What Make a Professional Community Innovative? A Study of Elementary Knowledge Building Teachers

(A very rough draft)

Abstract

Key to sustained learning innovation is the development of strong, innovative teacher communities. Through analyses of interview data and reflection journals, the present study examines the knowledge building innovation enacted by teachers at an elementary school. It suggests a number of key factors that inspire, enable, and sustain the teachers' innovative practice. These include: (a) Shared visions and deep ownership of teaching practice, coupled with deep trust in students' agency and potentials; (b) A hybrid identity that connects teaching with research; (c) Dedicated efforts to deepen pedagogical understanding and evolve designs; (d) Opportunism and collaborative emergence in classroom practice; (e) Dealing with the complex reality of teaching practice while maintaining a focus on innovation and improvement; (f) Community structures for professional dialogues, collegial support, and apprenticeship; and (g) Strong leadership support for teaching innovation.

Introduction

Key to sustained learning innovation is the development of strong, innovative teachers who have ownership over the innovation and capacity to sustain, spread, and deepen the underlying principles (Coburn, 2003). The innovative capacity not only lies in the knowledge, skills, and personalities of individual teachers, but also the community structure and contexts they collectively work in (Ballantyne, McLean, & Macpherson, 2003; Sarason, 1971). Teachers form into professional communities in every school; however, not all of them are strong communities that have intensive sharing and communication among members, and there are even fewer strong communities that encourage innovation and change as opposed to strengthening traditional teaching (McLaughlin & Talbert, 2001). As literature suggests, learning innovation can be better sustained by a community that engages teacher networking and collaboration; collegial critics; professional discourse about student thinking, subject matters, and pedagogical designs; deliberate investigation and risk-taking (Fogleman, Fishman, & Krjcik, 2006; Wilson & Berne, 1999). Further research needs to develop a systemic understanding of the essential features and conditions that make a professional community innovative based on rich data collections. The present study addresses this need by looking into the knowledge building innovation enacted by teachers at an elementary school—Institute of Child Study (ICS) Laboratory School located in downtown Toronto. Knowledge building represents a principle-based innovation with the goal of enculturating students into knowledge building communities where students' ideas have a public life, being continually revisited, critically examined, applied, revised, re-organized, and risen above (Scardamalia & Bereiter, 1994, 2006). This collective process is advanced through Knowledge Forum®, a computer-based knowledge building environment (Scardamalia, 2004). Knowledge building pedagogy and technology has been implemented at ICS over

the past decade, first by two teachers, and later evolving into a school-wide innovation. An earlier study analyzed the knowledge building initiatives facilitated by ICS teachers over the past years, and demonstrated sustained, significant advances among the teachers (Zhang & Scardamalia, 2007). As Bielaczyc and Collins (1996) have identified, ICS has formed a "hotbed" community for developing and sustaining innovations in learning and teaching. The purpose of this study was to unveil the mode of working of the teachers and understand major factors (e.g., structures and processes) that enable their sustained innovative work.

Method

The participants were eight knowledge building teachers and the Principal of ICS Laboratory School. We used qualitative methods to understand how the teachers enacted knowledge building innovation. The data sources included: (a) Semi-structured interviews with the teachers and the Principal. Each interview took approximately 40 minutes, focusing on the role of a teacher, goal of teaching, teaching advances, challenges, and school support. (b) Teachers' reflection journals shared online, called "Calendar of Inquiry (COI)," in which teachers recorded their knowledge building designs, classroom processes, and reflections on advances and problems. Following the process of inductive data analysis (Hatch, 2002; Strauss & Corbin, 1998), we read and re-read the above data and identified salient domains—major factors that enable and sustain teachers' knowledge building innovation. Each salient domain was represented by identifying "included terms" (members of a category) and their "cover term," followed by a search for connections across the domains. Comprehensive data analyses are still underway; below are some preliminary findings from the analyses we have conducted.

