Research-Practice Partnerships Supporting Adoption of Active Learning

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Abstract: Challenging the "business as usual" approach to instructional design and professional development is a transactional model of practice change–Research-Practice Partnership (RPP). This approach proposes that adoption requires gaining mutual understanding and involves joint work and shared communication. In turn, joint work requires stakeholders to create new practices that allow for *boundary crossings*, which often involves mediating tools. This presentation reports on RPP program, consisting of three sequential grants, that have an overarching goal of supporting the integration of evidence-based instruction – i.e., Active Learning – into the pedagogical design and practices of post-secondary instructors. These case studies detail the development of an online platform that allows stakeholders –researchers, teachers and instructional designers– to communicate across boundaries and engage in the joint work of designing solutions that are adapted to varied content and context.

We report on a Research Practitioner Partnership (RPP; Coburn & Penuel, 2016) program that has as its goal the integration of evidence-based Active Learning (AL) instruction in higher education. The intervention involves the development of an online platform, and tools, that allows stakeholders –researchers, teachers and instructional designers– to communicate across boundaries and to engage in the joint work of designing solutions that are adapted to their content and context. This case study investigates both the RPP process itself, as well as how the platform and tools developed to accomplish the joint work. In particular, how the tools meditate and bring together principles from research and the documented implementations of practitioners. In turn, the jointly designed tools facilitate the design of new materials and further tools; and, at the same time provide researchers opportunities to examine how the enactment work is achieved.

Description of the Intervention

Our intervention is an online platform that consists of co-designed instructional resources and frameworks that are part of an AL support program - growing out of a networked professional learning community initiative, SALTISE (authors; https://www.saltise.ca/). To make sense of these resources/data, collected from over 30 college and university instructors, we categorized them into an ecology that generates a principled taxonomy of student-centred active learning instruction – *approaches, strategies, activities, and scenarios* (see Figure 1). *Approaches* are the most general orienting principles of active learning instruction. They do not describe what the teacher or students will be doing, but rather propose how a pedagogy will unfold - e.g., flipped classroom (Tucker, 2012). *Strategies* are also general, however, they describe specific steps or sequences of tasks (i.e., script) that both teacher and students will engage in. They are grounded in the educational literature and often the focus of research, *e.g., peer instruction* (PI, Mazur, 1997), *jigsaw* (Aronson, 2002). *Activities*, by contrast, are the instructional units that teachers prepare. They are content-laden, specific to a course, thereby, idiosyncratic. In student-centered active learning instruction, we have documented that activities often employ and link together strategies that engage students in joint-work. Lastly, *scenarios*, bring individual activities together into a coherent sequence that span different time scales - i.e., a single lesson, several weeks (a module), or even a semester-long project.

Our platform, in addition to presenting this ecology, provides a framework to explore the workflows that make up the AL Activities. The framework works to reveal the relationships between the instructional components that include strategies (with scripts) and tasks that do not have a specified script. They also detail how these components are linked and orchestrated into an Activity. The framework is represented in terms of an annotated workflow that describes when and how the learning unfolds and who is responsible for which actions (Figure 2a). It provides information about each component, in particular, identifying the Strategies involves (Figure 2b) and

incorporate the embedded scripts (Figure 2c). Also included is information from the literature along with practical advice on how to implement them (Figure 2d). Strategies are at the heart of the ecology because they describe the "mechanisms" for the engagement – cognitive, socio-cultural (joint work) or psycho-social (motivational). Interestingly, elements of their scripts are also the focus of research.

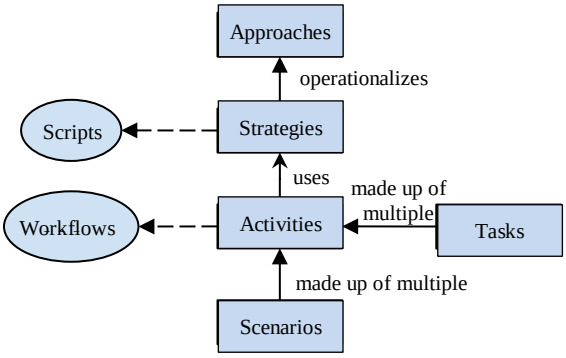

Figure 1. The ecology of instructional units forming a taxonomy within AL pedagogies.

