Chapter 10
Defining and Designing Responsive Online Professional Development (ROPD): A Framework to Support Curriculum Implementation

Jeremy Riel
University of Illinois at Chicago, USA

Kimberly A. Lawless
University of Illinois at Chicago, USA

Scott W. Brown
University of Connecticut, USA

ABSTRACT

Teacher professional development programs typically do not meet teachers' ongoing, long-term needs that arise. In this chapter, the authors forward a systematic framework called responsive online professional development (ROPD) that can be used by instructional designers to provide continuous, online PD for teachers in the service of curriculum implementation fidelity. The systematic process afforded by the ROPD framework promotes teachers' reflection on their individual classroom practice as they implement new curricula or standards and provides support to teachers as they are implementing new curricula, standards, and pedagogies. Design elements of the proposed ROPD framework are discussed by the authors, and an illustrative example of the implementation and observed outcomes of a previously enacted ROPD Program (GE2PD) are discussed. When compared to conventional PD programs, professional growth from ROPD is emphasized during the implementation process through a systematic approach that intentionally connect teachers with the instructional designers of a curriculum.

DOI: 10.4018/978-1-5225-2399-4.ch010

INTRODUCTION

When policy makers and school district leadership require new pedagogies and standards, teachers are required to implement these methods in their classrooms with high fidelity (Dutro, Fisk, Koch, Roop, & Wixson, 2002; Marrongelle, Sztajin, & Smith, 2013). As such, formal education presents two layers of learning in any given classroom: the everyday learning of students from their curricular activities, and the professional learning by teachers as they go about their daily work. As teachers are ultimately responsible for implementation, professional development (PD) is essential for preparing teachers to teach with educational reforms and adopt new pedagogical strategies (Hochberg & Desimone, 2010; Schnellert, Butler, & Higginson, 2008). However, PD programs that operate as one-time workshops or seminars typically do not meet teachers' ongoing, long-term needs that arise as they are implementing new methods. To ensure that teachers are well versed in how to conduct the pedagogies and activities in the particular contexts of their own classrooms and schools, many scholars have argued for more extensive, continuous PD programs (Lawless & Pellegrino, 2007; Penuel, Fishman, Yamaguchi, & Gallagher, 2007).

In this chapter, the authors forward a framework called *responsive online professional development (ROPD)* that can be used by instructional designers of novel curricula to provide continuous, online PD for teachers in the service of curriculum implementation fidelity. The systematic process afforded by the ROPD framework promotes teachers' reflection on their individual classroom practice as they implement new curricula or standards and provides support to teachers *in situ as needs emerge*. As such, ROPD emphasizes systems for expert support and ongoing iterative improvement of classroom curricular and pedagogical implementation.

PRINCIPLES FOR PROFESSIONAL DEVELOPMENT DESIGN IN SUPPORT OF CURRICULUM IMPLEMENTATION

Over the last three decades, there have been many types of teacher PD programs that operate under different timeframes. Previous reviews of teacher PD programs have indicated that programs typically have teachers participate in "one-shot", up-front, one-time programs ranging from one hour to one week (Lawless & Pellegrino, 2007; Garet, Porter, Desimone, & Birman, 2009). However, research has documented that PD interventions that have participants spend more time have been found to increase both teacher and student learning outcomes and increase practice and professional reflection (Dede et al., 2008; Penuel et al., 2007). These longer-term PD interventions should be specifically developed to de-emphasize memorization, promote reflection, and encourage teachers to implement new skills, pedagogies, and curricula over time in order to be effective (Lawless & Pellegrino, 2007).

