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ICT and Instructional Innovation: The Case of Crescent Girls' School in Singapore

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ABSTRACT

This paper describes a global professional development program called 21st Century Learning Design (21CLD), which helps teachers design academic lessons that integrate opportunities for students to develop 21st Century competencies in a variety of dimensions such as collaboration, knowledge construction, and the powerful use of ICT for learning. The framework and tools of 21CLD are grounded in learning science research, promoting aspects of these dimensions that have been shown to tie to deeper learning. The paper highlights the example of Crescent Girls' School in Singapore, which is implementing this program school-wide as a next step on its longstanding journey to leverage ICT for instructional innovation. Critical aspects of the school's supportive ecosystem include a clear and consistent vision for teaching and learning, strong teacher ownership and a common language of discourse, distributed leadership, and the use of ICT to support teacher professional development and lesson design. The paper describes results for teaching and learning through a Communicative Arts lesson that leverages place-based ICT tools for student knowledge construction. Although Crescent Girls' School is unusually well resourced and has a strong history of ICT use for learning, this case offers lessons that apply equally well for earlier-stage explorations into ICT.

Keywords: *21st Century Learning; Lesson Design; ICT for Learning; Teacher Professional Development; School Support Structures; Distributed Leadership*

INTRODUCTION

Teachers around the world have long felt a gap between global policy rhetoric on the imperative of promoting students' 21st Century competencies and the lack of specific tools for teachers to build these competencies into their lessons. In particular, it is tempting to believe images of the power of new technologies to transform schooling, making the learning environment more engaging and student-centered and the learning itself deeper and more powerful. But in real classrooms, the challenges of integrating information and communication technologies (ICT) and new pedagogies in ways that enhance rather than compromise academic success are ever-present, both in developing countries and in contexts such as Singapore that are further along the path. The research described in this paper offers a lens into what it takes to help ICT reach its potential for teaching and learning.

The focus of this paper is a global professional development program called 21st Century Learning Design (21CLD), which helps teachers design academic lessons that include opportunities for students to develop 21st Century competencies such as collaboration, knowledge construction, and the powerful use of ICT for learning. The setting of this study is Crescent Girls' School (Crescent) in Singapore, a high-performing, well-resourced secondary school for girls that has been on a journey to leverage ICT for instructional innovation for over a

decade. Crescent adopted the 21CLD approach school-wide in 2012, and has since leveraged it systemically to deepen the 21st Century competencies embedded into its instructional programs while continuing to promote academic excellence.

A striking element of the description of Crescent, later in this paper, is the pervasiveness of ICT throughout the school, both in access and in instructional use. We offer this case to demonstrate principles that are important in any setting in which teachers wish to take steps toward ICT-enabled student-centered pedagogies, whether those are first steps or simply next steps.

This paper examines the process of ICT-supported instructional transformation from three vantage points:

1) A program that provides a framework and tools for teachers;
2) The leadership structures and strategies within a school that can encourage and enable teachers to innovate; and
3) The view from the classroom, with a case of a Communicative Arts lesson that uses ICT to promote students' knowledge construction and collaboration competencies.

THEORETICAL FRAMEWORK AND PROGRAM DESIGN

21CLD grew out of a global multi-year research program called Innovative Teaching and Learning (ITL) Research (Shear, Gallagher, & Patel, 2011). The intent of ITL Research was to study ICT-enabled educational innovation and its school and national-level facilitators across a wide range of countries. The conceptual framework that grounds both programs is strongly rooted in decades of research in the learning sciences (Bransford, Brown, & Cocking, 2000; OECD, 2010; Sawyer, 2006) and in leading international frameworks for 21st Century skills (ISTE, 2008; Law, Pelgrum, & Plomp, 2008; Partnership for 21st Century Skills, 2009; UNESCO, 2008).

In 21CLD, primary elements of 21st Century teaching and student skills are defined as six dimensions that research has shown to tie to improved student outcomes: collaboration, knowledge construction, skilled communication, real-world problem-solving and innovation, use of ICT for learning, and self-regulation (see Table 1). The focus of the program is the lesson (called a "learning activity" in 21CLD) and the opportunities it provides for students to learn and practice these skills. Based on a toolset developed in ITL Research and validated in multiple countries (Gallagher, Shear, Patel & Miller, 2011), 21CLD provides detailed definitions, examples and rubrics for each of these dimensions that help teachers analyse the strength of a given lesson through the lens of that dimension. For example, when students participate in this lesson, how strong are their opportunities to construct knowledge, to collaborate in meaningful ways, or to use ICT to deepen learning?