Results and Discussion

Shared Visions, High Expectations, and Deep Ownership

To understand their visions of teaching, we asked the teachers and the principal to identify three most important qualities they would like to develop in their students and explain how they develop those qualities. While their responses varied in terms of specific phrases they used, the teachers and their principal indicated important, shared goals they attempt to accomplish, including: developing students' social characters like confidence, caring, respect, and collective responsibility; intellectual curiosity and enthusiasm; and self-directed, deepening inquiry of knowledge. These shared beliefs, values, and visions represent important cohesive factors that connect members in a strong professional community (McLaughlin & Talbert, 2001). Particularly related to continual innovation of practice, the teachers and the Principal all have high expectations in terms of what young students can accomplish in learning, knowledge building, and collaboration, continually re-envisioning what's possible in teaching practice. They believe that students can take high-level agency in their learning and inquiry, communicate their trust and expectation through daily classroom interactions, and create environments where students can be active contributors of knowledge and work close to

their highest potentials. The excerpts below voiced their expectations, visions, and related changes:

> *When I first tried out Knowledge Forum in my classroom, I experienced a seismic shift in my belief in how children in the early years can share ideas in order to come to a deeper understanding. My teaching became more supportive rather than directive of the learning. Over the years, I have consciously worked on ways to release agency in a classroom of pre-k children in a way that is meaningful to them.* (CH, a pre-kindergarten teacher)

> *I think that most important one is independence. In that thinking, I want the students to make independent, purposeful choices about how they spend their time in the class. So when they are presented with questions, or a bunch of materials, or an open time frame, that they can be thinking in a very purposeful way about how they're going to pursue it. Whether it's playing in the yard, playing with blocks in the class, or in the math class, or thinking about the questions around the sun unit that we're doing, I want them to be knowing that they can act independently, they don't need to have a teacher there, guiding them in the whole way, and telling them what they're doing is right or wrong… My soul gets constantly amazed by what these young children can accomplish...* (C, a kindergarten teacher)

> *The other thing is…a feeling maybe of empowerment that they are able to contribute knowledge, that they have something worth saying. Not everything we say is going to be accurate, but it's worth saying anyway… When you realize what you thought was inaccurate, "Oh it's interesting. I thought in this way. But I think in a new way." So along with that empowerment is an understanding that the theories are improvable. Theories that are presented maybe in a textbook or in a lesson, or theories that simply have the best research to support them. But there're other existing theories, or theories that have not yet been presented that might improve upon that idea, and students themselves can be the people who contribute that new note… Imagine for children from the very beginning that... by connecting things in interesting ways, they could add a new perspective or a new theory… Their job...life is about going out and finding what they need and bringing it together and testing things out.* (R, a grade 5/6 teacher)

Along with their strong belief in students' agency over learning and knowledge building, the teachers demonstrated agency and ownership over their own teaching practice, dedicated to continually advancing their professional understanding and going beyond best practice. They see themselves as contributing to the progress of their profession.

> *I think that my understanding of the [knowledge building] principles completely is different today than it was my first year, and even it is different than a year or two ago. … You're constantly going deeper in what this means... This is a process you need to go, and it never stops.* (R, a grade 5/6 teacher)

I think as a teacher I've always been something who has been very flexible... I never try to think that worked really well, I'm going to do the same thing again. I always look for ways to improve my practice. I think what the knowledge building process brought to me was making that more explicit, and was embedding it in an environment where it was so embraced. (C, a kindergarten teacher)

The trust in students' potentials and ownership over their practice help open up new possibilities for the teachers to develop new visions and seek continual improvement, driving them to try out new design strategies to fulfill their visions.

A Hybrid Identity That Integrates Teaching and Research

As another factor essential to the innovative culture of the professional community, the teachers, as well as their principal, build a hybrid identity that integrates teaching and research. While their primary focus is on their teaching practice, all of them underlined the importance of having a researcher's mind and eyes. They experiment with new interventions and collect data to examine how their changes affect the students; they observe what's happening in the classroom and reflect on their pedagogical ideas and designs; they read research literature, interact with researchers, and present their work at conferences. Their engagement in knowledge building innovation makes these efforts much more purposeful and systematic.