In addition to the length of time that teachers spend in PD, research in professional learning over the last 20 years have demonstrated the importance of *reflection* as a process of professional growth. As such, processes of reflection should be promoted in PD. Teachers make sense of their experiences through continual reflection, which involves teachers' perceptions, analysis, and inferences about what happens in their classrooms (Gikandi, 2013; Hoban & Hastings, 2006). Regular opportunities for reflection provide teachers with an opportunity to analyze their own experiences and practice and to gain insights on how their students learn (Hammerness, Darling-Hammond, Bransford, Berliner, Cochran-Smith, McDonald, & Zeichner, 2005). Reflective opportunities also provide coaches and support staff with important empirical information about the events that are occurring in teachers' classrooms. In effect, reflections can

give an opportunity for instructional designers to "listen to the teachers" and adapt curriculum based on their needs and the challenges they face (Riel, Lawless, & Brown, 2016a).

In addition to the professional learning principle of reflection, teacher professional development programs should also be designed based on the principle of *ongoing support*. In the service of curriculum implementation fidelity, ongoing support from instructional designers that respond to emergent needs can promote learning and beneficial changes in teacher practice (Flint, Zisook, & Fisher, 2011; Green & Cifuentes, 2008). Teachers cannot be immediately expected to completely understand the motivations and have the required skills to enact new curriculum. For PD to be effective, long-term coaching and dedicated support should be available to teachers to provide helpful reminders and notifications of valuable resources as they became important (Mushayikwa & Lubben, 2009). Long-term PD and dedicated support reduces the one-time, up-front PD memorization burden of teachers and allows teachers to try new practices with opportunities for feedback from experienced teachers and instructional designers. For example, Anderson et al. (2011) found that a dedicated staff providing regular technical, pedagogical, and curricular help as requests come up can help ease the implementation process of new curricula. Teachers should be continually supported if they are to implement a curriculum with a high degree of fidelity of implementation to the intent of the instructional designers (Ertmer & Simons, 2006; Hoekstra & Korthagen, 2011). A dedicated support staff can specialize in supporting teachers' implementation, which can make the implementation process a constructive experience.

Access to information is also useful for teachers. Weekly ROPD reflection-support cycles should also include an online library of resources should always be available for teachers in an ROPD. Newcomers to any novel pedagogy or curriculum will not likely immediately memorize all the necessary information beforehand for successful implementation (Ball, & Cohen, 1996; Drake, Land, & Tyminski, 2014). To support ongoing growth, teachers should have persistent access to supportive materials and information (e.g., teaching examples, lesson plans, guidebooks, multimedia, handouts) that can be readily used in class to facilitate intended activities.

THE ROPD FRAMEWORK: A PROCESS FOR INSTRUCTIONAL DESIGNERS TO RESPOND TO AND UNDERSTAND EVERYDAY TEACHER NEEDS

Responsive Online Professional Development (ROPD) is a solution to meeting the ongoing challenges of teachers when implementing new curricula or learning new skills. ROPD is a framework for systematic *responsive* support as teachers learn in formal PD that leverages what is known about professional learning to systematically provide supportive structures for successful teacher implementation of new curricula. It should not be expected that teachers that are new to a curriculum will be immediately able to implement it in the exact way that instructional designers intended. Teachers implementing a new curriculum or pedagogical approach will experience practical challenges specific to their classrooms that designers cannot anticipate as they design the curriculum. In the ROPD framework, instructional designers take responsibility for, and are committed to, responding to the implementation needs of teachers as they emerge. Thus, ROPD is a systematic process to link dedicated curriculum experts with practitioners to address challenges as they arise and to ensure that curricula are being implemented as intended in a collaborative effort.