In summary, the platform is a principles-based repository of AL learning objects as well as a tool for building new instruction. It is useful to practitioners and researchers on their own. For practitioners, the resources are easily browsed and navigated according to multiple criteria from a practitioner's perspective. Using the research literature to link components with typical problems of practice encountered by instructors (*e.g.*, students not preparing for class) as well as typical general learning objectives (*e.g.*, deeper understanding course content). More importantly, the platform's social interface promotes networking and identifies practitioners who have extensive experience implementing the AL components and place them in reach of those looking for advice (*i.e.*, potential for sharing of experiences among peers). Thereby, the platform creates an environment that facilitates meaningful engagement with all these resources. For researchers, on the other hand, the platform and framework allow researchers and educational developers to gain insight on and learn from the practice-based knowledge developed by instructors (Dougherty, 2016).

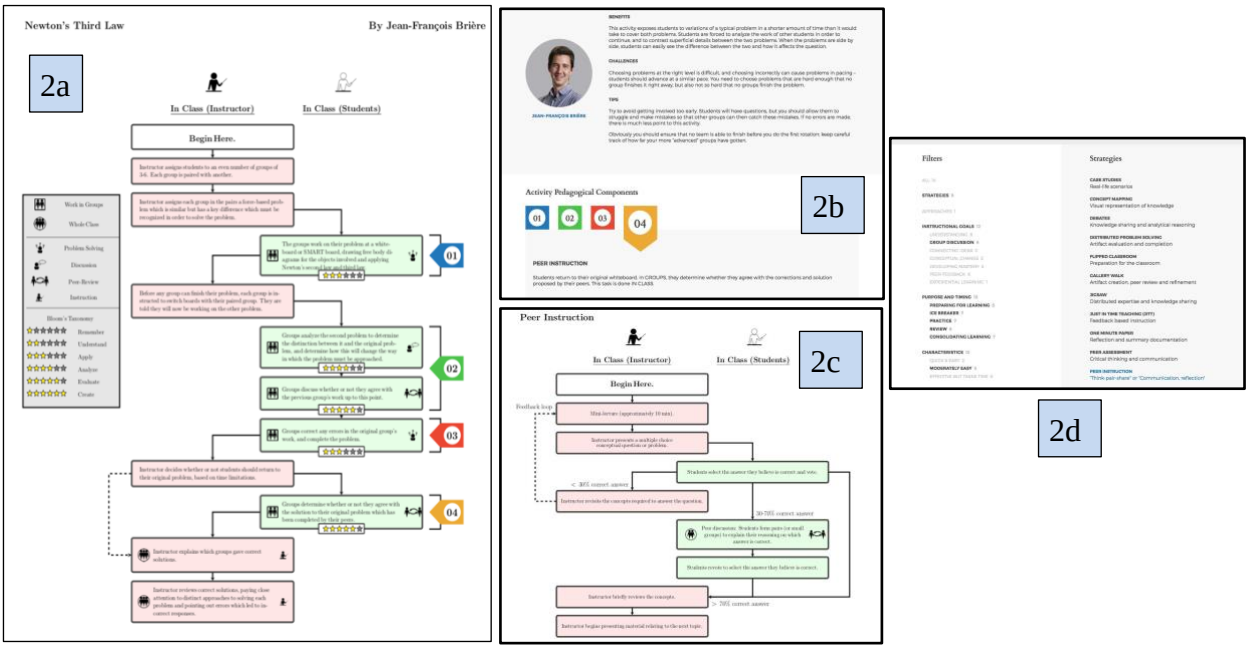

Figure 2. The framework describing the instructional activity including the workflow and the activity's components.

