Intel® Teach Elements: Evidence-Based Perceptions and Capacity-Building Implications for Professional Learning

Claudette Rasmussen

Michelle Perry
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Claudette Rasmussen
Michelle Perry
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Executive Summary

Introduction

Professional development opportunities for K–12 educators in the United States are rapidly changing. As teachers transform classroom practices away from traditional teacher-led instruction to incorporate new technology-based learning initiatives, so too has professional development for educators shifted from exclusively a face-to-face setting to blended, online, and connected learning settings. The Intel® Teach Elements professional development course content available to educators worldwide provides an example of a shift to the new blended, online, and connected learning. In the United States, Intel has not only provided Elements course content but also supported the capacitybuilding of states to deliver high-quality facilitated professional learning via a network of state-level professional development Intel Teach Affiliates.

As part of its commitment to high-quality educator professional learning, Intel requested information about how states and their local school districts might further develop their capacity to deliver professional learning to teachers. In order to address this request, this paper is divided into two sections that distinguish the evidence base of sound professional learning and the means of further building state and local capacity to implement Intel Teach Elements.

Section 1: Research Base and Standards Base of High-Quality Professional Learning

The first section of this paper seeks to summarize recent K–12 educator professional development implementation research and “promising-practice” findings to determine what is necessary for high-quality face-to-face, blended, online, and connected professional learning.

We began with several exploratory questions about high-quality professional learning and used the findings from the research to address the following:

- What are the characteristics of high-quality professional learning that apply to all forms of educator learning—face-to-face, blended, online, and connected?
- What additional characteristics are needed to advance high-quality blended, online, and connected professional learning?
- How do these characteristics relate to the Standards for Professional Learning and technology standards?
- Where is the gap in the knowledge base concerning high-quality professional learning, and what merits further study?

In our search for answers to these questions, we conducted a targeted literature review. In addition to 13 key findings, it resulted in an annotated bibliography of selected research-based and practical writings about face-to-face, blended, online, and connected professional learning.

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1 In this paper, we make greater use of the term professional learning than the term professional development in order to underscore the shift that has been taking place in how educators take an active role in their continuous development with an emphasis on their learning. When the organization Learning Forward developed the Standards for Professional Learning in 2011, it signaled the importance of educators advocating for and facilitating high-quality professional learning and the conditions required for its success.

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learning, including professional learning networks and communities of practice. The annotated bibliography is provided in the appendix.

The authors of this white paper were also key authors of follow-up reports to Connected Educator Months 2013 (see Cambridge & Rasmussen, 2014; Perry, Perez-Lopez, & Cambridge, 2014) and developers of a district toolkit (see Rasmussen, C., Cambridge, D., Nussbaum-Beach, S., Green, C., Conley, M., Perry, M., & Perez-Lopez, K., 2014) based on many of the same studies included in the literature review. Although there is significant overlap, the intent of this paper is to specifically address best practices for professional learning and how they may relate to Intel® Teach Elements professional development.

Section 2: High-Leverage Recommendations and Suggested Actions for Capacity-Building Implementation of Elements

We drew upon key findings of Section 1, identifying seven of the most influential characteristics of high-quality professional learning as follows:

- Provides intensive and sustained learning.
- Improves both content and pedagogical knowledge.
- Aligns with district and school goals, initiatives, and systems.
- Creates ongoing, job-embedded learning experiences.
- Provides opportunities for collective participation and collaboration.
- Includes a well-prepared facilitator.
- Incorporates thoughtful instructional design.

We then associated the characteristics with perceptions from an analysis of online survey data collected from Elements course participants and from semistructured interviews with Intel Teach Affiliate state leaders.

As a result, Section 2 of this paper focuses on suggested actions associated with two high-leverage recommendations for state and local implementers of Intel Teach Elements:

- **Recommendation 1:** Ensure that Elements implementation has the strongest possible basis in evidence from research; effective practice; direct experience; and national, state, and/or district standards.
  - “Tightly bundle” courses in order to increase contact hours and deepen understanding and application of content, knowledge, and skills.
  - Engage local sites as cohort groups and/or instructional teams.
  - Provide opportunities for blended solutions that effectively incorporate online and face-to-face professional learning.
  - Optimize the facilitator role to develop stronger and more frequent opportunities for participant applications, reflection, feedback, and connections.
• Carefully select and prepare facilitators, and provide ongoing support and networking for their continued growth.

• Intentionally align the purposes, professional learning strategies, and content of Elements with educator standards.

**Recommendation 2: Align Elements with district and school goals identified in the continuous improvement process, other state and local professional learning initiatives, and other components of teaching effectiveness.**

• Incorporate activities into Elements courses so that participants intentionally relate their professional learning goals and experiences with their local improvement goals.

• Monitor and evaluate implementation of Elements as a part of continuous improvement.

• Identify connections between Elements and other professional learning initiatives.

• Identify links between implementation of Elements and other components of teaching effectiveness.

• Incentivize Elements use.

We also discuss implications and action steps of these high-leverage recommendations for state policymakers and leaders, district administrators, and school administrators as they transition from Intel resource support of Elements to their own use of multiple types of capacity building to support ongoing high-quality professional learning for educators.
Introduction

“Transforming education to meet the needs of today’s learners requires ongoing support for teachers as they implement new teaching practices. Intel® Teach is a proven program that helps K–12 teachers integrate technology effectively into classrooms and promote student-centered approaches, engaging students in learning and preparing them with critical skills for success in our digital world.” (Intel, n.d.-b)

“Educational leaders across the United States recognize that transformation will only come with the enhanced capacity of educators to implement innovative, research-based programs that address their districts’ and schools’ particular circumstances.” (ICF International, n.d.)

Over the past few years, educators in the United States have increasingly faced new challenges and opportunities that have directly impacted their classrooms. States have adopted new learning standards for students and are developing new assessments that align with these standards. As technology has become more ubiquitous with many students having access to his or her own personal device (sometimes more than one device), classroom educators have searched for teaching strategies that take advantage of this innovation. As education in the United States has shifted from teacher-led instruction to technology-empowered “learning by doing” for students, the need for professional development for educators that matches the change in the teaching-learning process has grown.

Professional development in the past took place primarily in face-to-face settings. Just as technology-enabled learning has changed K–12 classrooms, blended, online, and connected professional development has opened opportunities for educators. Interest in the topic of blended, online, and connected professional development and learning has been growing in recent years due in part to educator professional development programs such as Intel® Teach Elements as well as broader educational technology events such as the Connected Educator Months (CEM) 2012, 2013, and 2014—sponsored by the U.S. Department of Education and American Institutes for Research—which sought to network educators and education stakeholders through connected professional learning experiences worldwide.²

These changes in teaching and learning and corresponding changes in professional development have been complex. Complicated educational change requires multidimensional capacity building. “Capacity is the knowledge, skills, resources, processes, and systems necessary to achieve intended goals” (Herpin et al., 2014, p. 17). In general, four types of capacity building support continuous improvement and change: human capacity, resource capacity, organizational capacity, and structural capacity. Well-designed and well-implemented professional learning builds human capacity by increasing instructional knowledge and skills and builds resource capacity through the effective use of technology-based tools (Century, 1999; Herpin et al., 2014).