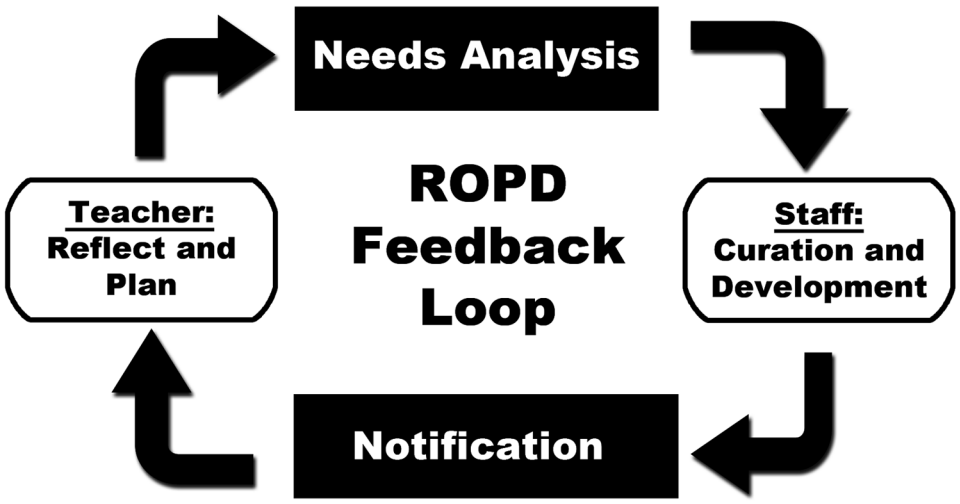
One-time PD courses are not made obsolete by ROPD. One-time programs are essential to provide basic familiarity with the core features, concepts, and procedures associated with new curricula and pedago-

gies. The ROPD framework is strategically employed by instructional designers alongside one-time PD to offload the immediate requirement of information memorization and to support learning during the process of implementation. As such, the primary goals for one-time PD workshops are for participants to gain a basic familiarity with the key concepts that will be encountered during their work and to know where and how to find on-demand resources when issues arise. In short, one-time PD should provide enough information to begin working with new curricula and pedagogies, and to prepare participants to be successful with long-term ROPD.

Based on the principles of *reflection* and *ongoing support* that are known to support teachers' learning of new curricula, the ROPD framework calls for a systematic approach to facilitate communication between *instructional designers* and *teachers*. In other words, instructional designers do not abandon teachers as they learn to implement new curricula. Instead, the groups work together toward the common goal of curriculum implementation fidelity. The ROPD framework promotes communication between these two groups via weekly *feedback loop* cycles. The feedback loop maintains a constructive dialogue between teachers and support staff, which results in specific recommendations for practice and the development of new resources that teachers can use to support their work.

As illustrated in Figure 1, four steps occur in each ROPD cycle, with each step founded on the principles of learning new curricula discussed in the sections above. In examples of previously enacted ROPD interventions (e.g., Riel, Lawless, Brown, & Lynn, 2015), a week-long ROPD cycle works well as it is a natural unit of time for a classroom teacher using a five-day teaching schedule. Thus, the four steps of an ROPD cycle follow sequentially within any given week, and cycles are repeated indefinitely until either curriculum implementation stops or a break is desired for ROPD program evaluation.

Figure 1. The Responsive Online Professional Development (ROPD) framework. The key feature of the framework is an opportunity for instructional designers to facilitate activities with teachers within a continuous feedback loop.



Step 1: Reflective Journaling

Each week starts with a *reflective* component of the cycle, based on the PD principle that teachers learn as a result of experiencing and reflecting upon everyday practice. Setting aside time for reflection in an ROPD intervention gives teachers the opportunity to consider how classroom activities went in the previous week, plan activities and changes they want to try the next week, communicate any challenges that they faced the previous week to the support staff, and receive new coaching resources from the support staff. Despite the professional learning benefits of reflection, teachers' reflective practices may not be well developed (Killeavy & Moloney, 2010). Online journaling activities that have flexible journal prompts and open sharing among participants can be effective for facilitating teacher reflection (Gikandi, 2013). In addition, reflective teacher logs can also be used to support professional development, as a curricular support staff can subsequently review teachers' journals to identify areas in which teachers need help (Rowan, Camburn, & Correnti, 2004). Thus, structured weekly prompts that are completed online can provide an easy format for facilitating the teachers' reflective and planning processes, as well as to provide real-time curriculum implementation information to a support staff of instructional designers.