For each dimension, the levels of the rubric are based on elements that learning sciences research highlights as supportive of more meaningful learning (see key questions for each dimension in Table 1 below). For example, for the collaboration dimension, rather than simply working together to discuss an issue—which often passes for collaboration in classrooms—21CLD pushes teachers to focus on the substance of the collaboration. Lessons can be designed so that students are required to articulate their ideas, listen and build on the ideas of others, debate and negotiate, leading to deeper conceptual understanding (Brown & Campione, 1996; Scardamalia & Bereiter, 1994), and with responsibilities thoughtfully distributed so that each student plays an essential role (Nussbaum & Caballerio, 2013).

Table 1: *Key Questions by 21CLD Dimension*

Dimension	Key Question
Collaboration	Are students required to share responsibility and make substantive decisions with other people? Is their work interdependent?
Knowledge Construction	Are students required to construct and apply knowledge? Is that knowledge interdisciplinary?
Self-Regulation	Is the learning activity long-term? Do students plan and assess their own work, and revise their work based on feedback?
Real-World Problem-Solving and Innovation	Does the learning activity require solving authentic, real-world problems? Are students' solutions implemented in the real world?
Use of ICT for Learning	Do students use ICT to support knowledge construction? Is ICT required for that knowledge construction? Are students designers of an ICT product for an authentic audience?
Skilled Communication	Are students required to communicate their own ideas regarding a concept or issue? Must their communication be supported with evidence and designed with a particular audience in mind?

Similarly, the knowledge construction dimension focuses on whether students are primarily repeating information they have learned or participating actively in creating their own conceptual understandings (Bransford et al., 2000) through activities such as interpretation, analysis, synthesis, or evaluation, and making those understandings increasingly robust through subsequent application to new situations (Pellegrino & Hilton, 2012). According to the 21CLD framework, ICT is viewed within the context of support for broader pedagogical innovation and deeper learning, not as an end in itself. The use of ICT for learning dimension focuses on whether ICT is supporting knowledge construction, and whether it is being used in ways that enable new learning opportunities that would not be possible without it (Bransford et al., 2000).

The goal of the 21CLD program is to translate these and other powerful ideas for learning into classroom activities for students. It begins with a 3-day workshop designed to engage teachers actively in each of the dimensions. The workshop leverages the teacher-friendly definitions, examples, and rubrics for each dimension that were developed and refined through the three-year multi-national ITL Research program. For each dimension, teams of teachers collaborate in hands-on activities to work through definitions and examples of each "big idea" (the main constructs of the dimension); learn to recognize learning activities that do or do not promote these skills by applying the rubrics to strong and weak exemplars; act as designers to strengthen the learning opportunities a lesson offers in this dimension; and consider teaching strategies that best facilitate successful enactment of the big ideas. By the time the workshop concludes with a comprehensive lesson design activity, teachers have developed a common vocabulary for talking about 21st Century competencies, and have the building blocks to use these tools both for their own or collaborative reflection on the opportunities their instruction is providing for students to develop these competencies and for their own or collaborative lesson design.

Depending on the context in which it is used, 21CLD often serves as a first in-depth introduction for teachers to the concepts of 21st Century teaching and learning, and serves as a bridge

between the language of policy/standards and concrete methods for the classroom. In the case of Crescent, the school itself already had a long history of focusing on ICT use and on 21st Century competencies for students. For them, 21CLD offered a common language to discuss 21st Century learning and a concrete way to focus on these competencies in the design of instruction, with the goal of more deeply incorporating them into the school's curriculum.

As with any supports for instructional change, a workshop is only the beginning. This paper will focus on how 21CLD was leveraged in ongoing instructional design processes at Crescent within an ecosystem of supports for instructional innovation, and describe the case of a communicative arts class that leverages ICT to promote students' 21st Century competencies and academic success. The paper focuses on three of the 21CLD dimensions: collaboration, knowledge construction, and the use of ICT for learning.

