TEACHING
AND TEACHER
EDUCATION
An International Journal of
Research and Studies

Understanding the relationship between teachers' use of online demonstration videos and fidelity of implementation in *MyTeachingPartner-Math/Science*

CrossMark

Emily A. Barton[*], Jessica V. Whittaker, Mable B. Kinzie, Jamie DeCoster, Emily Furnari

University of Virginia, Curry School of Education, 405 Emmet Street South, Charlottesville, VA 22904, USA

HIGHLIGHTS

- Positive relationship between demonstration video viewing and curricular fidelity.
- Potential benefit of demonstration videos not maximized due to varied and low use.
- Most teachers chose demonstration videos to watch based on self-identified need.
- Teachers identified video characteristics as useful for fidelity of implementation.

ARTICLE INFO

1. Introduction

Evidence-based curricular programs are the current gold standard in early childhood education, linked to improved student outcomes and holding potential to reduce the achievement gap (Pianta, Barnett, Burchinal, & Thornburg, 2009). In order to effect widespread change in student learning, high-quality curricula need to be implemented at scale with high fidelity of implementation (FOI; Coburn, 2003; Clements, Sarama, Wolfe, & Spitler, 2015). Curricular FOI is the degree to which curricula are carried out as intended by developers (Berkel, Mauricio, Schoenfelder, & Sandler,

2011; Durlak & DuPre, 2008). One critical element of FOI we examine in this study is teachers' adherence to the core curricular components including materials, routines, and strategies. Unfortunately, FOI for early childhood curricula often varies by teacher, creating appreciably different experiences and ultimately, outcomes, for children (Lieber et al., 2009; Zaslow, Tout, Halle, Whittaker, & Lavelle, 2010). Thus, supporting FOI is necessary to achieve the potential benefits of high-quality curricula.

Professional development (PD) formats that support curricular FOI, such as workshops and coaching (Clements & Sarama, 2008; Starkey, Klein, & Wakeley, 2004), require substantial financial and human resources (Knight, 2014; TNTP, 2015). In sustainable curricular scale-up, districts, as opposed to curricula developers, must provide manageable PD supports for FOI that are less resource intensive (Coburn, 2003). FOI supports that allow for independent, teacher-driven PD engagement (Clements et al., 2015) could supplement more resource intensive and cost prohibitive PD and increase feasibility for school districts.

Internet-based resources allow for the provision of "just in time" supports (Romiszowski, 1997), or resources that can be used in the moment, while planning to teach a lesson (Dede, Jass Ketelhut, Whitehouse, Breit, & McCloskey, 2009; Gill, 2011). Teachers perceive pacing, flexibility, and convenient access as benefits of online PD (McNamara, 2010). However, provision of more resources does not necessarily mean more teacher use, especially in cases where teachers have agency over which resources they use and how often they use them (Kinzie, Whittaker, McGuire, Lee, & Kilday, 2015; Powell, Diamond, & Koehler, 2010). While researchers are beginning to examine characteristics of coaching that support FOI (Paxton, Wanless, & Rimm-Kauffman, 2013), little is known about the relationship between online supports (e.g.,

* Corresponding author.
E-mail addresses: eb6cu@virginia.edu (E.A. Barton), jew9t@virginia.edu (J.V. Whittaker), kinzie@virginia.edu (M.B. Kinzie), jamied@virginia.edu (J. DeCoster), ecf2w@virginia.edu (E. Furnari).

demonstration video exemplars) and teachers' FOI. Isolating and examining teachers' use of online PD resources, their relationship with teachers' FOI, and teachers' perceived usefulness of those online supports can inform the design of future online curricular support systems.

In this study, we examine the use of online curricular demonstration videos, video exemplars of high-quality and high-fidelity implementation of specific teaching practices (Pianta, Mashburn, Downer, Hamre, & Justice, 2008). We seek to explore the relationship between early childhood teachers' use of online demonstration videos and their FOI of the *MyTeachingPartner-Math/Science (MTP-M/S)* early childhood mathematics and science curricula. Observing other teachers' instruction through videos is a common technique for teacher training (Borko, Jacobs, Eiteljorg, & Pittman, 2008; Star & Strickland, 2008). However, in studies published to-date, researchers have not yet examined if viewing video exemplars is positively associated with teachers' own FOI.

In order to better understand teachers' use of online PD resources, we qualitatively examine teachers' perceptions of the usefulness of online demonstration videos in supporting their FOI. Using a sequential mixed methods explanatory design, we draw on the strengths of numeric data to establish a significant positive relationship between demonstration video viewing and FOI. Then, we draw on the strengths of narrative data, employing elements of grounded theory (Charmaz & Belgrave, 2012; Strauss & Corbin, 1998), to further understand why teachers choose to use the videos or not.