Information About the Context

The intervention is part of a larger initiative consisting of three phases and funded by three sequential grants (research and infrastructure), started in 2015. They have brought together educators from five post-secondary institutions within a major city in the Province of Quebec, Canada. Constituted as a research practice partnership (RPP; Coburn & Penuel, 2016), the team is composed of seven researchers and four graduate students who work directly with our network of practitioners. The researchers involved in this project each have years of experience in the Learning Sciences and STEM education. Over 30 practitioners selected for phases one and two were a purposeful sampling of early adopters (or power users) who, on their own accord or as part of other research projects, have engaged in designing, developing and implementing pedagogical innovations in their own classrooms, in a sustained manner over several years; also in STEM education.

Active learning pedagogical approach

Educational research shows that engaging students in meaningful tasks are more likely to lead to deeper learning. Instructional approaches that go under the headings of student-centered or active learning (AL) aim to do just that. AL instruction is based on a social theory of learning (Lave & Wenger, 1991; Vygotsky, 1978). It views knowledge as being constructed by the learner, and formal learning as a process promoted through participation and meaning making. AL approaches require students to engage in the doing and application of the knowledge, as well as the reflecting on the doing and application (Bonwell & Eison, 1991). As such, this pedagogical innovative require instructors to design activities that engage students at an appropriate level for learning (Chi & Wylie, 2014).

Currently, AL pedagogies are poorly defined and include everything and anything that changes the landscape from teacher centered to student-centered (Arthurs & Kreager, 2017). At the broadest scale, are ways that allow for a change to the business as usual approaches to instruction. For instance, flipped classroom (Tucker, 2012), which take a clear stance on content being moved outside of the classroom and reposition the where learning starts; and, *Just-in-Time Teaching* (JiTT; Novak, 2011), which reframes the teacher's role and responsibilities. Also at a large scale are the pedagogies that prescribe curricular approaches. Examples include *Problem-Based Learning* (PBL; e.g., Hmelo & Barrow, 2006), *Inquiry-based Instruction* (Edelson, Gordin, & Pea, 1999), to list a few. These pedagogies call for the inclusion of authentic and meaningful tasks, problems, and challenges rooted in designed activities involving specific routines and sequences of tasks. Often these require significant time commitments on the part of the students. On the smaller scales are the short interventions that sit alongside modified lecture approaches and promote deeper thinking and reflection. These straddle the fence between individual and collective work. Well-known examples include methods such as jigsaw (Aronson, 1978), *think-pair-share* (Lyman, 1987), which has gained broad attention under the title of *Peer Instruction* (Mazur, 1997) after being adopted and promoted by Harvard physics professor, Eric Mazur. At the smallest unit are descriptions of the tasks themselves, which suggests the objective of the work that students will engage around - concept mapping, one-minute paper and a host of others. While these themselves are not strategies, for the sake of simplicity we do so on our platform.

Research shows that AL instruction, not accounting for the differences described above, compared to traditional instruction, can significantly decrease failure rates in STEM courses (Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt & Wenderoth, 2014), particularly for populations traditionally underrepresented in STEM (Olson & Riordan, 2012); and, increases students' learning and achievement (Prince, 2004). In particular, student-centred instruction has a positive impact on critical thinking, motivation and communication skills (e.g., Kim, Sharma, Land & Furlong, 2013); the use of metacognitive processes such as decision making (Lin, Hmelo, Kinzer & Secules, 1999); and, the development of positive classroom cultures (e.g., Engle & Conant, 2002).

