Chapter 19
What Do Primary Teachers Take Away From Mathematics Professional Development?
Examining Teachers' Use of Formative Assessment

Christie Martin
University of South Carolina at Columbus, USA

Drew Polly
University of North Carolina at Charlotte, USA

Chuang Wang
University of North Carolina at Charlotte, USA

Richard Lambert
University of North Carolina at Charlotte, USA

David Pugalee
University of North Carolina at Charlotte, USA

ABSTRACT

This chapter shares the findings from a year-long professional development (PD) experience, Assessment Practices to Support Mathematics Learning and Understanding for Students (APLUS). The project provided over 80 hours of professional development to primary teachers regarding their use of an internet-based formative assessment system for their students' mathematics achievement. This inductive study used purposeful sampling to explicitly compare data for high fidelity and low fidelity teacher-participants in the professional development project. High fidelity teachers expressed beliefs that formative assessment supported their mathematics teaching, improved their students' learning, and was feasible to carry out in their classrooms. Low fidelity teachers conveyed challenges that prevented them from engaging in the program as intended. Implications for future online professional development designs are to create more activities that foster deeper analysis and reflection, identify high fidelity teachers that could serve as mentors, and provide support for low fidelity teachers.

INTRODUCTION

In an effort to support teachers' mathematics instruction, professional development programs are commonly viewed as a mechanism to positively support teachers and also improve student achievement (Borko, 2004; Loucks-Horsley et al., 2010). Mathematics professional development projects are most effective when they simultaneously can support teachers' development of knowledge related to content and pedagogy as well as how students develop an understanding of fundamental mathematics concepts. One of the high-leverage teaching practices that has gained attention in the literature is formative assessment, specifically examining students' mathematical thinking, analyzing data, and then making sound instructional decisions based on that information (Hattie, 2012; Wiliam, 2007a; Wiliam, 2007b). Teachers who are able to effectively carry out a formative assessment process have been empirically linked to gains in their students' mathematics achievement (Polly et al., 2014; Wiliam & Thompson, 2007).

This chapter presents a study in which we analyzed participants who completed a professional development project designed to support primary school teachers' use of an internet-based mathematics formative assessment system to support their mathematics teaching. Teachers participated in an 80-hour learning experience and data was collected on their use of the assessment system, their responses to reflection prompts, and their students' scores in the formative assessment system.

BACKGROUND

Formative Assessment in Mathematics

The purpose of formative assessment is to elicit and collect data that directly impacts instruction for individual learners (Koellner, Colsman, & Risley, 2009). Further, when working on activities related to formative assessment, teachers must connect evidence with instruction, which in turn requires them to understand and apply their expertise of learning progressions and how students best learn (Wiliam, 2007a, 2010). To that end, research on formative assessment has noted that the process is only valuable to the teaching and learning when the data is closely examined to modify instructional goals, instructional activities, and instructional pedagogies (Black, Harrison, Lee, Marshall, & Wiliam, 2004; Heritage, 2007).

Formative assessment processes can positively impact student learning. Formative assessment has been empirically associated with gains in student learning, teachers' increased knowledge of their students' understanding, and an increase in the alignment of instructional activities to students' abilities (Polly et al., 2014; Black & Wiliam, 1998; Wiliam, 2007b). With students who are at-risk and performing below grade level expectations, formative assessment and data-based instructional decisions can improve students' learning in struggling areas (Fuchs & Fuchs, 1986). Formative assessment helps teachers to access and honor students' mathematical knowledge and the resources they bring to the classroom individually (Kalinec-Craig, 2017). Pryor and Crossouard (2008) highlight the difference between convergent and divergent types of formative assessment. Convergent focuses on eliciting responses that are aligned with the teacher's expectations; this narrows the accepted responses and may cause greater inequities. Divergent formative assessment allows opportunity to express mathematical thinking and multiple strategies. In order for data from divergent formative assessment to support learning the classroom environment should include rich discussion that gives each student opportunity to express their understanding (Pryor & Crossouard, 2008).

Related Content

Exploring the Development of Pre-Service Teachers' ICT-TPACK Using a Cognitive Stimulation Tool

Syh-Jong Jangand Meng-Fang Tsai (2018). *Teacher Training and Professional Development: Concepts, Methodologies, Tools, and Applications (pp. 757-784).*

www.irma-international.org/chapter/exploring-the-development-of-pre-service-teachers-ict-tpack-using-a-cognitive-stimulation-tool/203204

Instructional Change Through Collaboration and Peer Coaching

 (2020). *Practice-Based Professional Development in Education (pp. 118-145).*

www.irma-international.org/chapter/instructional-change-through-collaboration-and-peer-coaching/253507

Routine Outcome Measurement and the Development of the Australian Mental Health Workforce: The First 25 Years of Implementation Are the Hardest

Tim Coombs, Philip Burgess, Rosemary Dicksonand Roderick McKay (2017). *Workforce Development Theory and Practice in the Mental Health Sector (pp. 302-316).*

www.irma-international.org/chapter/routine-outcome-measurement-and-the-development-of-the-australian-mental-health-workforce/171518

Teacher Training in 3D Virtual Worlds: Understanding Immersive Learning for Teaching Practices

Yi Fei Wang (2018). *Teacher Training and Professional Development: Concepts, Methodologies, Tools, and Applications (pp. 1422-1442).*

www.irma-international.org/chapter/teacher-training-in-3d-virtual-worlds/203236

Learning While Teaching: Teacher Candidates Working With University ESL Students

Yukari Takimoto Amosand Nicki Kukar (2019). *Handbook of Research on Educator Preparation and Professional Learning (pp. 100-130).*

www.irma-international.org/chapter/learning-while-teaching/228000