

Research Questions

1. How do X-STEM teachers report using the curriculum and dashboard?
 - a. Does reported use align with actual use?
 - b. Do reported and actual use align with intended use, as articulated by the curriculum designers?
2. What are X-STEM teachers' attitudes about the curriculum and dashboard?
 - a. Do these attitudes differ from teachers who use different science curricula?
 - b. Do different attitudes correlate to different levels and/or patterns of use?
3. What role do teachers play in revising the X-STEM curriculum and dashboard?
 - a. What changes and improvements were recommended?
 - b. Does their participation affect their attitudes toward the curriculum and dashboard?

Methods

Quantitative:

- Survey analysis

Curriculum	n	Response rate
X-STEM	210	28%
non-X-STEM	103	14%

- Analytics analysis

Analyses
Correlations between three reported use variables and four actual use variables
Correlations between teachers' reported use of the curriculum in its intended sequence and their actual sequence of use
Independent samples t-tests to determine if X-STEM and non-X-STEM teachers varied in their survey responses
Correlations between teachers' attitudes (i.e. attitudes toward science, technology, X-STEM, and the X-STEM dashboard) and reported and actual use

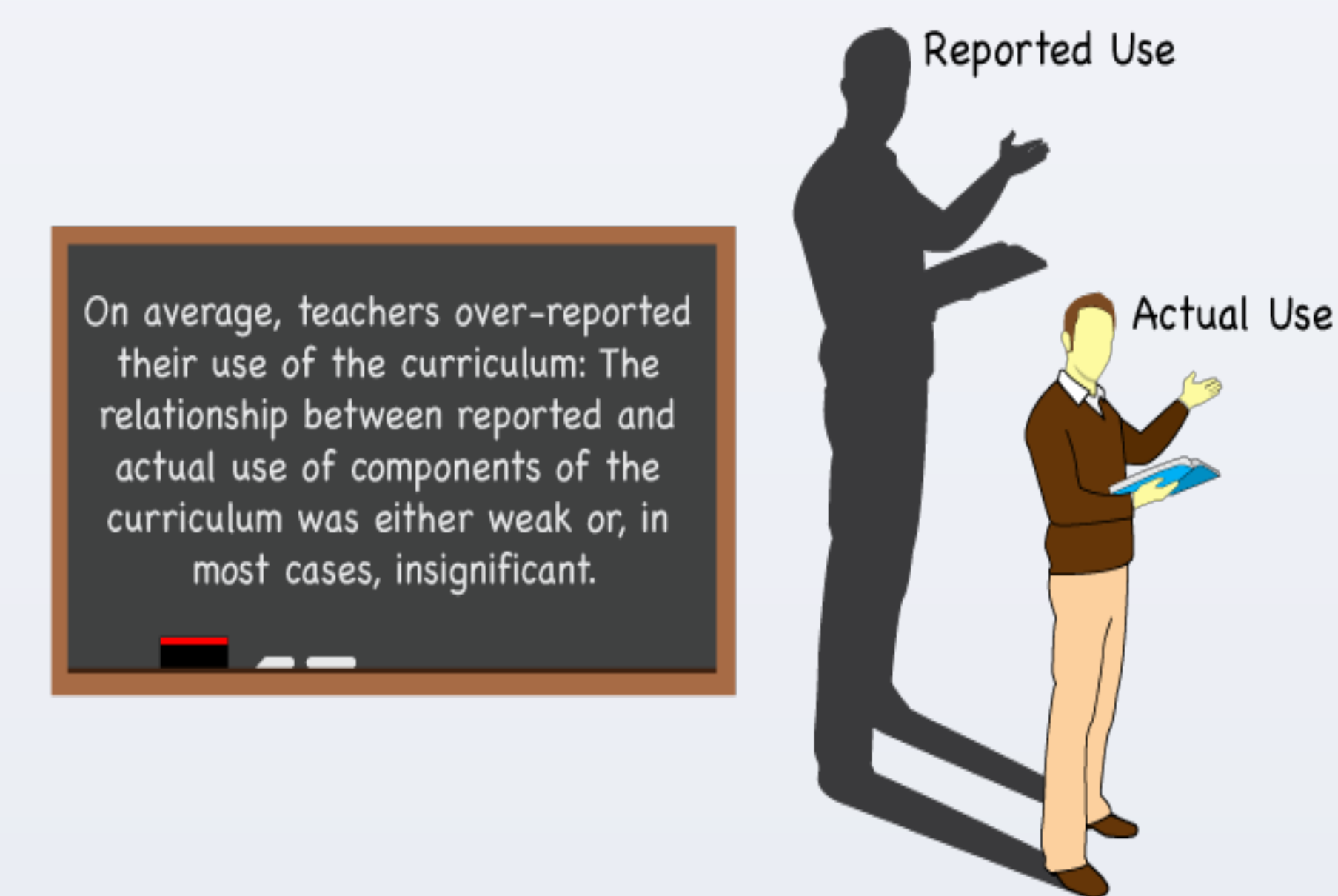
Qualitative:

- Focus group and questionnaire with 17 master elementary science teachers
- Follow-up interviews with four of the master teachers
 - Describing and categorizing teachers' responses to the questionnaire and during the focus group
 - Describing and categorizing responses during follow-up interviews

Results

Research Questions 1a and 1b:

- Teachers reported using X-STEM for some to most of the objectives they taught. However, there was much more variability in actual use according to the data analytics.



Research Question 2a:

	non-X STEM teachers	X STEM Teachers
Technology in the classroom	2.48	2.44
Attitudes toward science	3.42	3.31
Attitudes toward technology	3.24	3.31
District common understanding of science	2.90	2.95
Support for teaching science	2.27	2.60*
Science in your school	2.69	2.82
How often teachers access curriculum website	2.03	4.11*
Attitudes toward science curriculum	2.58	3.22*
Attitudes toward curriculum dashboard	2.53	2.98*

Note. The range of responses for Technology in the classroom and Access to website are 1-5 and for attitudes and support are 1-4 with higher scores indicating more positive attitudes. * $p < .05$

Research Question 2b:

- No significant correlations between teachers' attitudes toward science and technology and their reported or actual use of X-STEM.
- Teachers who had more positive attitudes about X-STEM and the X-STEM dashboard reported more frequent use of the curriculum and visited the 5E components more frequently, although these correlations were small.

Research Question 3:

- Some teachers were not aware of the X-STEM dashboard, but some gave specific feedback—much of it was oriented toward progress-monitoring for their students
- What teachers wanted depended on their role—science coaches or curriculum specialists wanted to see data for teacher use in addition to student data
- The process of giving direct feedback on the curriculum and the dashboard design improved the teachers' attitudes toward and reported use of both
- Teachers also talked about the challenges they continued to face when implementing a blended curriculum model—specifically, access to computers in their classrooms

Discussion

- By harnessing the power of learning analytics, the study employed a relatively new technique that has tremendous potential for learning about technology use
- The gap between teacher's reported use of the curriculum and their actual use echoes existing findings that teachers' beliefs and perceptions often are disconnected from their actual behaviors
- We provide further evidence of the existence of a disconnect between how the designers intended for a technology to be used and how teachers actually use the technology
- While teacher training on a new technology may be necessary, it is not sufficient for ensuring 'good' use of the tool
- Technology and curriculum designers need to embrace the reality of flexibility by ensuring their products are not so rigid that they will only work if implemented as intended
- While technology might have the *potential* to revolutionize and 'disrupt' education, any change is contingent on how the technology is (or is not) integrated into the daily work of school.

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