Step 2: Needs Analysis

The support staff must solicit feedback from the teachers in order to understand how a curriculum is being implemented. In the second step of the ROPD framework, instructional designers can use teachers' regular reflections to better understand implementation challenges as they occur. As such, the instructional designers, serving as a *dedicated support staff*, review regularly submitted teacher reflections and identify challenges that can be addressed through the needs analysis. Needs analysis is a semi-formalized procedure of systematically reviewing teachers' expressed concerns and challenges and developing items on which to take action to support the teachers. Methods that solicit information on and investigate the pedagogical and curricular events in classrooms are essential for the dedicated support staff to provide responsive feedback to teachers on their implementation. An example of this occurs in a previous ROPD study in which the authors developed a formal inductive approach for analyzing classroom events as reported by teachers in their weekly teacher logs (Riel, Lawless, & Brown, 2016a).

Step 3: Support Staff Curation

The third component of ROPD aligns with the principle of professional learning that holds that teachers who are learning new skills, knowledge, and ideas need community and expert interaction in order to continually refine their understanding (Hammerness et al., 2005). In the ROPD framework, experts and dedicated support staff can provide critical and timely feedback for teachers on their own practice from an outside perspective, which may be difficult to identify via reflection alone (Bonk, Ehman, Hixon, & Yamagata-Lynch, 2002). The primary goal of the support staff is to *respond* to teachers' expressed implementation issues that are identified in the needs analysis in Step 2 of the framework. This step of the framework has an added effect of making teachers a collaborative and critical part of the curriculum implementation process through iterative design changes, adaptations, and employing strategies to address particular contextual challenges. In this step, the support staff promotes teacher learning by curating an online collection of on-demand resources for each cycle in response to teacher needs. These resources can be accessed on-demand by any teacher at any time via an online permanent resource library.

Step 4: Notification

Once a collection of resources has been assembled to respond to issues in the needs analysis, teachers are notified of the week's curated responsive content. Email systems and SMS text messages can particularly useful in this process, as both systems have the ability to unobtrusively track teachers' interactions with the notifications. This allows the support staff to know if teachers have seen notifications or have used any of the given resources. Embedded in notifications are links to navigate to responsive content that address teachers' needs.

AN EXAMPLE OF ROPD IN ACTION: THE GLOBALED 2 ROPD PROGRAM

About GlobalEd 2 and the GlobalEd 2 ROPD Program

An illustrative, applied example of the ROPD framework is in the history of the GlobalEd 2 ROPD Program (GE2PD) since 2013 to support the GlobalEd 2 (GE2, www.globaled2.com) curriculum. GE2 is a blended, multi-classroom social studies curriculum for middle school that emphasizes problem-based activities and the development of 21st-century literacies among students. The key feature of GE2 is students' interaction in an online negotiations simulation in which they communicate with other students from multiple classrooms to develop solutions to real-world socioscientific problems. Each classroom is assigned the role of a "country" to play in the negotiations simulation, and approximately 15-20 classroom "countries" participate in each simulation. Students assume the role as a "delegate" to the negotiations simulation for their assigned country and are assigned a *problem scenario* that all countries are asked to solve in an online negotiations environment with other classrooms.

Because GE2 is a complex, blended curriculum that is conducted partially online, the GE2 instructional designers anticipated a significant PD effort would be necessary to promote the implementation of GE2. The GE2PD program was first developed in early 2013 to provide "up-front" information to teachers as they joined GE2, as well as ongoing support from a dedicated instructional design staff to help solve implementation challenges as they arose. The goal of GE2PD was to facilitate teachers' professional development with the new pedagogies promoted by the curriculum through systematic, structured supports. This approach was well received by GE2 teachers and proved to be highly supportive of curriculum implementation.