²In 2012 and 2013, Connected Educator Month (CEM) was convened as part of the U.S. Department of Education Office of Educational Technology’s (OET) Connected Educators project, led by American Institutes for Research and its five partner organizations. In 2014, OET passed ownership of CEM to American Institutes for Research, who partnered with Grunwald Associates, LLC, and Powerful Learning Practice to convene the event, with support and collaboration from OET and hundreds of participating organizations.
Intel’s commitment to teacher professional development and learning resources has spanned 16 years. In its earliest days, the teacher professional development sessions were delivered in a face-to-face format. In 2009, Intel transitioned its evidence-based professional development to an online format through the introduction of Intel® Teach Elements courses (see Light, Culp, Menon, & Shulman, 2006, for examples of Intel’s evidence-based professional development at that time). In the United States, Intel extended its human capacity building to include leadership by developing a network of state-level professional development leaders, Intel Teach Affiliates, and resource capacity building within the states themselves with two types of support. The resources consisted of modest grants to the Intel Teach Affiliate states and external expertise in training for online facilitators. The Intel Teach Affiliate grants and the investment in developing well-prepared online facilitators were key factors in meeting Intel’s goal to build the capacity of states to prepare their own cadres of online facilitators and to develop and deliver additional professional learning opportunities for their teachers.

This paper is divided into two sections that distinguish the evidence base of sound professional learning and the means of further building state and local capacity to implement Intel Teach Elements.
Section 1: Research Base and Standards Base of High-Quality Professional Learning

Characteristics of High-Quality Professional Learning

Understanding what it means for professional learning to be high-quality is critical to providing effective support and growth for educators. The characteristics described in this section apply to all forms of high-quality professional learning (face-to-face, blended, online, and connected). These attributes should be addressed when selecting a professional learning provider and designing, customizing, and evaluating a professional development program. Key findings from the literature review describe each characteristic as it may appear in practice.

- **Provides intensive and sustained learning.**
  High-quality professional learning is not only focused on topics examined thoroughly, but also provided in a practical manner that is easy to apply to teacher practice. This allows teachers to see the connection between content and practice more easily and, therefore, to sustain the use of learned strategies (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). According to the research, intensive and sustained professional learning involves receiving substantial contact hours of professional development over a period of time (Darling-Hammond et al., 2009; Garet, Porter, Desimone, Birman, & Yoon, 2001; Parsad, Lewis, & Farris, 2001; Porter, Garet, Desimone, Yoon, & Birman, 2000; Yoon, Duncan, Lee, Scarloss & Shapely, 2007). For example, Yoon et al. (2007) found a positive relationship between the duration of professional development and student achievement among the nine studies that met the What Works Clearinghouse’s rigorous evidence standards. Across the nine studies, an average of 49 hours of professional development was shown to boost student achievement by about 21 percentile points.

- **Provides opportunities for collaboration.**
  Collaborative situations include interactions between an individual teacher and coach or mentor, groups of teachers and a facilitator or coach, and teams of teachers working together to plan and evaluate classroom lessons and instructional strategies and to identify solutions to classroom problems. Collaborative teams and relationships among colleagues who are able to learn and problem-solve together create consistency across instruction and build support systems for teachers (Blitz, 2013; Croft, Coggshall, Dolan, & Powers, 2010; Darling-Hammond et al., 2009; Mundry, 2005; Owston, Wideman, Murphy, & Lupshenyuk, 2008). Further, teachers who participate in professional learning with extended duration, content focus, and active learning strategies develop more expertise and confidence in their practice; through collaboration and collegial interactions, that expertise spreads among teachers (Killion, 2014; Sun, Penuel, Frank, Gallagher, & Youngs, 2013).

- **Improves both content and pedagogical knowledge.**
  Effective professional development provides opportunities for teachers to deepen their content knowledge to allow a rich understanding of the subject matter. Teachers who are engaged in building content and pedagogical knowledge are better able to understand how students learn and to think critically about teaching practice and the learning
experience. Further, research has shown that professional development that focuses on improving student learning also develops teacher instruction and content knowledge (Archambault, Wetzel, Foulger, & Williams, 2010; Hill, Rowan, & Ball, 2005; Mundry, 2005).

- **Aligns with district and school improvement goals, initiatives, and systems.**
  High-quality professional learning is integrated into the school and district culture and a part of the larger initiatives aimed at school and district improvement. Programs of professional learning that are stand-alone or siloed efforts are less likely to be prioritized by the teacher, especially if there are no tangible connections to other efforts in the school (Darling-Hammond et al., 2009; Mundry, 2005; Parsad et al., 2001; Porter et al., 2000). Strategic leadership looks at all parts and players in a teaching effectiveness system, including but not limited to working conditions, certification and licensure, evaluation, and compensation, to see that they are strategically aligned and not working at cross purposes with professional learning (Cambridge & Rasmussen, 2014; Killion, 2013; Laine, 2011).

- **Creates ongoing, job-embedded learning experiences.**
  High-quality professional learning is ongoing and job-embedded; integrates teacher learning throughout the school day in the classroom; and involves teachers actively learning by assessing classroom situations and finding solutions for immediate problems, examining student work, or engaging in other authentic work. In order for professional development to be effective and make an impact, teachers have to stay up-to-date on changing content and strategies by participating in learning experiences throughout their careers (Croft et al., 2010; Darling-Hammond et al., 2009; Garet et al., 2001; Mundry, 2005; Villarreal, 2005; Yoon & Sztajn, 2015).

- **Incorporates methods for feedback.**
  Team and one-on-one collaborations are not only for group problem-solving, they also provide a means for feedback. Teachers learn best from timely, focused, and informative feedback about their practice. The extent to which teachers learn from this feedback and use it to change their practice depends, in part, on the skill of those providing the feedback and whether the feedback is based on observable evidence that the teachers receive as part of coaching, observation, or evaluation. Its usefulness also depends on whether there are ample professional learning opportunities for teachers to practice their developing skills and receive follow-up feedback (Blitz, 2013; Coggshall, Rasmussen, Colton, Milton, & Jacques, 2012; Croft, et al., 2010; Danielson, 2009; Mundry, 2005).

- **Provides opportunities for reflection.**
  Reflection involves a teacher’s purposeful thinking about classroom practice or teaching experience in order to identify problems and understand why those problems occurred. Successful reflection helps teachers think in new proactive ways about their teaching practice and their students’ learning. High-quality professional learning should provide ample opportunities for reflection (Croft et al., 2010; Danielson, 2009).

- **Is supported actively by leadership.**
  Effective administrators influence policies to support professional development, including ensuring there are appropriate time and other resources for professional learning and collaboration with coaches and other educators. Principals and central office
administrators understand effective instruction, and they may participate in teacher learning and provide useful feedback. Leaders see themselves as active learners and model the learning processes they desire staff to embrace. Supporting professional learning also includes integrating it into the school and district culture and providing opportunities for professional leadership and growth among teachers (Blitz, 2013; Croft et al., 2010; Mundry, 2005; Perry et al., 2014).