Problems of Changing Practice: Transfer vs. Transaction

Even with such promising results, the adoption of AL instruction has been slow at the post-secondary levels, with multiple roadblocks that prevent its sustained development (e.g., Kirkland & Sutch, 2009). A major element of these obstacles involves the challenges of changing teacher and learner practices. Pedagogical shifts remain remarkably difficult to implement in sustainable ways (Henderson & Dancy, 2008; Henderson et al., 2011; Kirkland & Sutch, 2009). Adding to the challenge, AL requires considerably more knowledge about the intersection of pedagogy, learning and content, compared to teacher-centered methods - i.e., the overlap of pedagogical content knowledge (PCK; Koehler & Mishra, 2009). In many ways changing classroom practices mirrors the dimensions involved in the adoption of ICT (e.g., Law, Pelgrum, & Plomp, 2008). Such complex expertise rarely develops over the course of a workshop or resides in individual teachers. In essence, the methods and metaphors used for professional development are often linear and transmissive rather than non-linear (emergent) and transactional.

Research Practice Partnership Methods

This research uses a transactional model of changing practice–RPP model. Arguably, it is an effort to bridge the gap between research and its adoption by practice. The creation and implementation of effective, sustainable, and scalable educational interventions can only be achieved through a new metaphor that puts researcher and practitioners in close contact as laid out in DBIR approach (Fishman, Penuel, Allen, Cheng & Sabelli, 2013). RPP model positively re-positions practitioners. They are no longer considered the end-point for the uptake of research, rather, they are source of insight into the solution. "For researchers to make participants' own perspectives on how to improve instruction at scale the basis for a theory of action is an unusual move" (Penuel & Coburn, 2015, p. 191). RPP work involves cycles of planning-doing-studying-acting. These iterative cycles involve developing indicators of success both in the development, design, testing and refining phases (Penuel, Allen, Coburn & Farrell, 2015). Adding to the challenge of coordinating across partners are the different time scales on which research and practice operate. Practice can move quickly because there is no call for testing, while research often moves slowly because of the rigour demanded.

In focusing on "problems of practice," RPP interventions involve the use of co-design approaches to develop educational solutions, anchor the collaboration; and, examine and design for long-term mutualistic collaborations between researchers and practitioners including the joint work at multiple boundaries (Penuel, et al., 2015). Penuel and colleagues identify the socio-cultural processes considered *boundary crossing* and *boundary practices* as productive constructs and concepts for understanding the relationship between research and practice. A boundary crossing is an event, whereas, a boundary practices are "new routines that bridge the practices of researchers and those of practitioners as they engage in joint work" (p. 190). To accomplish the hybrid work done as part of these new activity systems tools are developed, what others have referred to as *boundary objects* (Star & Griesemer, 1989) facilitating researcher-practitioner transactions. Within the RPPs, these boundary objects (both material and procedural) have interpretive flexibility and provide organizational structure. Objects in our context should be considered *boundary tools* because they are intended to mediate the boundary crossings.

Relationship Between RPP and Our Intervention

The value of our platform, and more specifically, the workflow framework is that, like a Rosetta Stone, it allows for boundary crossings. The framework attempts to transform the design of the instructional activities into a common language, understandable by researchers and practitioners alike - i.e., a boundary tool. Our boundary tools allow the various participants in the RPPs to serve the different information needs and workflows of both instructors and researchers and thereby co-interpret and collaboratively transform activity/object through the co-design process. The design of the activity serves as an artefact that is continually refined, transformed and adapted to capture the knowledge co-production and exchange processes. In the case of our intervention, the platform is a boundary tool that allows researchers and practitioners to engage in the boundary practices that includes the cycle of developing and designing new instructional practices based on both the literature (research) and implemented activities (practice). See Figure 3.