1.1. Defining and measuring fidelity of implementation

Berkel et al.'s (2011) model of program implementation includes fidelity, quality of implementation, adaptation, and participant responsiveness. In this study, we focus on curricular fidelity of implementation (FOI), or the extent to which teachers adhere to the lesson design and carry out the actual components or steps in an activity as presented in the curriculum (e.g., Piasta, Justice, McGinty, Mashburn, & Slocum, 2015). For example, as illustrated in Fig. 1, each *MTP-M/S* activity includes an "*Investigate*" section comprised of a series of steps to guide students' inquiry (Kinzie et al., 2015). One indicator of adherence to an *MTP-M/S* activity is the completion of each investigation step. While we recognize that FOI can be considered more broadly as a multifaceted construct including but not limited to measures of dosage, quality, adaptation, and responsiveness (Berkel et al., 2011; Durlak & DuPre, 2008; O'Donnell, 2008), we use this narrower, adherence-focused definition of FOI based on instructional design of the demonstration videos to specifically show activities carried out as intended. Our confirmatory questions and hypotheses are based on our belief that the videos will have a primary influence on adherence to the curricular design.

FOI is of key importance in interpreting if outcomes are a true reflection of an intervention's effect. In others words, they can help, "distinguish between intervention failure and implementation failure" (Abry, Hulleman, & Rimm-Kaufman, 2015, p. 321). If an intervention is delivered with low fidelity, positive effects are not necessarily attributable to the intervention, and negative or null effects are not necessarily evidence of an unsuccessful intervention (Wang, Nojan, Strom, & Walberg, 1984; Durlak & DuPre, 2008). Investigations of preschool science (Gropen, Clark-Chiarelli, Ehrlich, & Thieu, 2011), literacy (Davidson, Fields, & Yang, 2009), and mathematics (Kinzie et al., 2015) curricula have found higher FOI to be positively associated with gains in students' skills. Findings such as these lend support for the importance of designing curricular support packages to specifically target teachers' FOI and examining FOI as a moderator of curricular effects.

1.2. Fidelity of implementation for sustainable curricular scale up

Sustainable curricular scale up — the degree to which curricula can be implemented over time in diverse contexts with continued fidelity to the curricular design (Coburn, 2003; Dede, 2006) — is of growing concern in the field of educational research (Century & Cassata, 2014). Ultimately, school districts need to sustain curricula with fewer financial and human resources than may have been available in the initial implementation (Fishman, Marx, Blumenfeld, & Soloway, 2004). Lack of resources might contribute to low levels of program sustenance, as in the case of *First Step,* a program supporting students' replacement of problem behaviors with positive behaviors both at school and home (Sumi et al., 2012). Despite positive academic and behavioral outcomes, only one of five sites maintained use of the program after a scale-up trial.

Recent studies and discussions of curricular sustainability emphasize the continued importance of FOI (Clements et al., 2015; Fishman, Penuel, Hegedus, & Roschelle, 2011; Layzer, 2013) beyond initial establishment of positive curricular effects. Sustained FOI is moderated by teachers' initial degree of implementation fidelity (Clements et al., 2015; Lieber et al., 2010). Teachers showing high FOI at the start of a study are better able to maintain implementation fidelity over time (Clements et al., 2015; Wenz-Gross & Upshur, 2012) and are more likely to continue to use curricula beyond an implementation trial (Lieber et al., 2010). Effective, independently accessible, and less resource-intensive supports hold promise both for initially increasing and sustaining high curricular FOI, maximizing the impacts of evidence-based curricula on student outcomes by establishing and maintaining treatment strength.

1.3. Online support for teachers' fidelity of implementation

Curriculum developers are shifting both formal, in-person PD formats (e.g., workshops, coaching), and independently accessible, teacher-selected PD resources (e.g., demonstration videos), online with promising results (Downer, Kraft-Sayre, & Pianta, 2009; Hamre, Pianta, Mashburn, & Downer, 2012; Powell, Diamond, Burchinal, & Koehler, 2010). Online PD increases flexibility and decreases travel costs while maintaining or extending geographic reach (Dede et al., 2009). Although evidence suggests the viability of online curricular guidance as an alternative to in-person support in terms of the impact on student learning gains (e.g., Powell, Diamond, Burchinal et al., 2010), curricular implementation interventions finding consistently high FOI often provide costly formal PD formats such as workshop series and intensive instructional coaching (Clements & Sarama, 2008; Knight, 2014; Starkey et al., 2004; TNTP, 2015). Online curricular resources, Internet-based supports providing instructional guidance and models, are a scalable and affordable alternative to promote successful curricular implementation leading to positive gains in student outcomes (Downer et al., 2011; Hamre et al., 2010).

The provision of online curricular resources also allows for increased teacher agency in self-selecting independently accessible supports, but there are mixed findings as to their relative value. Pianta et al. (2008) found teachers receiving both coaching and access to website resources that included video exemplars of high quality interactions had significantly greater improvement in classroom interactions than teachers with access to the website only, controlling for teacher and classroom characteristics. However, for those teachers with access to the website alone, higher usage rates, measured by page views, were associated with greater gains in classroom interaction quality. It seems there was value in the website resources independent of coaching, but they were most effective when used in a blended model. Contrary to Pianta et al.'s