The Relationship of Influential Characteristics of High-Quality Professional Learning

Having looked at each of the eight characteristics of high-quality professional learning, we also considered evidence of select characteristics that, when taken together, promise to be highly influential in the design of high-quality professional development that supports teacher learning and improves instruction. (See Figure 1 and the text that follows.)

Figure 1: Key Features of Teacher Professional Development and Their Relationship to Better Instruction

![Figure 1](image-url)

Figure 1—adapted from the seminal work of Garet, Porter, Desimone, Birman, and Yoon (2001)—illustrates the degree of influence of three structural or design features of high-quality professional development: (1) duration of activity, including total contact hours and time span over which the activity takes place; (2) “reform” types of activities such as coaching, mentoring, or study groups as opposed to traditional types of activities such as workshop, course, or conference; and (3) collective participation of groups of teachers from the same school, department, or grade level. Note that the reform types of activity are not shown in the illustration because they provide the context for longer contact hours and extended duration.
Figure 1 also illustrates the degree of influence of three core features of high-quality professional development: a focus on content knowledge; opportunities for active learning such as examining student work, peer observation, coaching, or feedback; and coherence with the state and district improvement goals, standards, and assessments.

Key findings from the in-depth report of research written by The School Redesign Network at Stanford University (Darling-Hammond et al., 2009) underscored the importance of many of the same features or characteristics of professional learning that lead to improved instruction and student learning: intensive, ongoing, focused on content, collaborative, and connected to practice and school initiatives.

The features or characteristics of high-quality professional development that were identified in both works (Darling-Hammond et al., 2009; Garet et al., 2001) remain significant today and can serve as guiding principles in the choice, customization, and implementation of high-quality professional learning experiences.

In fact, a recent study by Sun et al. (2013) was based on professional development of teachers’ writing instruction that reflected a high degree of three features of high-quality professional learning that were identified by Garet and colleagues (2001): duration, content focus, and breadth of active learning strategies. Given that base, they examined the indirect or “spillover” effects of professional learning in which the “provision of professional development to some teachers shapes the practices of other teachers in the school who may or may not directly participate in professional development” (Sun et al., 2013, p. 347).

The empirical results of this study affirmed the authors’ two hypotheses: (1) “Teachers are more likely to provide help with writing instruction if they participated in high-quality professional development” and (2) “The expertise that teachers gain from participation in professional development will spread to colleagues through the provision of help and thus change colleagues’ instructional practices” (Sun et al., 2013, p. 348). In relation to the first hypothesis, the researchers found that teachers developed more confidence in practice and were more likely to provide help as they became go-to experts for colleagues and used the active learning strategies with peers. Regarding the second hypothesis, the authors found that the expertise that teachers gained from direct participation in professional development spread to other teachers as they provided help. “In some cases, the spillover effects on the improvement of instructional practices were almost equal to the direct effects of teachers’ participation in professional development” (Sun et al., 2013, p. 360). These findings reinforce the benefits of collaboration, the influence of collective participation and active learning strategies, and the importance of leveraging the spillover effect in high-quality professional learning.

Yoon and Sztajn (2015) suggest that selected key features of high-quality professional development, as illustrated in Figure 1 and described in the research (Darling-Hammond, et al., 2009; Sun et al., 2013), are necessary but not sufficient to understand what makes professional learning effective. They recommend broadening the scope of the research by using a larger set of elements of professional development that includes the theory guiding the professional development design, goals for the professional learning, context in which professional development occurs, and the content and organization, and activities and artifacts that are used in the learning. Further, they advocate for close attention to professional development design and
implementation (the inputs and process) as well as outcomes in order to gain a broader understanding of what makes professional learning effective (Yoon & Sztajn, 2015).

**Additional Characteristics of High-Quality Blended, Online, and Connected Professional Learning**

With budget cuts and the need for more efficient delivery of ongoing services, school systems and educators are increasingly turning to online learning to supplement and enrich face-to-face professional learning, or to replace it entirely. Regardless of the mode, professional learning should be held to a high standard in order to provide effective professional development. Additional characteristics are needed to advance the dynamic components of online and blended learning. Although research is limited in this area, descriptions of some emerging attributes follow.

- **Includes a well-prepared facilitator.** The role of a facilitator, especially in online professional development, can be critical to guiding teachers through the material, prompting thoughtful discussions, providing feedback, monitoring progress, and evaluating professional learning activities. Facilitators also can help teachers make connections between the professional learning and practice they may not readily see (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009; Feger & Zibit, 2005; PBS TeacherLine, n.d.). It is important to note that the effectiveness of a facilitator in creating a high-quality online learning experience may depend on the design of the program and the needs of the participants (Fishman et al., 2013).

- **Incorporates thoughtful instructional design.** Design of online professional learning programs is a key aspect that determines effectiveness. An online program needs to be thoughtfully designed to encourage the participants’ engagement. Online programs also need to take into account varying levels of technological background and skill and the learning readiness of participants. A face-to-face curriculum may not directly translate to an online format, and activities may need to be modified to accommodate asynchronous or nonsequential learning (Dede et al., 2009; Taylor, 2012).

- **Uses technology effectively.** Incorporating collaborative technology platforms affords a user-friendly collaborative setting for peers to provide motivation, encouragement, and instant feedback. One study found this integration of technology shifted the technological pedagogy from instructor-led learning to a student-led learning. In some professional development courses, the initial session is conducted in a face-to-face setting where the course is introduced and participants have an opportunity for hands-on introduction to the learning platform and collaboration tools. The subsequent instruction is continued in an online format where participants collaborate and learn from each other (Archambault et al., 2010; Killion, 2013; Taylor, 2012).

- **Encourages active, self-directed participation through social networks.** Online and blended forms of professional learning can encourage more ongoing and sustained dialogue and instant feedback, especially with use of social networks such as Twitter or collaborative platforms and blogs where discussions can take place in
comments or various topical threads. Programs that use online communities of practice to support innovation for improved learning open up a realm of connection and collaboration beyond the school walls to a global community and support collaborative knowledge construction via various communication and collaboration tools (Archambault et al., 2010; Owston et al., 2008).

- **Allows for personalization and customization of learning.**
  Using online and blended methods of professional learning can make the ongoing and frequent collaboration necessary for successful professional learning easier to maintain owing to the flexibility that technology affords. Teachers may be able to select the courses and content that are most relevant to their specific needs, creating a more meaningful learning experience. In addition, teachers do not have to travel to physical locations, schools and districts do not have to provide substitutes, and teachers often have the ability to engage in collaboration methods when it is suitable for them (Blitz, 2013; Killion, 2013; Owston et al., 2008).

### Alignment to Professional Learning and Technology Standards

When determining the characteristics necessary for high-quality professional learning, it is also important to consider how they align to established standards of excellence and professional practice. The Standards for Professional Learning from Learning Forward (2011) synthesize nearly 30 years of research on professional learning. They include seven standards that are meant to work in partnership with one another: focusing on learning communities, leadership, resources, data, learning designs, implementation, and outcomes. “Learning Forward asserts that, when professional learning incorporates the indicators of effectiveness defined in its standards, educator effectiveness and student learning increase” (Learning Forward, 2011, p. 15). The characteristics for high-quality professional learning described in this paper are consistent with these standards.