Though I always felt that research informed practice, I did not consider that the two could occur simultaneously. I imagine my role both as the researcher and the researched. I am constantly examining KB's effect on me, the teacher, as well as its impact on the students my classroom. (CH, a pre-kindergarten teacher)

In practice, in a way as a teacher, we should always have a mind of researcher. Even if we are not sharing research in any kind of formal way, as a teacher growing with the children, you always need to be wondering about what's happening and asking yourself questions and testing things out, and looking for feedback from your kids. What can you observe is what you are doing is making a difference. (N, a grade 2 teacher)

I think that they go completely together that the researcher part informs teaching and the teaching informs the researcher part... I think that also has to do with teacher as co-learner in the classroom. Because I don't present myself as an authority figure necessarily in terms of knowledge, but that's where the researcher part comes in. We are a community of researchers in the classroom. So I work as a researcher on different levels: A researcher with the students trying to understand; I'm a researcher as a teacher trying to understand how children learn best. Knowledge building helps inform both of them. (R, a grade 5/6 teacher)

Deepening Pedagogical Understanding and Evolving Designs

The teachers started their knowledge building practice with understanding the knowledge building principles, as described in writing materials and presented by researchers and teachers. There are no standard "how to" procedures provided to teachers regarding the implementation of the principles. Classroom practices and effective knowledge building depend on teacher innovativeness and the formation of a knowledge building community among teachers in which classroom activities, knowledge building principles, challenges and possibilities are discussed at weekly professional development meetings, with the goal of exchanging insights and continually advancing best practice, instead of ritualizing their classroom procedures. Data analyses indicated that the teachers invented and tested a wide range of design strategies. They often focused on one or two of the 12 knowledge building principles in a particular year, trying to achieve a deeper understanding of the principles as they test and reflect on specific designs in different classroom contexts and content areas. For example, one of the knowledge building principles is "knowledge building discourse," which refers to discursive practice that results in not only the sharing of knowledge, but also the refinement and transformation of knowledge and emergence of new ideas (Scardamalia, 2002; Scardamalia & Bereiter, 2006). Knowledge Forum supports knowledge building discourse in an online environment that is a continuation and enrichment of classroom conversations. To engage students in knowledge building discourse in classroom, teachers at the school of the present study developed a design called "Knowledge Building Talk" ("KB Talk"). The original design of a Knowledge Building Talk is to have students sit in a circle, with the teacher as an equal member of the group. Their conversations focus on problems of understanding and knowledge advances, with the goal of collectively seeking deeper understanding in a domain (see Reeve, 2001). This approach has been subsequently adopted by many teachers in the school. Data Analyses show that the teachers do not merely replicate the activity structures of their peers, but have evolved different design strategies to engage knowledge building discourse in different classroom contexts. Below are two teachers' reflections on their improvements to Knowledge Building Talk:

> *We would hear what the principle was, [knowledge building discourse]. We would go into the classrooms, and we would do it DIFFERENTLY. And then we would come back and talk about it… When I first started, KB talk was on the schedule. They were every Tuesday 10 o'clock. I realized that wasn't working, because sometimes we had that time and we had nothing to talk about. Then we developed a sort of... We have pockets on the board, and if you have something to talk about, you would write it on a piece of paper…They would put the paper there, and I would pull them out, read it out, or pass it to that person. That was better, but still a bit too prescriptive. What's happening now… is I don't necessarily plan a KB talk. But they become more spontaneous. KB talks always used to be sitting down in a circle; that is not the case any more. It could be in the classroom, someone sits in the chair, someone sits on the floor, as long as everyone is following…Also that my role...I think I'm not a very quiet person in KB talk. When I interrupt, which I do, I'm a teacher saying: "Can you please say that a little bit more because the people on this side did not hear what you said." I'm more comfortable with that. You know, "Oh. I spoke again. That's terrible!" Now I realize no, I mean, we are still modeling for children… So that's my evolution of KB talk. Much less structured, more organic, spontaneous. They also*

can vary. I mean, we are not trying to filling up 30 minutes. If takes 10 minutes, that's it. If it takes 40 minutes, that's fine too. (R, a grade 5/6 teacher)