During the "up-front" PD portion of GE2PD, teachers were provided with information on the curriculum, its processes, and expectations. The workshop was divided into a number of modules, with each module containing videos from curriculum experts, content experts, and other teachers on the things that were most pressing to know before implementation started. Teachers were not expected to memorize everything in the up-front PD, but instead were expected to gain a familiarity with the curriculum, its main activities and timeline, and to know where to go to find additional information about implementation as they were in the process of teaching. The upfront PD portion was shown to help teachers improve their knowledge around key features of the curriculum and the pedagogies it used (Riel, Lawless, & Brown, 2016b).

The GE2 instructional designers complimented the up-front PD with ongoing support that used the ROPD framework. As teachers implemented GE2, a dedicated support staff implemented each of the four steps in the framework to identify challenges being faced by teachers and to provide timely support

in response to teachers' needs. In any given week during implementation of the GE2 curriculum, teachers were expected to participate in reflective activities to help promote their understanding of GE2. The GE2PD staff, in turn, responded to the feedback provided by teachers during their weekly reflections on curriculum implementation.

Elements of Weekly ROPD in the GE2PD Program

The goal of the GE2PD was to provide structured support for teachers' implementation *as they were implementing the curriculum*. Each of the four elements of the ROPD framework were used in the GE2PD weekly to provide implementation support over an extended period of time.

To begin each ROPD cycle, the GE2PD staff provided a structured website and reflective activity for teachers to reflect on GE2 implementation at the end of each week of implementation. This reflective activity represented Step 1 of the ROPD framework. The GE2PD staff asked teachers to reflect weekly in an online journal on how GE2 activities went in their classroom, to express any challenges they faced, and to plan their next week's activities. Over the last four years, reflective journals in GE2PD were collected using a web-based form via Google Forms. In the form, teachers responded to specific prompts inquiring about what activities they did each week, how these activities went, what teachers planned to do the next week, and if teachers observed any challenges to implementation. An example of these reflective teacher log prompts are illustrated in a study by Riel, Lawless, and Brown (2016a).

Representing Step 2 of the ROPD framework, the GE2PD staff evaluated the reflective teacher log responses on Fridays of each week during implementation to identify teacher challenges and needs that arose in the previous week. Due to the immediacy of teacher needs and the need to stay on a curricular schedule, the needs analysis had to be conducted quickly and responses generated rapidly. As a result, the responses generated by the staff were not expected to be perfect, but instead simply a substantive contribution to help teachers meet particular issues identified in the needs analysis. In this process, it is necessary to examine curricular implementation events in depth to identify areas of support that capture both the areas of need that were specified by teachers, as well as those that were not directly expressed by teachers. An example of a more detailed needs analysis procedure is discussed in Riel, Lawless and Brown (2016a).

The GE2PD staff was responsible for the responsive and resource curation activities outlined in Step 3 of the ROPD framework. As such, the GE2PD staff developed text, video, and classroom organizer tools (e.g., worksheets, articles for students on complex concepts, graphic organizers, lesson plans) that teachers could immediately use to address the needs and challenges that had been identified in the needs analysis for a given week. To develop these resources, the support staff frequently conducted research on teacher issues, followed up with certain teachers for additional information or to conduct a coaching session, drafted lesson plans and worksheets, and requested and conducted interviews with outside experts based on particular needs. The GE2PD support staff maintained a permanent online resource library for teachers in which curated resources were placed.

Finally, Step 4 of the ROPD framework was represented by weekly notifications that were sent to teachers via email newsletters. These newsletters contained all of the curated collection of resources that were intended to meet the identified needs of the previous week. Over the last five years, the MailChimp email service (mailchimp.com) has been used to develop and deliver HTML-enabled emails to participants. A number of curated resources were embedded in each weekly notification email, each with a unique URL. A valuable feature of the MailChimp service and others like it are the robust data analyt-

ics features that allow researchers to analyze the degree to which participants have received, seen, and interacted with the email notifications. An example of the email newsletters used by the GE2PD appear in Riel, Lawless, Brown, Lynn (2015).