The authors of this paper contributed to the development of a toolkit (Rasmussen et al., 2014) that includes the [Professional Learning Strategies Self-Assessment Tool](#), an instrument that identifies characteristics of high-quality and evidence-based strategies for face-to-face, blended, online, and connected professional learning, aligned with professional standards. The purpose of the tool is to help districts in the planning, integration, and implementation of professional learning for continuous improvement.

Part 1 of the Professional Learning Strategies Self-Assessment Tool focuses on characteristics of high-quality and evidence-based professional learning strategies that are aligned with Learning Forward’s Standards for Professional Learning.

Part 2 of the tool aligns additional evidence-based characteristics of high-quality online and connected professional learning strategies with designated technology standards, including the International Society for Technology in Education (ISTE) standards: teacher standards (ISTE, 2008), coach standards (ISTE, 2013), and administrator standards (ISTE, 2012), as well as the National Standards for Quality Online Teaching (International Association for K–12 Online Learning [iNACOL], 2011). These are standards of excellence and best practices in teaching and leading with technology and are grounded in years of research.
The Professional Learning Strategies Self-Assessment Tool is one of five tools in the *Future Ready Schools: Empowering Educators through Professional Learning Toolkit*. The toolkit was an outgrowth of CEM 2013, an online professional learning event sponsored by the Office of Educational Technology and the U.S. Department of Education (Rasmussen et al., 2014). It was developed to provide district and school leaders with a decision-making process, practical tools and numerous examples for integrating effective online and face-to-face professional learning as part of continuous improvement.

**Suggestions for Further Research**

Although the current available research provides a good starting point for determining what constitutes high-quality face-to-face, blended, online, and connected professional learning, there are additional areas that can and should be explored further. This section presents some of these areas, as follows:

- Additional study of the role of feedback—both how to provide meaningful feedback and how to reflect on and apply to practice what is learned from feedback—is timely for professional learning and educator evaluation. As new immersive, problem-based professional development environments are created, future studies should examine the effect of such experiences on teacher learning and implementation in the classroom. Although evidence is emerging about the efficacy of gamification in adult learning (Enders, 2013; Kapp, 2012), it is also necessary to conduct specific research to examine whether gamification has a positive effect on classroom teachers’ behavior and practice.

- Another area for further research involves the costs of implementation and ongoing support of online professional development, including a learning management system, the technical support needed to operate and maintain such a system, and its viability to adapt to the needs of educators taking online professional development courses.

- Identification of specific ways in which video can be used effectively for professional learning and how video-based professional learning can be integrated into other school and district professional development offerings, such as professional learning communities (PLCs), would meet a practical need. For example, *Focus on Teaching: Using Video for High-Impact Instruction* by Jim Knight (2014) discusses the use of video for improving professional learning; however, additional research is needed to test his strategies and recommendations.

- There is still a need for research that identifies each of the following:
  
  - The impact of characteristics of high-quality face-to-face, online, connected, and blended professional learning on teacher content knowledge and instructional practice, and on student learning
  
  - The impact of job-embedded professional development models, such as instructional or content coaching, PLCs, communities of practice, or lesson study, on teacher practice and student learning

- As previously noted, Yoon and Sztajn (2015) suggest that select key features of high-quality professional development, illustrated in Figure 1, are not sufficient to explain what makes professional learning effective. They advocate that researchers describe the design and implementation of their professional development activities and programs.
more systematically, using a larger set of elements of professional development such as theory, goals, content, context, organization, and activities. This type of study is important not only to learn about the outcomes of the professional development (e.g., whether a particular program of professional development was effective) but also to learn about various design and implementation methods (or inputs and process) of professional development.
Section 2: High-Leverage Recommendations and Suggested Actions for Capacity-Building Implementation of Elements

As part of its investment in developing teacher professional development resources and building capacity to implement Intel® Teach Elements, Intel requested information on ways in which Elements courses are grounded in sound and current professional learning research and practice. Drawing on evidence from that research and practice base, high-leverage recommendations for the implementation of Elements are presented in Section 2.

The high-leverage recommendations also draw on evidence from experience with Elements—feedback from participants in Elements courses and state Intel Teach Affiliate leaders. The evidence comes from two sources. The first is a report of results of an analysis of online survey data collected from course participants (Wan, Meyers, & Brandt, 2013). Overall, course participants in 26 states, representing a broad range of experience levels, offered feedback regarding the professional learning experience provided by courses taken between January and September 2013. Most of the participants’ responses reflected their experiences in the Assessment, Collaboration, Data, and Project-Based Learning courses. A second source is narrative from semistructured interviews of 10 Intel Teach Affiliate state leaders conducted by American Institutes for Research staff in June 2013. The Intel Teach Affiliate program was unique in that the participating states identified a state-level professional development organization and coordinator to lead the planning and implementation of Elements. Intel provided support to the Affiliates through Elements professional development courses, ongoing networking among the Affiliates, facilitator training (at no cost to the Affiliates) and ongoing learning including an online community of practice (Intel Engage, formerly Teachers Engage), and modest grant funds to build capacity for further deployment of Elements and other high-quality professional development.

Table 1 consolidates the survey and interview feedback in relation to seven of the 13 research-based characteristics of high-quality professional learning identified in Section 1 of this document. The seven characteristics reflect the five most influential features illustrated in Figure 1 and two additional high-interest characteristics of blended, online, and connected professional learning identified by Intel Teach Affiliates.
Table 1. Alignment of Intel® Teach Elements Implementation With Characteristics of High-Quality Professional Learning