*I played around with it (KB Talk) a lot, because I'm really interested in discourse, and in trying to have children talk to each other without putting their hands up, so that if their ideas build on to someone else's, they can just say it. So I over the years was trying to get one person start and the children just talk. They take turns and don't put their hands up. They learn to hold back. If someone else starts to talk at the same time, they need to wait. It's very hard for kids, but I like the discussion that feels more like a conversation, not like the teacher choosing as the children put their hands up. So that's been a big thing for me. (*Z, a grade 3 teacher*)*

As has been observed in many contexts, teachers need to adapt and localize an innovation to meet the conditions and needs of their local contexts, ensuring a fit between the innovation and the local circumstances (Barab & Luehmann, 2003). Teachers in the present study also need to "adapt" Knowledge Building Talk and other designs to make them feasible in particular contexts (e.g., student age). But they are not merely seeking a "fit," but continually creating innovations to the designs based on their reflections upon the principles and classroom processes and new insights they gain from colleagues and researchers. They are responsible for the initiation of the designs, and maintain intentional efforts to experiment with new design features to enable more productive, authentic, and collectively engaged knowledge building processes.

Collaborative Emergence

Working with a set of principles instead of pre-specified procedures, the teachers perceived great opportunities and demands to make flexible, responsive decisions during classroom interactions, with planned activities adjusted and new strategies generated and adopted in an emergent way. This is challenging for teachers, as they need to re-conceptualize their role and control in classroom. The teachers in this study seemed to have gradually embraced greater emergence and opportunism in their approach as their comfort level increased. For example, responding to the interview question about major advances he had made in teaching in the past years, Teacher R reflected:

The other thing … is the control that as a teacher, when you're early in your career, you want…the principal to come to your room, and you're able to say: "Everybody is writing that right now." You know, that's safe. Knowledge building is not like that. So in order to feel like I knew what everybody is doing … I spent a lot of time saying: What you're going to be doing, what you're going to be doing, OK, go, come back, tell me what you did. I still do a little bit of that. But it took a lot of time to do that, and was still very structured, and there wasn't enough fluidity. So I learned to really have to face what students do. … So the students thought they were reading an article about something, then new question appeared. They could actually go and do something else. So as a teacher I have to learn that it's OK to say: "I'm not sure what that group is doing." I can go and find out and ask them. I know that they were able to answer it. The children might work inside, outside, in the hallway. That's fine,

because when they come back, I realize students are usually on task, and they are able to go deeply, because they have been given the opportunity to do that.

Teacher R's evolution towards more emergent, fluid classroom processes is also reflected in his approach to Knowledge Building Talks as elaborated above. Similar comments were made by Teacher C teaching kindergarten kids:

What does it mean to be a teacher in the classroom? You're not always the authority. You're not always the intellectual authority. Maybe that's it. And yet you still have to hold the piece together. You still need to be the one to make things safe for everybody. To make things safe in every way, physically, emotionally, socially, intellectually. So juggling that in a way that's right for me as a teacher, and feels right for the children, I think that's been a big change for me as well, because more and more I see that I hold the piece together, can be that teacher who can manage things, who keep things safe, who lets kids know what is OK is OK, and be more flexible with what is appropriate and what is impropriate, and be much more flexible with letting the children make decisions for the group.

A related interesting phenomenon observed in teachers' data is that classroom designs are often co-constructed by teachers and students through an interactive process. Students and their teacher collaboratively decide on what views should be created in Knowledge Forum, how they should be linked, and how students should be grouped. They discuss issues such as: what are the weak areas that need deeper research? what experiments need to be conducted to test our theories? when do we need a Knowledge Building Talk and what should it focus on?, and so forth. These classroom processes are characteristic of what Sawyer (2004) terms "collaborative emergence:" The process cannot be predicted and pre-specified in advance; the outcome is collectively determined by all participants instead of a single, authoritative member. Collaborative emergence exists in many contexts, however teachers depend on collaborative emergence to enact principle-based, knowledge building innovation.