METHODOLOGY

This paper describes preliminary results of the school-wide implementation of the 21CLD program at Crescent Girls' School in Singapore through the lens of a communicative arts lesson. It represents an early stage in a larger study in which teachers are researching their own practice, with the support of SRI International to conduct a cross-case analysis of teachers' use of the 21CLD process to build lessons designed to deepen students' 21st Century competencies. In line with the literature on case study and cross-case analysis, we first create individual case records describing teachers' experiences implementing 21CLD-developed lessons in their classrooms before systematically analyzing across case records to understand school-wide 21CLD implementation (Merriam, 1991; Miles & Huberman, 1994; Yin, 1994). For this study, the case record includes the following data:

- Assessment of lessons using 21CLD learning activity rubrics
- Assessment of students using 21CLD student rubrics as well as content-specific assessments
- Peer classroom observations
- Teacher case reports reflecting on their implementation of 21CLD

To develop the case record, we use teacher-driven action research to collect information about the experiences teachers have implementing pedagogical approaches to develop students' 21st Century competencies in their own classrooms. Action research is an iterative process through which teachers investigate their classroom instruction, reflect on how they can improve, and make changes to their practice (Carr & Kemmis, 1986; Pine, 2009). Because teachers are the implementers of instruction, their inquiry into their own practice often uncovers valuable information about improving teaching practices and the effectiveness of school-wide instructional programs (Foley, 2009; Kaftan, Buck, & Haack, 2006; McGlaughlin, Watts, & Beard, 2000). Since we seek to understand school-wide implementation of 21CLD through individual teacher's classroom experience, action research creates a unique opportunity for teachers to collect data on implementation of their pedagogical approaches while reflecting on successes and areas for future improvement. This paper focuses on one teacher case.

This research places a heavy emphasis on the school-level context of innovation, and the structural and cultural components that promote classroom-level change. From the perspective of the global 21CLD program, the school has also been treated as a higher level of a "case", when we look at implementation models that support innovation in widely varying national and local contexts (e.g., Shear, Mikkonen, Sithamparam, & Tang, 2012). We gather data on school-level factors that influence the implementation of 21CLD through interviews with school leaders and

teachers and reviews of documents describing school programming. We use these data in this paper to describe the critical school-level elements that influence classroom-level implementation of 21CLD at Crescent.

CONTEXT: AN INTRODUCTION TO CRESCENT GIRLS' SCHOOL

Crescent Girls' School in Singapore is a secondary school with about 1,100 students and a staff of about 90. The school has had a 1:1 learning environment since 2003, where each student owns a personal learning device provided by their parents and has access to reliable wireless connectivity and technical support thereby allowing for the seamless integration of technology into classrooms. Under the school's mobile learning program, students use their devices across all subjects for all levels. The mobile learning program is founded on the school's vision and strategies around curriculum, pedagogy, and assessment. A 1:1 learning environment has facilitated the creation of various ICT-supported innovations in teaching and learning, where technology is leveraged in unique ways.

Because students possess their own personal devices, learning can take place anytime, anywhere, and with anyone. Technology use is ubiquitous in the school – teachers naturally and seamlessly leverage Web 2.0 tools to facilitate collaborative learning and self-directed learning. To harness technology effectively and pervasively for learning beyond the school, Crescent has also developed a comprehensive suite of technologies to extend learning beyond the four walls of the classroom. For example, Trail Shuttle is a technology application that was developed by Crescent in collaboration with key partners. This web-based application enables both teachers and students to create exciting multimedia and location-based investigations called i-Trails, which are subsequently made available for both their peers and public to experience through their smartphones and other mobile devices.

In addition to these technology innovations, the Crescent curriculum features a number of ICT-supported instructional programs designed to support more meaningful and connected learning. For example, an integrated curriculum program in secondary 1, 2, and 3 (the first three grades of secondary school) draws theme-based content from multiple subject areas, applying skills, concepts, and processes in authentic and real-life situations so that students can see the connection across different disciplines. The Secondary 1 communicative arts program, which is the focus of the case presented in this paper, integrates literature and English and places a strong emphasis on the skill of effective oral communication.