<table>
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<th>Evidence-Based Characteristic of Professional Learning</th>
<th>Feedback From the Field*: Perceptions Aligned to Evidence-Based Characteristics</th>
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<tr>
<td>1. Provides intensive and sustained professional learning</td>
<td>The structure of Elements courses allows flexibility for facilitators to build in additional project work to ensure an optimal number of contact hours. Most Intel Teach Affiliate states reported requiring a final action plan to ensure an in-depth application of new skills. For each course completed, the majority of teachers reported completing all action plan activities thoroughly, thereby ensuring the critical threshold of contact hours was met. Each Elements course is based on a consistent educational philosophy that promotes deeper student learning. Courses easily “link” together, allowing teachers to build their learning. Increasingly, states indicated they planned to bundle together two or more Elements courses, thereby increasing contact hours. All Elements courses follow the same general format, so that after an educator has taken one course, the navigation and structure are familiar when taking subsequent courses. When asked about the potential application of practices, more than two thirds of teachers completing an Elements course anticipated “definitely” increasing the frequency or depth of use of the targeted strategies in their teaching or school.</td>
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<tr>
<td>2. Improves both content and pedagogical knowledge</td>
<td>Intel Teach Affiliate states report that the final action plan in each Elements course is designed to ensure that teachers apply their new pedagogical knowledge and skill to their particular content area(s) and grade level(s). The majority of teachers completing an Elements course reported that their facilitator was knowledgeable about course content and encouraged teachers to apply their learning to their own content area. The majority of teachers completing an Elements course agreed or strongly agreed that their facilitator helped them develop an effective assessment plan aligned with student needs and 21st century skill standards. The Elements courses were aligned to the Common Core State Standards, which enabled teachers to see the connections between both pedagogy and content knowledge. Because of the flexibility of Elements course “shells,” states also have added other state-specific alignment documents and resources, especially in content areas of importance to the state. Although most Elements courses do not focus on a particular content area or grade level (such as ninth-grade Algebra), the exception is the Elements course, <em>Inquiry in the Science Classroom</em>. It is intended to develop science content and</td>
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<td>pedagogical knowledge for teachers working with students in Grades 3–8. Intel® Teach Affiliate states reported this course met a need for teachers in those grade levels. The majority of teachers completing an Elements course rated their level of targeted knowledge and skills positively after completing the courses (ranging from 77% to 95% depending upon the course).</td>
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<td>Intel Teach Affiliate state leaders usually have responsibilities beyond coordinating the offering of Elements courses, which allows these leaders to tie together various state initiatives to ensure alignment. Facilitators of Elements courses often lead other online professional development courses within their states or districts. States report that their Elements facilitators include in their course introduction the value of connecting Elements coursework to other local professional learning experiences and to district and/or school improvement initiatives. Elements courses focus on problem-solving, critical thinking, collaboration, and inquiry. Intel Teach Affiliate state leaders identified this focus as aligning with Common Core and/or other standards in their respective states. Districts obtaining an Elements license report that they are intentionally aligning courses with district and school goals. The format of the learning management version of Elements courses provides districts the ability to enhance and modify the course shells and to make more connections with district and school priorities and goals. Because Elements courses do not currently have a specific sequence, districts may select the course(s) that meet(s) their learning goal(s) without requiring teachers to take prerequisite courses. More than two thirds of the teachers completing an Elements course anticipated they would “definitely” increase the use of the key targeted strategies in their instruction or professional practices.</td>
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<td>Intel has invested in ongoing support of educators beyond Elements courses via Intel Engage, an online community of practice dedicated to providing professional learning. The Intel Engage community provides a venue for global collaboration. All the professional learning support within Intel Engage is consistent with the educational foundation used with Elements, reinforcing a consistent educational focus throughout all the Intel Teach collaborative work.</td>
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<td>Intel® Engage is designed to include both a structured learning community as well as a platform or “place” where teachers may start and continue their own informal learning networks. Intel offers professional learning beyond Elements (e.g., webinars led by experienced moderators). Many of the Intel Engage forum and webinar moderators from the United States are experienced Elements facilitators and emeritus Senior Trainers. They exemplify the learning from Elements to incorporate into the work they do for the broader educational audience (not just an Elements “thing”).</td>
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<td>5. Provides opportunities for collective participation and collaboration</td>
<td>The majority of the Intel Teach Affiliate states offer facilitated Elements courses through a learning management system (LMS) of their choice. In this implementation design, there are three components of the course: e-Learning content, action planning, and facilitated discussion. According to Intel Teach Affiliate state leaders, the action planning incorporates reflection on practice by the individual teacher, and the facilitated discussion is designed to encourage collaboration among teachers. This model of online professional development was favored by the state leaders because it incorporates both individual reflection as well as collaboration with other teachers. The majority of teachers completing an Elements course reported that their facilitator engaged in quality interactions with the course participants.</td>
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<td>Characteristics 6 and 7 are specific to online and blended professional development. These two were identified by Intel Teach Affiliates in the unstructured interviews as important factors they wished to see addressed.</td>
<td>Over a number of years, Intel provided support to Intel Teach Affiliate states (27) to build facilitator cadres. This support included providing online facilitation training through EdTech Leaders Online at no cost to Intel Teach Affiliate states as well as modest funds to the states themselves to grow the ability to prepare and support more facilitators. These facilitators were prepared to lead teachers through Elements courses and to intentionally pose questions to help teachers make connections between pedagogical knowledge and skills and content. Further, the states themselves built on this support and developed the capacity to prepare more online professional development facilitators. Intel Teach Elements courses do not require a facilitator. However, the majority of Intel Teach Affiliate states interviewed either offered Elements as a facilitated option only or gave more “credit” to participants for courses that were facilitated. Facilitators have access to resources designed to make their work with Elements more effective. The Intel Teach Elements Facilitation Toolkit (part of Intel Engage) is a one-stop resource for facilitators. It is designed to provide materials and strategies to...</td>
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<td>make online professional development such as Elements more successful. In addition, webinars featuring newly introduced Elements courses (e.g., Designing Blended Learning) are available via the Intel Engage community and allow facilitators to learn about new courses that they may be leading. According to state leaders, their facilitators typically model their own professional learning networks as they lead teachers through Elements courses and invite teachers in their courses to participate in similar endeavors. Through Intel Engage, facilitators have opportunities for an ongoing support network. This network not only enhances deployment of Elements but also helps to ensure that facilitators with other professional development responsibilities learn together in a collaborative manner.</td>
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<td>7. Incorporates thoughtful instructional design</td>
<td>The instructional design of each Elements course models the strategies that teachers should incorporate into their own classroom practice. Each Elements course follows two or more educators as they face hypothetical challenges in the teaching/learning process. States reported that the course design was effective in that the “problem” identified by the make-believe educators was realistic and that each course also embedded evidence from research that justified and supported the work these make-believe teachers were undertaking. Further, the courses do not “sugar-coat” the challenges teachers may face as they implement project-based learning. The flexibility of delivery options for Elements was important to state leaders. Elements can be delivered and facilitated via a variety of LMS platforms, which allows great flexibility for support of the course instructional design at the state and local levels. For those districts with no LMS, the courses may be streamed from Intel’s website, and districts are encouraged to incorporate no-cost social network platforms (e.g., Edmodo) for collaboration and assignments/work products. Each Elements course has accompanying resources such as a syllabus, a facilitation guide, end-of-module quizzes, and suggested action planning documents. All of these documents may be modified and customized to meet the needs of the states and districts. The Intel Engage online community of practice has resources for Elements (facilitators and Intel Teach Affiliates) all in one place. Intel Teach Affiliates report that the most common resources include course syllabi, facilitation guides, marketing materials, completion certificates, and action plan rubrics. The courses are designed to reflect effective professional development by pacing the content of the course so that teachers may learn new skills and content, try new strategies in their own classroom, reflect on their own practice, and then proceed to the</td>
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next new content of the course. The pacing design also models how teachers may use this strategy in their own classrooms (students learning new content and skills and applying these in their own learning). Because of the flexibility in Elements implementation, course facilitators may pace the courses to allow teachers opportunities to try out new strategies in their own classrooms, to reflect on the new strategies with colleagues, and to refine their practice. This feature was cited as especially important in implementation of classroom practices in blended learning settings. Each course consistently focuses on project-based learning, technology integration, student-centered assessment practices, and questioning strategies. Intel Teach Affiliate state leaders pointed out that the technology integration was especially valuable for the teachers in their states.

* Data were collected from two sources. The first is a report of results from an analysis of online survey data collected from course participants taking Elements courses between January and September 2013. (Wan et al., 2013). The second source is narrative from semistructured interviews of 10 Intel Teach Affiliate state leaders conducted by American Institutes for Research staff in June 2013.