I think a watershed moment for me as a teacher happened in my first year senior kindergarten...It was the very first day of school, I thought it would be interesting to do a study of trees. And whenever I think about a broader topic that we might be looking at, I think about whether this is going to impact children in the class, is going to be something that catches their interests. And I tried to think where it might go. So I can imagine, every year, five-year-olds bring leaves to class. Every year in the fall, they bring in different colors of leaves, they look at the shapes...I think I would probably be talking about leaves and colors and maybe get to the cells. I didn't have gone beyond that in the way for the kids. So the very first day, I started asking kids what they knew about trees. And as they told me about different parts of trees, I drew on a piece of chart paper. So someone said branches...twigs...and then a child said: "lungs." And I just stopped. And it was an important moment for me, because it made explicit the fact that I didn't say that trees don't have lungs. I don't think I would have said that. But it's such a clear way that puts me in an interesting position. So I said: "Where would I put the lungs?" And she said: "I don't know. They have to breath, don't they? They're alive." And for the next months, we looked into

how trees breathe. That's how it caught children's interests in the class. I knew nothing about it. It connected me very strongly to some people involved in Knowledge Forum. Somebody over OISE who heard about it through knowledge building...connected me ultimately to a professor, I can't remember where he was, Pennsylvania or something, who emailed us back. It was absolutely fascinating!...It was the first year that I came back from the Christmas vocation. So three months has passed while we were studying trees. And I felt that we had to stop studying trees. In January we need to start something new. And I really felt against that. We did start looking at new things. But I let the thread of trees continue through. And it was amazing to notice that you don't have to have these arbitrary barriers, that you can study so many things: do literacy and drama, and deep thinking, and specific experiments...every kinds of learning we want the children to do, you can actually do as one topic, because if it's a good topic, like trees and breathe, it is so rich, there're so many directions you can go. It led them to the human body, because they were thinking about breathing...So for me it was a huge moment as a teacher to realize just how much you can blast open the possibilities of depth and time. (C, a kindergarten teacher)

Enacting Innovation in a Complex Reality

Teachers typically work in a complex reality, interacting with many students at once, juggling multiple goals that often require trade-offs from moment to moment (Hammerness et al., 2005; Jackson, 1974). A big challenge facing the teachers in the present study was to maintain a focus on teaching innovation while dealing with multiple, changing demands in school, attempting to weave knowledge building into all aspects of classroom work. For example, central to the philosophy of the school is a dedication to "education for all," aiming to understand and respond to the needs of individual students and promote their development in all aspects, social, cognitive, emotional, and physical. The teachers tried to connect these missions to the creation of a knowledge building community where students respect, care, and listen to each other's ideas and feelings, and make reflective and fair decisions, and take collective responsibility in their work, with every student being an active, contributive member.

This year, I'm finding that I have social issues that I have not encountered with this group of four…They came in with a culture where certain voices had absolute authority over other children. If they said something, the other children, even they are upset about it, would accept it...unkindness...So that has been really a big focus for me and making sure that when we're in a group, children who used to be followers, used to be accepting the authority of a few other children know that I value their voice as much as I value what other child has to say. And maybe in that moment, I value theirs more, because it's new for them to speak out and it's new for others to hear it. So I work so hard to make those voices heard...For children who used to be talk dogs they feel a little bit threatened. So I also try to make them still feel safe and successful, but I need to find ways to make them feel safe and successful without have their thumbs on other children… Of course this translates into the work we're doing

in classroom... (C, a kindergarten teacher)

Adding to the complexity and messiness of classroom life are problems associated with technology use. In most of the classrooms of the teachers, there are no one-to-one computing facilities. Teachers need to come up with a responsive, flexible schedule so that students can access computers when they have a real need, and provide necessary support to help all student contribute to and benefit from the online knowledge space. For example, in her first year with the knowledge building pedagogy, Teacher Z worked with a Grade 2 class. According to her reflection journal, a challenge she encountered was that the second-graders were not comfortable typing, so they could not enter their ideas into Knowledge Forum's communal space so others could build on and improve them. After talking to her colleagues at a meeting, she decided to address this challenge using several strategies:

