

The Digital Use Divide and Knowledge Building

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Abstract: This paper delves into the digital divide challenge through an interaction analysis of educational partners engaged in co-designing, sustaining, and scaling classroom-based innovation using collaborative platforms in rural settings. The innovation is analyzed by referring to an emerging multilevel multiscale model, with emphasis on the five dimensions of Dede's conceptual framework (Depth, Sustainability, Spread, Shift [in Ownership], and Evolution, 2006). Organizational structures, interaction processes put in place and the technology in use during the Remote Networked School (RNS) initiative are identified.

Keywords: Innovation, scalability, collaborative technologies

Introduction and background

At the onset of the Remote Networked School (RNS) initiative in the Province of Quebec, Canada, the target was to temper the closing of small rural schools, based on the assumption that Internet-enabled activities would enhance the learning environment (equity of access and quality of education). Online courses not being an option, this constraint became an opportunity for suggesting the use of the computer for collaborative learning/knowledge building purposes between students from different classrooms geographically dispersed. Given the obscure general awareness of the possibilities that Internet were opening for remote networked schools, a more attainable goal was set, that of enriching their learning environment so that it would become difficult for a school district to close such a school on the basis of underachievement.

Educational partners (teachers, school principals, school district administrators, and government public servants), brought together by a knowledge transfer agency named CEFRIO, were invited to engage in participatory design (Silva & Breuleux, 1994). According to Bereiter & Scardamalia (2003), the design mode is a process of working with ideas for solving real complex problems with no ready-made solutions, identifying and exploiting promising ideas. Design experiment/design-based research was the methodology of use. Ely's (1999) conditions of innovation with information and communication technologies (dissatisfaction with the status quo, available resources, available time, rewards or incentives for participants, expected and encouraged participation, commitment, and leadership) were monitored at least twice a year during a ten-year period (Hamel, Turcotte, & Laferrière, 2013). Co-design was favored (Voogt et al., 2015). Volunteer teachers engaged students into networked learning/knowledge building activities with the support of collaborative platforms – Knowledge Forum (KF) and a desktop videoconferencing system (iVisit) and, later, a web-based one (Via). A member of the research and intervention team (RIT) was available during working hours, in a virtual room of the videoconferencing system, to respond to on-demand practitioners' inquiries. Teachers were provided student participation data (e.g., numbers of written, read, revised, and linked contributions on KF, use of scaffolds, types of questions asked). RIT held meetings onsite/online to co-interpret data with school and school district partners. Research results pertaining to learning outcomes (e.g., students' vocabulary growth, reading comprehension and explanation level) were provided to educational partners for informed decision making.

In relation to the theme of the 2017 CSCL conference, it can be stated that the RNS initiative (2002-2017), now involving on a yearly basis over 6 000 students, 200 teachers 100 schools and 23 school districts, enlarges the digital use divide in the Province with teachers engaging students in advanced collaborative work while others do not. It can also be stated that the RNS helps reduced the digital use divide by engaging some rural school students in advanced uses similar to those some urban school students in North America and beyond may engage in. Scaling innovation is critical for addressing the digital use divide. For Engeström (1987, 2015), innovation occurs when an acculturation process takes place. In this short paper, we identify the organizational structures and interaction processes put in place as the RNS initiative was co-designed, and gained sustainability and scale while propulsing local practitioners at the upper end of the digital use divide.

Method

Building on Coburn's (2003) conceptualization of scale (four interrelated dimensions: depth, sustainability, spread, and shift [in ownership]), Dede (2006) suggested that evolution, meaning the learning that takes place for the original creators of an innovation while they interact with users, is an additional dimension to be considered. The depth dimension refers notably to teacher beliefs about classroom teaching and to what students

can do when prompted to engage in unfamiliar interaction with their peers (e.g., knowledge building, Scardamalia, 2002; Scardamalia & Bereiter, 2006). Shift (in ownership) refers to local educational leaders taking charge of the innovation. We referred to these dimensions and applied an earlier draft of Law, Yuen and Lee's (2015) multilevel multiscale model that distinguishes eight different levels: international, system, school-university-government partnership, school district, school (leadership), teacher, classroom student, and technology. For each level, the organizational structures, the interaction processes and the technology put in place were identified as we revisited RNS technical reports (conditions of innovation put in place, teacher professional development, onsite/online activities, classroom learning/knowledge building artifacts). We present the organizational structures, interaction processes, and technologies that stood out.

Findings

Depth

There were no well-elaborated pedagogical materials to begin with (*technology*). The initiative tapped on teachers' agency, encouraging them to engage in new forms of interaction among themselves and with students (*organizational structure*). Volunteer teachers' beliefs about classroom teaching and what students can do were challenged (*interaction process*) through their uses of KF (*technology*). Administrative, technical and pedagogical support (*interaction process*) was provided. For teachers to come online, ask questions or talk about issues with a RIT member, trust had to be built (*interaction process*). RIT monitored the presence/absence of conditions for innovation and provided feedback iteratively (*interaction process*) during RNS district/school committee meetings (*organizational structures*).

The RNS initiative put forward a variety of educational practices (adult-adult, adult-student, student-student) using the collaborative platforms (*technology*). Participants reported on their activities onsite, online and at annual provincial knowledge transfer sessions (*organizational structure*), thus contributing to demonstrate the collaboration that could happen within and between networked schools. Regarding knowledge building (KB), a deliberate effort to increase the cultural capital of a community (Scardamalia & Bereiter, 2006), teachers and other educational partners at the system level have been introduced to its principles (*interaction process*). KF's affordances (e.g., neuronal presentation of notes, basic participation measures, scaffolds, promising idea highlight, analytical tools) and those of the videoconferencing system (e.g., a virtual room for on-demand technical and pedagogical support, identification code allowing teacher self-management of online classroom activities) informed and facilitated the conduct and analysis of written and verbal online discourse (*technology*). Both platforms presented constraints: Via required more bandwidth, equipment and time coordination; KF required the writing and reading of contributions (*organizational structure*).