From the evidence base of professional learning research and promising practices articulated in Section 1 and of direct experience with Elements presented in Table 1, we have distilled a set of suggested actions organized under two high-leverage recommendations. These recommendations and corresponding actions are likely to further build the human and resource capacity of state and local implementers of Elements. The recommendations and actions also begin to address organizational and structural capacity building, so that state and local leaders can support the integration of Elements into their organizational culture and system and provide an infrastructure likely to sustain its use.

**High-Leverage Recommendations for Effective Implementation of Elements**

Two broad recommendations are likely to give state and district implementers of Intel Teach Elements the greatest return on their professional learning investment:

**Recommendation 1.** Ensure that Elements implementation has the strongest possible basis in evidence from research; effective practice; direct experience; and national, state, and/or district standards.

**Recommendation 2.** Align Elements with district and school goals identified in the continuous improvement process, other state and local professional learning initiatives, and other components of teaching effectiveness.
1. Ensure that Elements implementation has the strongest possible basis in evidence from research; effective practice; direct experience; and national, state, and/or district standards.

- “Tightly bundle” courses—by identifying two or more courses or professional learning experiences (e.g., two or three Elements courses or an Elements course and another state or local professional learning experience) that are closely related and complementary to one another in which content, concepts, instructional practices, and/or active learning strategies are intentionally connected and extended—in order to increase contact hours and deepen understanding and application of content, knowledge, and skills.

- Engage local sites as cohort groups and/or instructional teams, including an administrator as an active member of the team, in order to build collective participation and collaboration.

- Given local cohorts and/or instructional teams, provide opportunities for blended solutions that incorporate online and face-to-face professional learning effectively by capitalizing on: (1) existing collaborative structures such as subject-area or grade-level teams, professional learning communities, and other structures; (2) common work time; (3) connecting professional learning as closely as possible to the classroom; and (4) intentionally distributing expertise among local staff, thereby providing more sustainable, ongoing professional learning, extending collective participation and collaboration, and setting the stage for “spillover effects” of instructional practices.

- Recognizing that the quality of facilitation is a critical element in successful implementation of online professional development, carefully select and prepare facilitators and provide ongoing support and networking for their continued growth.

- Optimize the facilitator role to develop stronger and more frequent opportunities for applications, reflection, feedback, and connections among participants and to help participants make effective use of online communities of practice and social networks to extend their access to human and material resources and their collaborative knowledge and skill building.

- Intentionally align the purposes, professional learning strategies, and content of Elements with: educator professional learning standards such as Learning Forward’s Standards for Professional Learning; technology standards such as the National Standards for Quality Online Teaching (iNACOL) and standards published by the International Society for Technology in Education (ISTE); and the Common Core State Standards and/or other state content standards for students. (See the Professional Learning Strategies Self-Assessment Tool to inform development of standards-based strategies.)

“Intel Engage is an online community for educators worldwide to support their work in transforming the 21st Century classroom.”

(Intel Engage, n.d.-a)
2. Align Elements with district and school goals identified in the continuous improvement process, other state and local professional learning initiatives, and other components of teaching effectiveness.

- Incorporate one or more activities into Elements courses so that participants intentionally align their professional learning goals and experiences with their local improvement goals, thereby creating greater coherence and likely impact.
- Monitor and evaluate implementation use of Elements as a part of continuous improvement in order to assess improvement of teacher practice and student learning.
- Identify connections between Elements and other state and local professional learning initiatives in order to capitalize on compatible content, instructional practices, interactive processes, collaborative structures and/or assessments, and to increase potential impact.

A three-year randomized-control research study in Missouri, funded by a U.S. Department of Education i3 grant, found that eMINTS professional development in conjunction with Intel® Teach professional development led to a significant difference in student achievement in mathematics in Grades 7 and 8 over the control group. Teachers completing the two complementary professional development programs were observed to utilize more inquiry-based instruction and technology integration than were teachers in the control group.

The use of Intel Teach was found to enhance eMINTS, in that those students whose teachers received one year of Intel Teach professional development in addition to the eMINTS professional development had higher mathematics achievement scores over those students whose teachers received only eMINTS professional development. The results were similar for observed teacher classroom behaviors, with those teachers receiving one year of Intel Teach utilizing more inquiry-based instruction and technology integration over those teachers with eMINTS training only. (Meyers et al., in press)

- Identify links between implementation of Elements and other state and local components of teaching effectiveness such as working conditions, teacher evaluation, teacher leadership, and certification and licensure, so that educators recognize Elements as part of a system of professional learning and continuous improvement.
- Incentivize Elements implementation by awarding professional learning continuing education units and/or badges and providing opportunities for teacher leadership.

Implications for Capacity-Building Implementation of Elements

State-, district-, and school-level policymakers and leaders play critical and varied roles in building multiple forms of capacity for effective implementation of Elements. Acting on the high-leverage recommendations and corresponding suggestions will further build human and resource capacity for effective implementation of Elements. In addition, each of these leaders can take action steps to address aspects of organizational capacity—processes that enable communication, cooperation, coordination, and collaboration—as well as aspects of structural capacity—infrastructure needed to operationalize policies, processes, and practices (Century, 1999; Herpin et al., 2014). Organizational and structural capacity building are essential for the full integration of Elements and other high-quality professional development into state and local organizational cultures and teaching-effectiveness systems and for the development of an
infrastructure likely to sustain high-quality professional development, including effective implementation of Elements.

The following lists provide action steps for state policymakers and leaders, district administrators, and school administrators:

**Capacity-Building Action Steps for State Policymakers and Leaders**

- According to the research, states that establish standards for high-quality professional development provide a basis for districts and schools to offer effective professional development programs. For example, as of 2012, thirty-five states had adopted some form of Learning Forward’s Standards for Professional Learning to help guide the development and implementation of their state educator learning programs (Killion, 2012; NGA Center for Best Practices, 2009).

- Evidence supports the development and implementation of a statewide teacher evaluation system that identifies effective teachers and supports teachers in improving practice by establishing policy and guidance for the dual purposes of a statewide system of accountability and professional learning. Such a system would link high-quality professional learning with evaluation and enable educators to recognize the role of job-embedded professional learning in evaluation, the importance of accurate and useful feedback, and the appropriate use of evaluation data to inform planning for professional learning, among other things. Such a dual perspective on teacher evaluation would help ensure that all teachers are able to receive effective and necessary professional development (Coggshall et al., 2012; Goe, Biggers, & Croft, 2012; Killion, 2012; National Association of Elementary School Principals[NCEA], 2011; NGA Center for Best Practices, 2009).

- States that provide technical assistance to districts for choosing high-quality approaches to professional learning tend to be more successful in implementing an effective program. For example, by disseminating targeted guidance on proper use of funds for online and blended professional learning and other forms of high-quality professional development, states can avoid later issues that may arise from lack or misuse of funds. In addition, states can begin building relationships with those at the district and school levels by establishing systems for communication (Killion 2012; NGA Center for Best Practices, 2009).

**Capacity-Building Action Steps for District Administrators**

- A common problem, according to the research, is that knowledge and resources can be siloed within districts and schools. By distributing content and pedagogical expertise among staff, districts can purposefully build capacity that can help increase diffusion of expertise across schools within the district. One way to do this is by creating districtwide collaborative teams to learn and share knowledge and resources. Regarding technology expertise, it is recommended that districts tap local connected educators and other teacher leaders for leadership in professional learning (Cambridge & Rasmussen, 2014; Killion, 2012; Killion, 2014; Sun et al., 2013).