> *Children who want to will type their notes themselves. When children are on the database, adults (the teacher and her intern) may come and offer to take over the typing for a period of time or to help them to finish off their note if time is running out or if the child seems to be tiring. Children may request that an adult type the entire note for them. Children may write the note by hand and have an adult enter it into the database as the child reads it aloud.*

After testing these strategies in her classroom, the teacher wrote:

> *I think that giving them choices … does provide a way in for everyone and that not insisting that they type for themselves takes typing out the equation and puts ideas at the centre.*

There are moments when some computers cannot connect to the Internet, a student forgets his/her password, or other technical problems occur. Although there are a number of ways for the teachers to obtain technical support, instant, on-site support is not available at this moment. The teachers need to develop alternative, flexible strategies to make sure that students can proceed with their ongoing knowledge building work.

> *The other challenge is always technology, and how it is unreliable. And this morning when we tried to use it, someone's laptop doesn't work, some other's laptop doesn't connect to the Internet, and you know, new things about [Knowledge Forum] 4.6. So that's always frustrating. My intern today said...like everybody was on, and leaving about three or four students and he said: "...we're having problems with technology." And I have to look at him, because if I say that, then none of them will work. In a minute all of them will stop working. So it forces you to have a very strong stomach. And I have to sort of look at him and say: "No, actually, everything is working, and we're going to fix those, and even if we don't get to fix them." It puts you in a role where you have to be happy all the time about technology. That's a lot of work. Because children are watching you, and you can give up easily, because frustrations sometimes are huge. So we always need to be flexible.* (R, a grade 5/6 teacher)

Another practical issue the teachers all face has to do with time and schedule. They have to spend time on different tasks/needs, for example, dealing with unexpected events,

talking to parents, organizing field trips, etc., and need to find a proper balance between teaching and personal life.

> *Another important improvement in my teaching has been finding a personal balance between home and school. This is not an academic improvement, but giving myself the time to pursue interests outside of school…has allowed me to become a more responsive teacher, as I have the energy and enthusiasm to take advantage of "teachable moments" that were likely passing by without notice in the first few years.* (H, a grade 1 teacher)

Professional Dialogues, Collegial Support, and Apprenticeship

The school creates a safe and supportive environment where teachers are encouraged to expose their problems, seek deeper understanding of the knowledge building principles, experiment with new ideas and designs, and sustain collegial dialogue and critical reflection. Data analyses suggest that the teachers themselves have formed a knowledge building community for shared, progressive problem solving, which in many ways resembles what McLaughlin and Talbert (2001) called a "teacher learning community," focusing on collaborative pedagogical innovation.

> *They (colleagues) are constantly supporting. In this building, one has to live with being constantly inspired by excellence. You're just seeing amazing thing happening all through the building, whether it's someone who has been here for many many years...or someone … who has only been here for one year... Things that these teachers are doing are so interesting, and reflective, and innovative, that you always feel like that you have to pick up their game a little bit.* (C, a kindergarten teacher)

On a regular basis, the teachers meet to talk about their problems and advances; and share their plans, actions, observations, reflection, and problems. These meetings, each of which runs approximately one-and-half hours, are recorded, indexed, and uploaded to a website to facilitate subsequent review and reflection and sharing with broader communities. Each teacher maintains a reflection journal, called "Calendar of Inquiry," in Knowledge Forum, which is accessible to colleagues and researchers. Instead of trying to eliminate problems and ritualize their classroom practice, they accept problems and their emergence in new forms as a norm of their practice, with dedication to levels of productive disequilibrium (Wilson & Berne, 1999) that allow them to improve their practice each year.