Throughout its recent history, school leaders at Crescent have recognized the importance of systemic supports for innovation within a vision that emphasizes instructional excellence. The next section describes critical elements in the education ecosystem within the school and how those elements have been leveraged to guide instructional innovation through 21CLD. We then present the case of a Secondary 1 communicative arts lesson unit as an example of how these critical elements support the design and implementation of a series of lessons that seamlessly and pervasively uses ICT to support the development of knowledge construction and collaboration skills in students.

A school-wide ecosystem for ICT-supported innovation

Significant changes to teaching and learning are complex and too often do not reach their potential in practice (Cuban, 1993; Payne, 2008). School improvement efforts fail in spite of much promise because implementation issues are usually underestimated. The pace of change often occurs too quickly, and is frequently imposed from the top or the outside, leaving very little time and space for leadership capacity building (Harris & Chrispeels, 2008). This section discusses the

key elements that have surfaced from the research at Crescent that support sustainable and scalable ICT-supported innovations.

Strong teacher ownership and a common language of discourse Teachers are the ultimate arbiters of change. Teacher beliefs and values underpin what they do in the classroom (Hill & Crevola, 1997). Hargreaves and Shirley (2009) describe lively learning communities where teachers share and learn from one another as one of the key principles for teacher professionalism. Changing the conversation in an organization can have profound impact on its culture and the day-to-day work of its people (Kegan & Lahey, 2001). Having a common language and precision regarding meaning of that language are crucial to the culture of discipline essential to effective schools (DuFour, DuFour, & Eaker, 2008).

Crescent has assessed 21st Century competencies since 2007. However, pedagogical practices surrounding development of these competencies were not apparent. 21CLD was introduced as a professional development framework to provide lenses for the design of learning activities that explicitly develop students' 21st Century competencies. 21CLD was introduced through a workshop conducted for all teachers. Teachers worked in collaborative teams to design lesson units using 21CLD and school leaders engaged in generative conversations in these teams. Structural elements were introduced to facilitate teacher ownership and collaborative discourse. Professional development time had been built into teachers' timetables so that time was protected for teachers to engage in collaboration and discourse.

Distributed leadership. One of the dimensions of effective leadership involves leaders promoting and participating in teacher learning and development (Robinson, 2008). School leadership has a greater influence on schools and pupils when it is distributed. Distributed leadership focuses on expertise rather than position. It serves to tap on "untapped" leadership in teachers, and achieves distributed accountability (Leithwood, Day, Sammons, Harris & Hopkins, 2010).

At Crescent, the change process has been deliberately facilitated by school leaders and owned by teachers, drawing on theories of effective and distributed leadership. Following the first series of 21CLD workshops, school leaders led conversations on 21CLD at various levels – from the middle management to department teachers. These conversations leveraged systemic structures like collaborative networks to catalyse change in teacher perceptions and practice. Teacher leaders were also identified and formed a "21CLD Think Tank" to pilot lesson packages in various subject areas. As teachers worked in collaborative teams, school leaders participated in the discourse and actively engaged teachers in the various aspects of the 21CLD framework.

Use of ICT to support teacher professional development Crescent teachers plan collaboratively using the 21CLD framework to build, review, and revise lessons to ensure instruction deliberately builds students' 21st Century competencies. At Crescent, teachers collaborate face-to-face during built-in professional development and also informally outside of that time to provide each other with feedback and suggestions on improvements to lessons. Realizing the importance of teacher collaboration for lesson development and the need for an easy way to collaborate outside of professional development time, a 21CLD web-based application was developed by the school. The development of the application was premised on design principles that arose to address challenges that were surfaced in the Innovative Teaching and Learning (ITL) Research (Shear et al., 2011), including the need to support consistent and purposeful lesson design across teachers and the benefits of teacher collaboration and peer support.

The application is currently being piloted and Crescent continues to refine it. Crescent teachers who have piloted the application reported that it has facilitated deliberate consideration of the

21CLD learning activity rubrics, and the corresponding pedagogical moves necessary to attain the requisite levels intended. The collaborative features also facilitated co-construction of learning activities, and served to maintain the rigor of the lessons designed as they are submitted for expert panel review.

CASE STUDY: SECONDARY 1 COMMUNICATIVE ARTS LESSON UNIT

Crescent teachers have been using technology to support student learning for over a decade. The introduction of 21CLD provided teachers with a framework to think more deliberately about how that technology can best support students in building their 21st Century competencies. A communications arts lesson unit on poems about World War II highlights how teachers at Crescent are using 21CLD in conjunction with technology to deepen students' knowledge construction and collaborative learning competencies.