- According to the literature, districts should invest in instruction-related professional learning for district staff as well as for principals and educators in order to build central
office capacity to support principals and schools. It is also recommended that districts provide *mentor-induction programs for new principals* to build their capacity for instructional leadership (Bottoms & Schmidt-Davis, 2010; Cambridge & Rasmussen, 2014).

- Districts that are ready to **integrate high-quality, face-to-face professional learning with online and connected professional learning** as a part of the continuous improvement process may wish to make use of the decision-making process, practical tools, and numerous examples in the evidence-based *Moving Toward the Goal: Toolkit for Creating Future-Ready Online Professional Learning* (Rasmussen et al., 2014).

- The literature indicates that professional learning should be ongoing and sustained. To encourage this, districts can **adjust school calendars to provide time for meaningful professional learning**. Districts can work with principals and schools to create opportunities for regular teacher collaboration and learning within the regular school day and yearly calendar so as not to take away substantially from student learning time, nor to overextend educator time unnecessarily (Killion, 2014; Sun et al., 2013).

- Districts that are aware and involved in the review of teacher and student data can catch issues before the state accountability system can. One way to do this is by **creating professional learning teams to monitor student data and tailor professional development to meet educators’ needs** in order to provide necessary and relevant professional learning. This may involve forming district-only or district-school staff teams to review changing curriculum and how to implement it, as well as periodically examining data during the school year and assessing the gaps and the resources needed to address those gaps (Leithwood, Louis, Anderson, & Wahlstrom, 2004; Mizell, 2010; NCEA, 2011; Rasmussen et al., 2014).

- In addition to providing time and guidance for implementing high-quality professional learning, recent studies indicate that schools and teachers are more likely to engage in professional development when they have access to the funds and tools necessary. Districts that **allocate sufficient resources** for professional learning, including making the necessary technology and technology training available, will be more likely to attract and engage their educators. Other resources that districts can provide for more effective and efficient professional learning include creating allowances in policy for technology and social media access necessary for both educator and student learning and development of personal learning networks (Dede et al., 2009; Mizell, 2010; NCEA, 2011; Rasmussen et al., 2014).

**Capacity-Building Action Steps for School Administrators**

- Similar to the district need to understand curriculum and implementation, the literature indicates that school administrators also should be **knowledgeable about the curriculum and standards** teachers are working with in the classroom. In order to be able to help implement and evaluate teachers in the classroom, it is important to understand the researchbase and strategies. In order to do this, building administrators can be involved in instructional leadership teams in order to understand the curriculum and standards teachers are working with. By engaging in this way, they will be more able
to provide guidance and input to classroom teachers, as necessary (Killion, 2014; Leithwood et al., 2004).

- Similar to districts, **adjusting school day schedules and school year calendars to provide time for collaboration** can be a great motivator for teachers to participate in professional learning activities. Principals and school staff can work to adjust school schedules to allow for in-building observation periods or arrange for a weekly grade- or subject-level free period for teacher planning or professional development (Killion, 2014; NCEA, 2011; Rasmussen et al., 2014; Sun et al., 2013).

- As with districts, schools can benefit from the **distribution of expertise among staff**. Schools can purposefully build capacity within the building by increasing diffusion of grade-level and content-area expertise among staff. Besides regular grade- and subject-level team meetings, one way to do this is by establishing mentorship and coaching programs such as pairing an experienced teacher with a novice to provide a resource when the need arises (Killion, 2014; Rasmussen et al., 2014; Sun et al., 2013).

- As with districts, schools can benefit from the **distribution of expertise among staff**. Schools can purposefully build capacity within the building by increasing diffusion of grade-level and content-area expertise among staff. Besides regular grade- and subject-level team meetings, one way to do this is by establishing mentorship and coaching programs such as pairing an experienced teacher with a novice to provide a resource when the need arises (Killion, 2014; Rasmussen et al., 2014; Sun et al., 2013).

- **According to the literature, principals who participate in and use social networks for collaboration and networking** are more likely to encourage staff and community participation and support for professional knowledge and growth. Effective principals and building administrators are those who are continually learning and adapting how they relate to teaching and learning. This includes their own modes of communication and collaboration within and outside of their own school community. Therefore, principals who model acceptable use of new and changing technologies may encourage and create buy-in among their staff (National Association of Elementary School Principals, 2011; Perry et al., 2014).

**Concluding Remarks**

As this paper demonstrates, Intel® Teach Elements professional development reflects many research- and standards-based characteristics of high-quality professional learning in its design and implementation. Intel has successfully built human and resource capacity for Elements in the United States by increasing teacher knowledge and skills and by supporting teacher professional growth with effective state leadership and technology-based resources.

Also elucidated in this paper, evidence-based perceptions drawn from research, promising practices, standards, and direct experience—together with the consideration of organizational and structural types of capacity building—enable state and local leaders to weigh recommendations and actions to inform how they optimize the implementation of Elements and integrate the courses into their professional learning systems.

In light of these evidence-based perceptions and capacity-building implications, Intel Teach Elements as a proven program has the potential to become even more dynamic, better able to leverage state and local support for ongoing professional learning for teachers as they respond to the complex needs of their students and to prepare them with skills for success in a digital world.
References


Appendix A: Annotated Bibliography of Selected Evidence-Based References about Face-to-Face, Blended, Online, and Connected Professional Learning


This paper looked at how 21st century technologies could be integrated into teacher education programs, which, in turn, would translate into improved teaching and learning in the classroom. The researchers used teacher perception surveys to analyze the effect of a professional development workshop integrated with Web 2.0 and social media usage on technological pedagogy, content, and content knowledge. Overall findings of the study indicate teachers noticed a shift from teacher-led instruction to student-led instruction through the use of technology. In addition, respondents saw a positive impact on student achievement. The paper also discusses respondents’ views on the effect of technology on their content knowledge and instructor role. This paper concludes that use of social networking tools and technology can benefit both teachers and students in the classroom; however, it calls for additional research in the area of technological pedagogical practice.


This report is a review of literature on professional learning communities (PLCs) in order to answer the title question. The reviewers searched for literature on both traditional and online PLCs in order to provide a baseline for comparison, although they did not produce an exhaustive search for traditional PLCs. The reviewers looked at advantages, disadvantages, and best practices for online and hybrid PLCs. The report acknowledges the lack of substantial methodological research on the topic but concludes that the available literature indicates online PLCs can be effective.


In this research and policy brief, the authors look at federal policy changes as well as research on effective professional learning practices in order to make the case for including professional learning in effective teacher evaluation systems. The authors discuss the characteristics of job-embedded professional learning and provide examples of how it promotes further learning and, therefore, teacher effectiveness. The brief
concludes with a discussion of the conditions needed in order for professional learning to be used effectively in evaluation systems.


In this issue brief, the authors define what is meant by job-embedded professional development (JEPD) and the conditions necessary for it to be considered high-quality. The authors determine a variety of formats in which JEPD can occur and in what manner. In addition, they look to research to determine how it can improve teaching practices and student outcomes specifically for teachers. They conclude by providing detailed action steps that state, district, and school leaders can take to support this type of professional development for teachers.