Since the start of the GE2PD, significant effects of the use of the ROPD framework have been observed with both teacher and student learning outcomes. In terms of teacher development, spending more time in the GE2PD was predictive of higher increases in knowledge and skills related to curriculum implementation (Riel, Lawless, & Brown, 2016b). In addition, the authors found that merely completing required activities was not enough to predict significant increases in knowledge and skills, suggesting that there are various dimensions of participation that influence learning within the GE2PD and online PD programs in general. In terms of student achievement, students whose teachers had high degrees of participation in the GE2PD had higher levels of positive affective growth when compared to students with low-participating teachers (Riel, Lawless, Brown, & Lynn, 2015). As argued in that study, student affect directly influences scholastic achievement, which can in turn be influenced by positive teacher affect toward curriculum. As such, positive increases in affect and disposition to curricular interventions by students via a teacher that participates in ROPD is a secondary learning feature further promoted by ROPD. Although research on ROPD is in its infancy, these initial studies are promising as to the positive effects this form of PD can have on both teachers and students.

DISCUSSION AND FUTURE RESEARCH DIRECTIONS

In this chapter, ROPD was suggested as a systematic approach for PD to be used in instructional design to support new curriculum implementation. Inspired by known principles of professional learning, the ROPD process allows instructional designers to meet teachers' ongoing needs and challenges as they implement new curricula, standards, and other reforms in the classroom. ROPD addresses needs where other PD approaches fall short by providing ongoing *responsive* feedback and resources to teachers as challenges arise. ROPD emphasizes the processes involved with teachers' classroom practice and valuable reflective opportunities that can occur in everyday work. As such, ROPD is a long-term approach as it seeks to simultaneously influence teachers' growth and improve curriculum implementation.

Unobtrusive data collection and data analytics capabilities from server interaction logs highlight the potential of future research of ROPD interventions. However, it will not only be important to understand what works by studying the efficacy of ROPD programs on achieving desired teacher and student learning outcomes, but also to investigate *why* certain ROPD interventions and design elements work (Fishman et al., 2013; Lawless & Pellegrino, 2007). To make substantial claims as to whether or not ROPD programs meet teacher and student learning goals, future research will need to clearly define the outcome measures that designers seek to realize as a result of ROPD participation. However, conventional efficacy trials and experimental designs may fall short in describing the effects of interventions in the new world of online, long-term ROPD programs due to their open-ended nature. As teachers can interact with ROPD in an almost-infinite number of ways, it is more difficult to describe the degree to which a participant interacted with the system when using conventional experimental interventions. As such, the long-term and diverse nature of ROPD participation promotes a new strand of research that examines the degree to which teachers interacted with or were exposed to various elements of ROPD programs over extended periods of time.

The ROPD framework represents a systematic process for instructional designers to understand and respond to teachers' everyday needs as they implement new curricula. The ROPD process allows instructional designers to immediately identify and respond to challenges as curricula are implemented and adapted to meet local classroom needs, complimenting processes of professional learning. To this end, ROPD affords instructional designers the ability to correct implementation challenges *during curriculum implementation* – not after. Thus, perhaps most importantly, students who use ROPD-supported curriculum stand to benefit the most from improvements to the curriculum as their teachers participate in ROPD.

REFERENCES

Anderson, A., Wood, E., Piquette-Tomei, N., Savage, R., & Mueller, J. (2011). Evaluating teachers' support requests when just-in-time instructional support is provided to introduce a primary level web-based reading program. *Journal of Technology and Teacher Education*, *19*(4), 499–525.

Ball, D. L., & Cohen, D. K. (1996). Reform by the book: What is - or might be - the role of curriculum materials in teacher learning and instructional reform? *Educational Researcher*, *25*(9), 6–8, 14.

Bonk, C., Ehman, L., Hixon, E., & Yamagata-Lynch, L. (2002). The pedagogical TICKIT: Web conferencing to promote communication and support during teacher professional development. *Journal of Technology and Teacher Education*, *10*(2), 205–233.