Ongoing contact with RIT (*organizational structure*) allowed for online individual and small-group conversations on topics of interest to teachers (*interaction process*): how to focus students on a driving question? What to do with promising ideas? When to end a collective investigation? Gradually, the RNS website (www.eer.qc.ca) presented artifacts of collaborative inquiry by Quebec Francophone students (*interaction process*). Co-design as a form of professional development (Voogt et al., 2015) was practiced onsite/online between teachers from different classrooms and schools, and online with RIT members (*interaction process*). The Knowledge Building International Project (KBIP) (*organizational structure*) took professional development beyond local expectations (Laferrrière et al., 2015).

Sustainability

Government funding endured but was reduced when another program provided subsidies to remote schools for their digital infrastructure (*technology*). CEFRIO remained the coordinating body (*interaction process*), and RIT kept providing professional development and research results (*organizational structure*). The two collaborative technologies that were part of the design of the RNS were challenged by IT school district departments wanting to roll in new "collaborative" technologies. The desktop videoconferencing system was replaced by a web-based one to the satisfaction of all but KF remained the main online written discourse platform (*technology*).

Spread

In 2008, the Government financed an Anglophone collaborative initiative across classrooms (*organization structure*). Recently, the Government expanded the limit number of school districts that could receive funding for participation, and the RNS initiative was renamed "The networked school" initiative (*organizational structure*). A growing number of Quebec urban private and public schools and France's rural academies are becoming interested in the model as they see what teachers and students accomplish with KB (*interaction process*) and KF (*technology*).

Shift (in Ownership)

Some school districts modified their school funding policies and provided for some teachers to work in their classroom four days a week, and devote the fifth day to the induction of volunteer colleagues into RNS practices (*organizational structure*). A governing body was established (*organisational structure*), composed of four school district superintendents, and representatives of Ministry of Education, Quebec Federation of school districts. The CEFRIO's representative became the director of the initiative. The KF server remained university-based, and a research center of which RIT was a member (*organizational structure*), offers on-demand support (*interaction process*), including server maintenance and upgrade (*technology*).

Evolution

RIT's valuing of the agency of the educational partners involved was put to test many times. RIT learnt to work within the zone of proximal development, and deal with tensions/contradictions between principle-based design and provincial/district policies, norms, procedures and routines (*organizational structure*). The virtual community, composed of elementary, secondary and postsecondary Francophone teachers engaged in KB practices (*organizational structure*), has its ups and downs (*interaction process*) but new ways to move ahead locally and also to participate in the international KB community are found.

Discussion

Facing together the problem of quality of education in small remote schools, educational partners envisioned that teachers from different schools could establish viable collaborations among themselves and among students (*organizational structure*). Their co-design rested on collaborative platforms, one for written discourse and the other for verbal discourse (*technology*). In best instances, the combination of the two platforms afforded deeper student understanding of authentic problems through collaborative inquiry.

This analysis of the depth, sustainability, spread and shift (in ownership) dimensions uncovers two double-binds. The first pertains to "spread" without "depth" or "depth" without "spread". "Spread" without "depth" occurred when teachers and students used the videoconferencing system to do time consuming surface activities (e.g., having students introduce themselves one after the other in a repetitive manner) or when students wrote on KF repetitive notes in response, for example, to a question originating from a teacher instead of a question growing out of a classroom discussion. The RNS initiative also had "depth" without "spread". For instance, some teachers guided students to improve promising ideas and develop a collective understanding of a question or problem but this practice did not spread. Another double-bind reflects a tension between "sustainability" and "evolution". RIT's thinking was that teachers willing to engage in collaborative activities were boundary spanners, not followers. It counted on teachers' agency, and therefore on their capacity to adapt and take advantage of the affordances of the collaborative technologies in a sustainable manner. But teachers, who had to cope with daily obligations, were asking for exemplars and more resources. RIT responded by developing some resources. Coburn and Stein (2010) stressed the importance of available teaching/learning activities and materials for innovation. Over the years, activity exemplars and materials were co-created with teachers (e.g., Allaire & Lusignan, 2011).

This analysis adds to Chan's (2011) three interacting themes (context and systemic change, capacity and community building, and innovation as inquiry), two other themes: 1) Ongoing use of up-to-date collaborative platforms, and 2) participation in a network. See also Clarke, Dede, Ketelhut and Nelson (2006), Coburn and Stein (2010), Coburn, Russell, Kaufman, and Stein (2012). We suggest that these five themes are critical for addressing the digital use divide in socially responsible ways.

Conclusion

Given that the first-level divide (access to digital technology) has been significantly reduced, the US National Education Technology Plan (2016) highlights the challenge of the "digital use divide" (second-level divide). It is a call to which one can respond by engaging in partnership research, or research-practice partnerships (Penuel, Fishman, Haugan Cheng, & Sabelli, 2011), committed to bring innovation to scale. It is a challenging task but one worth pursuing as third-level divides, according to Van Deursen and Helsper (2015), are now appearing. These authors defined this new generation of divides as "disparities in the returns from internet use within populations of users who exhibit broadly similar usage profiles and enjoy relatively autonomous and unfettered access to ICTs and the internet infrastructure" (p. 30). They add: "The internet remains more beneficial for those at the highest education levels, with higher social status, not in terms of how extensively they use the technology but in what they achieve as a result of this use for several important domains." (p. 46).

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