In this article, the author discusses what research says about the importance of reflective thinking as it relates to teachers’ professional growth and best practice, and suggests ways to encourage the practice among teachers in order to connect it back to practical classroom applications. Four modes of thinking are briefly described along with how and when a teacher would employ each. These include technological, situational, deliberate, and dialectical thinking. The author concludes by suggesting that reflection is best achieved along with colleagues who can act as mentors providing prompting questions for reflection, via study groups that review and explore each thinking method, and by a teacher’s own direct reflection of his or her classroom practice.


In this report, the authors surveyed current research on effective professional learning in order to come up with a set of strategies that the field can use, or develop further, to improve current professional development activities. In addition, using surveys, the authors looked at the policies and practices in place to support these practices, as well as the individual teachers’ access to such resources and supports. The authors also compared the findings of U.S. professional learning practices to those of other countries. The report findings indicate professional learning should include both pedagogical and content knowledge, and the report concludes by asking two questions for further research.

This descriptive study uses current (at the time) research and anecdotal evidence on online teacher professional development in order to illustrate the need for more rigorous research in the field. In their review of the literature, the authors found several understudied areas that they argue are necessary in future research so developers will know which elements are needed to design an effective program, and teachers will more effectively be able to determine the programs that can create teacher change and student learning. The authors provide recommendations for prioritizing a future research agenda, which include specific research topics, strategies, models, designs, methodologies, and issues of coordination and dissemination.


In this exploratory research study, the authors examine an online professional development program targeted at elementary school mathematics teachers and specialists in order to understand the role of facilitation as a key design element of professional learning. The study looked at two questions: (1) what is the role of facilitation in the online seminars? and (2) what strategies does the facilitator use to deepen participants’ knowledge of mathematics and teaching? The authors determined that facilitation in professional learning uses additional strategies versus the role of a teacher/facilitator in online courses. They discuss the key facilitation strategy observed, “steering towards others,” and its impact of fostering inquiry and building professional knowledge within an online professional learning context.


In this experimental study, the authors examine whether online professional development is more effective than face-to-face professional development for both teachers’ knowledge and classroom practice and student learning. Teachers from across the United States in a variety of settings were randomly assigned to either a face-to-face or online course for learning to use new science curriculum materials, with students assigned to the same group as their teacher. The study concluded that there was no difference in teacher or student outcomes based on the mode of delivery of professional development where the content was the same. The authors note that further research is needed to look at different professional development designs.


This is one of the first large-scale empirical studies looking at the effects of characteristics of professional development on teacher learning. Researchers identified characteristics of professional learning as identified in the literature at the time and
compared them to the self-reported change in teacher knowledge and behavior. The study indicated that three features of professional development resulted in positive effects on teacher learning. In addition, the authors determined that three structural features of professional learning lead to the positive results: (1) the form of the activity; (2) collective participation of a group of educators from the same school, grade, or subject area; and (3) duration of the activity.


In this book, the author goes in-depth into the basis and elements of gamification and applications for learning. Chapter 4 focuses on what the research says about the effect of gamification on instruction and learning. Looking at several meta-analyses as well as individual research studies on the effects of particular game elements, the author looks at the effectiveness as well as the limitations of games. The review indicates that game-based learning provides a slight advantage in terms of participant outcomes over traditional instruction.


In this article, the author distills the findings from a larger report, *Meet the promise of content standards: Tapping technology to enhance professional learning*, which examines the role of technology in professional learning. The author discusses the five ways technology can enhance professional learning through personalization, collaboration, access, efficiency, and learning designs. The article includes a matrix of criteria for selecting technology-enhanced professional learning, which includes core elements required and a description of how each element should look within a program or product.


In this article, the author discusses findings of the study *Shaping Professional Development to Promote the Diffusion of Instructional Expertise Among Teachers*, which provides evidence that effective professional learning has real, positive effects not only on the educators who undertook the training, but also on those who receive training or support from those with direct participation. The author describes the study, methodology, and results along with the practical implications for educators. Because of this “spillover effect” from effective professional learning, the author stresses several points that those developing and implementing professional learning must consider: (1) use research-based elements noted in the study and elsewhere; (2) ensure that learning and expertise are distributed among staff; (3) build capacity for collaboration within the school and content knowledge among leaders; and (4) adjust school calendars to allow for the necessary collaboration.

This informational brief explores the purpose of, and need for, professional development for teachers as a means for improving educational practice, and by extension, student outcomes. Using a question-and-answer format, the author explains what constitutes professional learning for teachers, why it is necessary, and the various forms it takes. The author also addresses general concerns over the timing of professional development with respect to student learning time and ways it is effective.


Organized around seven principles for effective mathematics and science professional development identified by the National Institute for Science Education, this paper discusses three things: (1) characteristics of effective professional development, (2) positive trends in professional development, and (3) logistical and planning issues. The report uses the practical experience of the Eisenhower Regional Mathematics and Science Education Consortia to reinforce the research base in identifying effective professional development traits to assist others in selecting high-quality professional development programs.


In this issue brief, the authors discuss what professional development research reveals about teacher practice and its impact on student improvement, noting that there are several elements of professional development that positively affect both. The authors go on to discuss what the research indicates is still lacking in effective professional development and to provide recommendations for states and districts to drive improvements to professional development through policy change.


This quasi-experimental study explores four research questions that arose out of a literature review of research on blended learning models. Researchers reviewed evaluation reports for three teacher professional development programs focused on math and science teaching in middle and high school with high English-language-learner populations. Results are presented as a discussion of how each program addressed the four questions, along with how the literature supports these findings. The authors conclude that blended learning can be an effective professional development model and provide recommendations for developers for how to incorporate the findings into effective blended programs.

Researchers reviewed longitudinal and psychometric data from a 39-school study to determine the extent to which high-quality professional learning has the effect of extending beyond those who directly participated in the professional development activities. Researchers looked at two areas: (1) how do the duration, content, and learning strategies of professional development affect the number of colleagues a teacher helps? and (2) how do teachers’ changes in instruction result from interactions with colleagues who had prior professional development? The authors discuss the results of their findings along with policy implications. They conclude that effective professional development should promote both individual participation as well as an ability to collaborate in order to have the most reach.


In this study, the author examines online professional development (in the form of Web-based Blackboard courses) to determine the perceived characteristics of effective professional learning and compares the outcome to characteristics of effective professional learning based on a literature review. The author discusses the perceived characteristics of effective online professional learning—instructional design, interactivity, and collaboration—and the implications of these in developing effective professional learning programs. The author concludes by providing suggestions for further study.


The authors of this report narrowed down 1,300 studies addressing the effect of teacher professional development on student achievement to identify nine studies that met What Works Clearinghouse evidence standards. With these nine studies, the authors identified evidence that direct teacher professional development can have a positive effect on student outcomes in the three key content areas of mathematics, science, and language arts. The report provides an overview of how professional development affects teacher learning and practice as well as student achievement, and discusses the results of each of the nine studies based on previously identified characteristics of high-quality professional development. The authors conclude that though there appears to be a moderately positive effect, there are not enough studies specifically addressing this area, and more rigorous research is required.
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