The main objectives of the lesson were to deconstruct a poem to identify the uses of key literary devices and use what they learned through analysis to construct their own poem. To show their understanding for literary devices in poetry, the lesson culminated in students co-constructing a poem to help the reader visualize and empathize with what happened during the battle at Bukit Chandu – a historical World War II site in Singapore.

To achieve these objectives, the communicative arts teacher first introduced the poem "Andan and Comrades at Bukit Chandu" by Edwin Thumboo to build student knowledge of literary devices as well as content knowledge of Singapore during World War II. During this activity, students were prompted to answer questions in an online platform about their prior knowledge of World War II and reflections on the poem. Student responses were then shared with classmates via an online platform where they could easily be seen by every student. After introducing students to literary devices and activating their prior knowledge of World War II, the teacher took the students on a trip to Bukit Chandu. Using an i-Trails activity created by the teacher to support this learning journey (a journey of student discovery through place), students were prompted with teacher-developed questions and reflections as they moved around key locations within Bukit Chandu. Students worked in groups of four and moved through the facility with handheld devices, stopping at exhibits to learn about the personal experiences of Singaporeans during World War II and to respond to the corresponding reflection questions on Trail Shuttle. After building their knowledge for the time period and reflecting on what they had learned, students in each group co-constructed a poem to convey the sentiment of the time.

Figure 1: *Students on the Learning Journey*

Figure 2: *Poems Co-Constructed by Students*

Throughout the entire learning design process, teachers used 21CLD as a framework to provide key guiding considerations in the design of a lesson unit that deliberately fostered knowledge construction. In this lesson, the teacher used 21CLD to develop a technology-rich learning activity designed to deepen students' understanding. Instead of directly teaching students about the various literary devices, the teacher asked students to deconstruct "Andan Comrades at Bukit Chandu" to build their own understanding for how literary devices are used. To further push students' thinking, the teacher required students to use what they had learned about literary devices through the analysis of "Andan and Comrades at Bukit Chandu" to construct their own poem, thus requiring application of knowledge they had previously built. In addition, students constructed knowledge in history through the learning journey activity, fulfilling objectives in two disciplines simultaneously. The 21CLD knowledge construction's highest code requires students to apply their knowledge in another setting as well as provide interdisciplinary instruction, which this lesson skillfully fulfilled.

The collaboration dimension of 21CLD was keenly incorporated into various aspects of the learning unit. The notion of collaboration was not a new one to the teachers – collaborative learning as an instructional strategy has been frequently employed in Crescent classrooms. However, the collaboration dimension of 21CLD provided clearer articulation of what was expected of a learning activity that developed students' ability to collaborate. It was not merely about designing an activity where students worked in groups. Teachers used 21CLD as a lens to examine the depth of this collaboration by asking questions like "Do students have shared responsibility, or are they just working in teams?", "Are there segments in the learning activity that

require students to make substantive decisions together?" and "Is the students' work interdependent?" What resulted was a lesson unit that had students de-constructing a poem together, learning together on the learning journey to Bukit Chandu, and co-constructing a group poem together. Students shared the responsibility of analyzing literary devices, had various substantive decisions to make together (like which literary devices to use at which parts of the poem), and the resulting group poem was not one that they could have devised separately. The co-constructed poem was one in which each student in the group had to make a substantial contribution. Thus, 21CLD added greater rigor to the notion of collaboration within the learning activity.

The use of ICT for learning dimension was explicitly used to push teachers' thinking about higher levels of use of ICT that are essential for knowledge construction. Online collaborative platforms were purposefully used to support collaborative knowledge construction in student groups. Reflection questions and prompts, designed and deployed on the ICT platform Trail Shuttle, were carefully crafted to elicit student responses and required students to interpret, analyse, synthesis and evaluate information. Teachers were conscious of designing a place-based experience at Bukit Chandu in which ICT use greatly added value to the students' acquisition of knowledge construction competencies.

DISCUSSION

This paper described a step on the journey of Crescent Girls' School as it continues to deepen its integration of ICT into teaching and learning in the service of students' 21st Century competencies. Prior to the start of this program, the school already had pervasive use of ICT and a set of teacher-developed definitions and rubrics for the 21st Century competencies they wished to develop. 21CLD supported the intersection of these two capacities: the design of lessons that take full advantage of the 21st Century learning opportunities that ICT can bring.