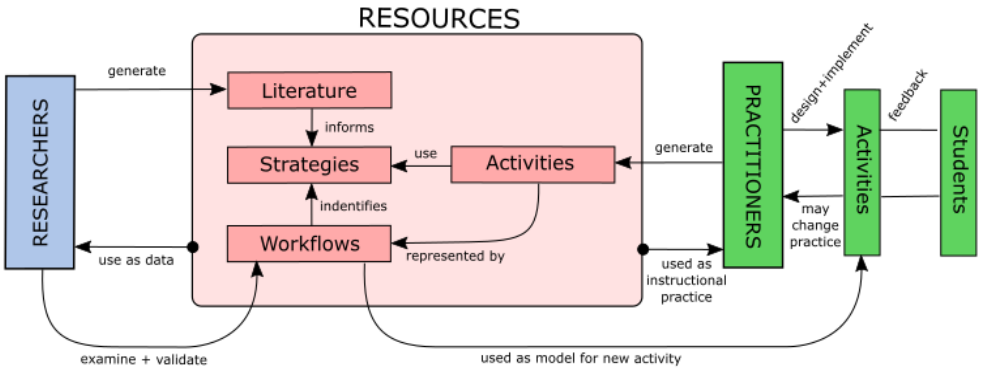

Figure 3. Instructional design boundary practices, joint work of practitioner and researcher within a common tool.

Explanation of Challenges and Opportunities

The main challenge that this type of project faces is the *sustainable transformation of practice*. A second, related challenge is *scaling* of the intervention from its initial "protected" environment (where funding and support are present at an unusual level) to the more habitual environment. We see these two challenges --and the solutions we are exploring-- as intimately related. The conjecture that we are exploring in practice is that to be sustainable and scalable, innovations need to be meaningful to the members of the larger community of practice, and this is best achieved by involving practitioners as early and as deeply as possible in the transformation of practice. In our case, the co-design

of instructional resources and frameworks --new tools to support AL-- is a process of making concrete, visible, and available some of the initial attempts by practitioners to engage in AL, "an intervention that is developed *in* practice *by* participants in that practice, rather than in a controlled laboratory" (Penuel, 2014). In relation to the frameworks of communities of practice and cultural-historical activity theory, it corresponds to the *reification* (Wenger, 1998) of the *germ cell* of innovative practices (Engeström & Sannino, 2010). In that context, scaling is less problematic, especially in relation to the classic problem of ensuring fidelity of an intervention that originates from an "in vitro" experiment: because we are developing tools within the integral practices of instructors, the collective zone of development for other practitioners is manageable (i.e., proximal), and uptake and positive mutual adaptations (Penuel et al., 2011) are more likely. Another perspective on the challenges and opportunities of this kind of work is to think of our co-design as a form of re-mediation (i.e., providing new mediational tools; see Sannino, Daniels, & Gutierrez, 2009) of teaching in support of AL.

Connection to Conference Theme

While this project is not directly related to the first part of the Conference theme, Rethinking learning in the digital age. It is directly related to the second part of making the Learning Sciences count. The entire process of RPP is intended to find ways to integrate research into practice by changing the metaphors of transfer into ones of transactional actions. Working in a RPP model organized around co-design of boundary tools, members of different stakeholder communities learn from each other: teachers about the learning sciences, researchers about the practical aspects and constraints of embedded teaching practice, and faculty developers about new methods of working with both teachers and learning scientists. Connecting these three communities allows for the multidirectional knowledge exchange that is critical to the overall integration of research knowledge into teaching practice. We believe the iterative and recursive cycle, at the heart of the RPP program, allows us to address both research questions and authentic problems of practice thereby making what is learnt in the Learning Sciences count for practitioners and what is learnt in practice count for the Learning Sciences researchers.

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Acknowledgments

This research was supported by the following grants: Entente Canada-Québec grant ALPIC (2014-17) & SALTISE/S4 (2017-18); Social Sciences and Humanities Research Council of Canada, grants: (1) SSHRC-CCSIF Application title: Leveraging New Paradigms and Disruptive Technologies to Successfully Orchestrate Pedagogical Change (2015-17); and, (2) SSHRC-Connections grant: Fostering a knowledge community: co-constructing and leveraging a digital platform for STEAM education (2017-18). We wish to thank our colleagues, SALTISE research team, the practitioners we interviewed, and graduate students who collect the observations and interviews: Chao Zhang, Veronique Brule and Meghan Marshall.