Dede, C., Ketelhut, D., Whitehouse, P., Breit, L., & McCloskey, E. M. (2008). A research agenda for online teacher professional development. *Journal of Teacher Education*, *60*(1), 8–19. doi:10.1177/0022487108327554

Drake, C., Land, T. J., & Tyminski, A. M. (2014). Using educative curriculum materials to support the development of prospective teachers knowledge. *Educational Researcher*, *43*(3), 154–162. doi:10.3102/0013189X14528039

Dutro, E., Fisk, M. C., Koch, R., Roop, L. J., & Wixson, K. (2002). When state policies meet local district contexts: Standards-based professional development as a means to individual agency and collective ownership. *Teachers College Record*, *104*(4), 787–811. doi:10.1111/1467-9620.00179

Ertmer, P. A., Glazewski, K. D., Jones, D., Ottenbriet-Leftwich, A., Goktas, Y., Collins, K., & Kocaman, A. (2009). Facilitating technology-enhanced problem-based learning (PBL) in the middle school classroom: An examination of how and why teachers adapt. *Journal of Interactive Learning Research*, *20*(1), 35–54.

Ertmer, P. A., & Simons, K. D. (2006). Jumping the PBL implementation hurdle: Supporting the efforts of K-12 teachers. *Interdisciplinary Journal of Problem-Based Learning*, *1*(1), 40–54. doi:10.7771/1541-5015.1005

Fishman, B., Konstantopoulos, S., Kubitskey, B. W., Vath, R., Park, G., Johnson, H., & Edelson, D. C. (2013). Comparing the impact of online and face-to-face professional development in the context of curriculum implementation. *Journal of Teacher Education*, *64*(5), 426–438. doi:10.1177/0022487113494413

Flint, A. S., Zisook, K., & Fisher, T. R. (2011). Not a one-shot deal: Generative professional development among experienced teachers. *Teaching and Teacher Education*, *27*(8), 1163–1169. doi:10.1016/j.tate.2011.05.009

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2009). What Makes Professional Development Effective? Results From a National Sample of Teachers. *American Educational Research Journal*, *38*(4), 915–945. doi:10.3102/00028312038004915

Gikandi, J. (2013). How can open online reflective journals enhance learning in teacher education? *Journal of Technology and Teacher Education*, *21*(1), 5–26.

Green, M., & Cifuentes, L. (2008). An exploration of online environments supporting follow-up to face-to-face professional development. *Journal of Technology and Teacher Education*, *16*(3), 283–306.

Hammerness, K., Darling-Hammond, L., Bransford, J., Berliner, D., Cochran-Smith, M., McDonald, M., & Zeichner, K. (2005). How teachers learn and develop. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 358–389). San Francisco: Jossey-Bass.

Hoban, G., & Hastings, G. (2006). Developing different forms of student feedback to promote teacher reflection: A 10-year collaboration. *Teaching and Teacher Education*, *22*(8), 1006–1019. doi:10.1016/j.tate.2006.04.006

Hochberg, E. D., & Desimone, L. M. (2010). Professional development in the accountability context: Building capacity to achieve standards. *Educational Psychologist*, *45*(2), 89–106. doi:10.1080/00461521003703052

Hoekstra, A., & Korthagen, F. (2011). Teacher learning in a context of educational change: Informal learning versus systematically supported learning. *Journal of Teacher Education*, *62*(1), 76–92. doi:10.1177/0022487110382917

Kazemi, E., & Hubbard, A. (2008). New directions for the design and study of professional development: Attending to the coevolution of teachers participation across contexts. *Journal of Teacher Education*, *59*(5), 428–441. doi:10.1177/0022487108324330

Killeavy, M., & Moloney, A. (2010). Reflection in a social space: Can blogging support reflective practice for beginning teachers? *Teaching and Teacher Education*, *26*(4), 1070–1076. doi:10.1016/j.tate.2009.11.002