As described in the communicative arts case, 21CLD has helped teachers to sharpen their design focus on how ICT can support deeper learning. For example, while students' use of handhelds was already commonplace and the Trail Shuttle technology already existed, this teacher used the 21CLD rubrics to guide selection of the prompts and reflection questions students would respond to in the Bukit Chandu i-Trail to encourage knowledge construction. It is possible to design a learning trail that makes use of ICT to connect student learning to place-based experiences, but in which the learning still revolves around simple information retrieval and articulation. This lesson makes use of ICT to support learning that is doubly deep: it is richly connected to place, and requires students to construct knowledge about the place.

It is striking in this case that ICT is not used as an end in itself: it is part of a coherent pedagogical vision, and is used as an enabler of that vision. At Crescent the ultimate goal is a student-centered model of learning that produces graduates with well-rounded competencies for the 21st Century. In the communicative arts example, ICT is used as a support for the type of strong collaboration that learning sciences research suggests can promote deeper learning, and that can also help students to become effective collaborators as adults.

21CLD provides a set of concrete tools that help to define this coherent pedagogical vision. But no toolset can foster lasting pedagogical change on its own. What makes the program successful at Crescent is a carefully designed ecosystem of supports for innovation, based on strong teacher ownership, distributed leadership, and the embedding of the vision and 21CLD constructs into school-wide discourse so that ideas are debated using a common language and framework. These conversations are facilitated through multiple structures within the Crescent teacher organization, including the 21CLD Think Tank and disciplinary teacher teams that undertake

collaborative lesson design. With an app for lesson design aligned to 21CLD, Crescent has also leveraged ICT to build the framework into the process of lesson design.

CONCLUSION

This paper described a program called 21CLD that offers tools and a process to help teachers design stronger opportunities for the development of 21st Century competencies into their instruction, including designs that use ICT in powerful ways to support deeper learning. Crescent Girls' School in Singapore is presented as a model of a school-wide ecosystem to support this vision of instructional change, with a case of a communicative arts lesson to illustrate results in the classroom.

It is important to note that this paper represents an early stage of research in the use of 21CLD to support innovative teaching at Crescent. It offers a single instructional case, which cannot be claimed to generalize to instruction throughout the school. In addition, the relatively unique context of Crescent means that possible implications for other school settings must be considered with care. Crescent Girls' School is clearly farther along the ICT adoption curve than the majority of schools around the world, and benefits from financial and technology resources and other capacities that most schools do not have access to. Studies are underway in other contexts that will contribute to a broader view.

Despite these limitations, this paper offers a number of important considerations for schools and teachers that are leveraging ICT to support student learning in any setting. The experience at Crescent suggests that when looking toward meaningful integration of ICT for learning, the ICT itself is not a sufficient first step. Instead, it is important to begin with a vision for the pedagogy and the learning that the ICT will enable, and to consider locally appropriate models for an ecosystem of supports that can give teachers both freedom and guidance to take steps toward that vision. In this way ICT is positioned as a means to an inspiring end, not a separate requirement that teachers must fulfill. Finally, this paper suggests that when it is time to implement in the classroom, the focus must be on learning activity design, with clear and practical supports for teachers in *how* to shift their instruction. While students might be engaged in using ICT in any number of ways, it is the design of the learning activity that shapes students' ICT use in support of deeper learning, which in turn puts ICT on a path to reaching its educational potential.

REFERENCES

Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). *How people learn: Brain, mind, experience, and school.* Washington, DC: National Academies Press.

Brown, A. L., & Campione, J. C. (1996). Psychological theory and the design of innovative learning environments: On procedures, principles, and systems. In L. Schauble & R. Glaser (eds.), *Innovations in learning: New environments for education* (pp. 289-325). Mahwah, NJ: Lawrence Erlbaum Associates.

Carr, W., & Kemmis, S. (1986). *Becoming critical: Education, knowledge, and action research*. Philadelphia, PA: Falmer Press.

Cuban, L. (1993). How teachers taught: Constancy and change in American classrooms, 1890-1990. *Research on Teaching Series*. New York, NY: Teachers College Press.