> *It (collegial support) is huge! Because everybody here is so interested in their teaching and improving it. And people will talk about things that didn't go well. There's not a sort of pretending that everything is great. You know, people bring their problems up, and they admit when things aren't going well and ask each other for help. So that makes it so easy to do that myself. People here also are like-minded. So I don't have to be afraid when I come that people are going to think you're crazy or why you think that. There's none of that here. It's very accepting atmosphere. We have weekly staff meeting where we spend a few hours together, and then the Thursday meeting as well. It means that I know that I'm going to have regular*

opportunities to sit down with my peers and talk. We're also busy. If we don't have those regular time, it probably would not happen. Even if we love it, we just get so busy. (Z, a grade 3 teacher)

My colleagues challenge my thinking by questioning which aspects of KB (knowledge building) are developmentally appropriate for children so young. We have many discussions about young children's understanding of idea improvement. ... I have adopted many of the innovations of my colleagues by adapting them to suit my classroom. For instance, I changed the scaffolds in last year's KF (Knowledge Forum) view to reflect the abilities of my students after one of my colleagues suggested that he had done this for his class. The KF meetings on Thursday afternoons provide me with an opportunity to share my ideas and get feedback. I also find support from a few of my colleagues who are new to KF and KB. We have had informal conversations about what KB looks like up the years. (CH, a pre-kindergarten teacher)

You'll hear on the Thursday afternoons. None of us says: "This is the way you need to do it." What we might say is: "B did it this way, Z did it this way, and I've done this way. How do you think you're going to do it? Please let us know because it may be a totally different, a BETTER way of doing something." So none of us has learned it. We're all learners. That's a difference. Once you think you know, you'll die I think. I want to live. [Laugh] (R, a grade 5/6 teacher)

The rich, open, inclusive conversations and interactions in this professional community provide apprenticeship opportunities and support for new teachers to get start and move forward with knowledge building. They can observe knowledge building processes happening in different grades and content areas, access diverse design strategies and implicit expertise of experienced teachers, and receive feedback from them. As a first-year grade 1 teacher reflected:

The best support I have received has been to have people that I respect listen to, and ask questions about, my efforts. Meeting weekly with teachers who have more experience has been fundamental in keeping me motivated. When I know that I can ask for help if I need it, it becomes easier to try new things alone. The chance to view the COIs (Calendar of Inquiry) of other teachers has also been extremely helpful. This has allowed me to get a sense of what questions teachers are asking themselves as they are growing in their field.

Create a Dynamic School Environment through Leadership Support

Vital to the innovativeness and sustainability of the professional community is the leadership support of the Principal. She communicates her high expectations of teaching excellence and innovation and her trust in her teachers, gives them the flexibility and space to try out new ideas, creates social structures and opportunities for teachers to share their ideas and practices and participate in sustained conversations, and provide financial

resources and release time to support teachers' professional development (e.g., visiting other classrooms and schools, presenting at conferences).

> *E (the Principal) conveys an implicit trust in us (the teachers). While she is excited about the kinds of innovation that are taking place in our classrooms, she does not manage the teaching that takes place in them. She sets the stage for teachers to feel secure enough so that our own inquiry can take place. Elizabeth communicates her faith that I am doing good work and I feel secure enough to try new ideas. (CH, a pre-kindergarten teacher)*

> *E gives us a lot of freedom, a lot of flexibility to try things out. So we are told the big goals, but we are responsible for achieving those big goals in a way that 's right to us. So we are not told: "On this day you have to do this. On this day you have to do that." So that kind of freedom and flexibility are amazing... And I think also that she encourages dialogues among our teachers. She doesn't always hold herself as an expert… But she will say: "speak to so and so. They've done that." And you know, providing meetings where we can do that.* (N, a grade 2 teacher)

Conclusions

The above analyses suggest a number of key factors that inspire, enable, and sustain the innovative practice in the professional community at ICS. These include: (a) Shared visions and deep ownership of teaching practice, coupled with deep trust in students' agency and potentials; (b) A hybrid identity that connects teaching with research; (c) Dedicated efforts to deepen pedagogical understanding and evolve designs; (d) Opportunism and collaborative emergence in classroom practice; (e) Dealing with the complex reality of teaching practice while maintaining a focus on innovation and improvement; (f) Community structures for professional dialogues, collegial support, and apprenticeship; and (g) Strong leadership support for teaching innovation. We are currently conducting more comprehensive data analyses and collecting new data (e.g., teachers' meeting records) to deepen and expand our understanding of the factors that make an elementary professional community innovative, with the goal of setting out basic conditions for sustaining and scaling up knowledge building pedagogy and technology.

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