Lawless, K., & Pellegrino, J. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research*, *77*(4), 575–614. doi:10.3102/0034654307309921

Marrongelle, K., Sztajn, P., & Smith, M. (2013). Scaling up professional development in an era of Common Core standards. *Journal of Teacher Education*, *64*(3), 202–211. doi:10.1177/0022487112473838

Marx, R. W., Blumenfeld, P. C., Krajcik, J. S., & Soloway, E. (1998). New technologies for teacher professional development. *Teaching and Teacher Education*, *14*(1), 33–52. doi:10.1016/S0742-051X(98)00059-6

Mushayikwa, E., & Lubben, F. (2009). Self-directed professional development – Hope for teachers working in deprived environments? *Teaching and Teacher Education*, *25*(3), 375–382. doi:10.1016/j.tate.2008.12.003

Penuel, W. R., Fishman, B. J., Yamaguchi, R., & Gallagher, L. P. (2007). What makes professional development effective? Strategies that foster curriculum implementation. *American Educational Research Journal*, *44*(4), 921–958. doi:10.3102/0002831207308221

Riel, J., Lawless, K. A., & Brown, S. W. (2016a). Listening to the Teachers: Using weekly online teacher logs for ROPD to identify teachers' persistent challenges when implementing a blended learning curriculum. *Journal of Online Learning Research*.

Riel, J., Lawless, K. A., & Brown, S. W. (2016b). *Completion, time-in-intervention, and movement: Relationships between dimensions of participation in oTPD and knowledge growth*. American Educational Research Association 2016 Annual Meeting, Washington, DC. http://doi.org/ doi:10.13140/RG.2.1.3452.7123

Riel, J., Lawless, K. A., Brown, S. W., & Lynn, L. J. (2015). Teacher participation in ongoing professional development to support curriculum implementation: Effects of the GlobalEd 2 PD program on student affective learning outcomes. In D. Slykhuis & G. Marks (Eds.), *Proceedings of the Society for Information Technology & Teacher Education 2015 International Conference* (pp. 1031-1038). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE). http://doi.org/doi:10.13140/RG.2.1.3986.9048

Rowan, B., Camburn, E., & Correnti, R. (2004). Using teacher logs to measure the enacted curriculum: A study of literacy teaching in third-grade classrooms. *The Elementary School Journal*, *105*(1), 75–101. doi:10.1086/428803

Schnellert, L. M., Butler, D. L., & Higginson, S. K. (2008). Co-constructors of data, co-constructors of meaning: Teacher professional development in an age of accountability. *Teaching and Teacher Education*, *24*(3), 725–750. doi:10.1016/j.tate.2007.04.001

Wang, J., & Paine, L. W. (2003). Learning to teach with mandated curriculum and public examination of teaching as contexts. *Teaching and Teacher Education*, *19*(1), 75–94. doi:10.1016/S0742-051X(02)00087-2

KEY TERMS AND DEFINITIONS

Dedicated Support Staff: A team of instructional designers, curriculum and content experts, and administrative staff to help support teachers' implementation of new curricula and to facilitate ROPD. The support staff responds to teacher requests in an ROPD by developing a curated set of resources that targets teachers' expressed needs and challenges.

Feedback Loop: A process by which teachers communicate needs and challenges to support staff, and in turn the support staff provides resources and coaching to address these needs. Ideally, feedback loops should be unbroken and iterate through multiple cycles.

Notification: The process in an ROPD cycle by which teachers are notified of the dedicated support staff's responses to the needs and challenges identified in the needs analysis.

Reflection: A professional development process in which professionals critically analyze past experience in order to perceive inferences and plan future activity. Reflection is regarded as a necessary component of professional learning and skill acquisition.

Responsive Online Professional Development (ROPD): A systematic framework used by instructional designers to promote professional development of teachers while emphasizing long-term, regular improvement of curriculum by identifying teachers' needs and challenges in everyday practice.