DuFour, R., DuFour, R., & Eaker, R. (2008). *Revisiting professional learningcCommunities at work: New insights for improving schools*. Bloomington, IN: Solution Tree Press.

Gallagher, L., Shear, L., Patel, D., & Miller, G. (2011). *ITL Research Phase I: Technical supplement.* Seattle, WA: Microsoft.

Greene, D., & David, J. L. (1984). A Research design for generalizing from multiple case studies. *evaluation and program planning*, *7*, 73-85.

Foley, M. (2009). *An exploratory action research study investigating the consequences of the implementation of a middle school alternative education program* (Unpublished doctoral dissertation). University of Hartford, Hartford, CT.

Hargreaves, A., & Shirley, D. (2009). *The fourth way-The inspiring future for educational change.* Thousand Oaks, CA: Corwin Press.

Harris, A., & Chrispeels, J. (2008). *International perspectives on school improvement*. London, England: Routledge Falmer.

Hill, P.W., & Crevola, C. A. (1999). Key features of a whole-school, design approach to literacy teaching in schools. *Australian Journal of Learning Disabilities, 4*(3), 5–11.

ISTE (2008). *National educational technology standards for teachers.* Eugene, OR: International Society for Technology in Education.

Kaftan, J.M, Buck, G.A., & Haack, A. (2006) Using formative assessments to individualize instruction and promote learning. *Middle School Journal*, 44-49.

Kegan, R., & Lahey, L. (2001). *How the way we talk can change the way we work: Seven languages for transformation*. San Francisco, CA: Jossey-Bass Publications.

Law, N., Pelgrum, W., & Plomp, T. (2008). *Pedagogy and ICT use in schools around the world: Findings from the IEA SITES 2006 study.* Hong Kong: IEA.

Leithwood, K., Day, C., Sammons, P., Harris, A., & Hopkins, D. (2010). 10 strong claims about successful school leadership. National College for Leadership of Schools.

McGlaughlin, H. J., Watts, C., & Beard, M. (2000). Just because it's happening doesn't mean it's working: Using action research to improve practice in middle schools. *Phi Delta Kappan, 82*(4), 284-290.

Merriam, S.B. (1991). *Case study research in education: A qualitative approach*. San Francisco, CA: Jossey-Bass.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage.

Nussbaum, M., & Caballerio, D. (2013, July). *Design of collaborative learning activities*. Paper presented at the IEEE 13th International Conference on Advanced Learning Technologies (ICALT), Beijing, China.

OECD (2010). *The nature of learning: Using research to inspire practice*. Paris, France: OECD Publishing.

Partnership for 21st Century Skills. (2009). *P21 framework definitions.* Retrieved from http://www.21stcenturyskills.org/.

Payne, C. M. (2008). *So much reform, so little change*. Cambridge: Harvard Education Press.

Pellegrino, J. W., & Hilton, M. L. (2012). *Education for life and work: developing transferable knowledge and skills in the 21st Century.* Washington, DC: National Research Council.

Pine, G. (2009). *Teacher action research: Building knowledge democracies*. Thousand Oaks, CA: Sage.

Robinson, V. M. (2008). Forging the links between distributed leadership and educational outcomes. *Journal of Educational Administration*, *46*(2), 241-256.

Sawyer, R. K. (Ed.). (2006). *The Cambridge handbook of the learning sciences*. New York, NY: Cambridge University Press.

Scardamalia, M., & Bereiter, C. (1994). Computer support for knowledge-building communities. *The Journal of the Learning Sciences*, *3*(3), 265-283.

Shear, L., Gallagher, L., & Patel, D. (2011). *ITL research findings phase I: Evolving educational ecosystems.* Seattle, WA: Microsoft.

Shear, L., Mikkonen, I., Shaw, K, Sithamparam, S., & Tang, H.W. (2012, December). *ITL LEAP21: Localization of professional development for 21st Century teaching and learning*. Symposium conducted at the conference of the World Educational Research Association, Sydney, Australia.

UNESCO (2008). *UNESCO's ICT competency standards for teachers.* Retrieved from http://cst.unesco-ci.org/sites/projects/cst/default.aspx.

Yin, R. K. (1994). *Case study research: Design and methods*. Thousand Oaks, CA: Sage.