The Educational Scalability of Inquiry-Based Learning as a Means to Promote Authentic Student Achievement

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ABSTRACT: Inquiry-based learning is regularly published as a standard method of delivering curriculum at the intermediate level in Newfoundland and Labrador. With any educational initiative there can be gaps between policy and implementation. This paper questions the possibility of a lack of consensus on what inquiry-based learning entails, policy implementation and the relationship between inquiry and authentic student achievement. A link is drawn between the ability to structure inquiry-based learning environments that can satisfy the standards associated with authentic student achievement and provincial curriculum. The relationship between these elements and the principles of scaling up educational innovation are also discussed as a means of developing frameworks that can promote authentic inquiry on a larger scale.

RESUMÉ: A Terre-Neuve et au Labrador, on promeut régulièrement comme méthode courante un apprentissage conçu sur des enquêtes pour enseigner le programme du niveau moyen. Toute initiative du système éducatif peut présenter des lacunes entre le programme et la mise en place. On envisage ici l'absence de consensus pour les conséquences, pour la mise en place du programme et pour les rapports entre les enquêtes et les progrès réels de l'étudiant dans le cadre de cet apprentissage. On établit un lien entre l'aptitude à organiser la structure d'un apprentissage conçu sur des enquêtes et qui serait susceptible de répondre aux demandes tout en conjuguant les progrès réels de l'étudiant et le programme du gouvernement provincial. On analyse aussi le lien entre ces éléments et les principes pour renforcer une innovation dans l'enseignement comme un moyen d'élaborer une structure pouvant porter la vraie demande à grande échelle.

Introduction

A cursory survey of Newfoundland and Labrador's K-12 intermediate curriculum documents suggests a strong commitment to inquiry and inquiry-based teaching and learning through a wide spectrum of disciplines (Newfoundland and Labrador Department of Education, 2005, 2010, 2010, 2011a, 2011b, 2012). Although inquiry is promoted in the front matter, rationales, suggested teaching strategies and outcomes of these documents, several questions surface about the potential relationship between policy and practice. In particular, this paper questions the possibility of a lack of consensus on what inquiry-based learning entails, policy implementation and the relationship between inquiry, authentic student achievement, and the scalability of educational innovations.

Inquiry-based learning is a complex process that can present many implementation challenges for educators as they move away from traditional instructionalist teaching approaches (Edelson, Gordin, & Pea, 1999; Friesen, 2013; Marx et al., 2004). Without a deep understanding and consensus of what the term means, in context, any implementation of inquiry-based learning may be lost in a sea of ambiguity and rhetoric. Social, cultural, political and ideological frameworks from various educational stakeholders may skew this understanding even further. If these policy documents place inquiry in such high priority how is inquiry being interpreted and implemented at the intermediate classroom level? If inquiry is being treated with serious consideration how well are individuals and schools integrating inquiry-based learning? If inquiry is present, how proficient and efficient is the implementation? Why include inquiry in these documents at all, as so many other approaches exist, and to what purpose could inquiry-based learning serve the student population of any educational jurisdiction?

While these larger organizational and structural questions are not within the scope of this paper, the ideas surrounding the construction and articulation of a working framework for implementing and evaluating inquiry-based teaching and learning strategies will be considered. Inquiry-based learning can be a catalyst for student and teacher engagement in authentic tasks at the classroom or school level, but how can isolated pockets of innovation be successfully adopted on a larger scale (Jacobsen, Lock, & Friesen, 2013; Owens, Hester, & Teale, 2002)? This paper will consider the relationships between authentic student achievement and intellectual work and inquiry-based learning in context of the research on scaling up educational innovation.

Identifying and scaling up innovation in education is not an easy task (Dede, 2006; Elmore, 1996; Lee & Luykx, 2005; Stein et al., 2008). If purposefully implemented inquiry-based learning environments can lead to students engaging in authentic intellectual work that promotes higher achievement (Newmann & Associates, 1996) how can policymakers move such initiatives forward without losing their fidelity? How these three areas interact and may influence each other will be the basis of this paper's articulation of frameworks and principles that can promote authentic student achievement and can be considered when scaling up local educational innovations.

Concepts and Terms

In the context of this paper three concepts will be considered of primary importance. As with any investigation it is important to define the boundaries of these concepts in an attempt to add a level of focus. Authentic achievement, inquiry-based learning and scaling up educational innovation all have various meanings within different contexts. Below are the operational definitions of these terms for this paper.

The idea of authentic achievement in education stems from the reform movement of the United States in the 1980s and 1990s. In its simplest form authentic achievement can be defined as the worthwhile, significant and meaningful intellectual accomplishments that students can demonstrate through the construction of knowledge, rigorous disciplined inquiry and the value of the inquiry beyond school. This stands in stark contrast to accomplishments that are contrived or based on isolated facts with no connection to the real world (Wehlage, Newmann, & Secada, 1996). This definition and the standards associated with authentic achievement will be the baseline measurement of the effectiveness of any inquiry-based approach to teaching and learning discussed in this paper.

It has been noted by Clifford and Marinucci (2008) that many teachers struggle with the concept of inquiry-based learning. There can be a cloud of uncertainty that surrounds the idea and this can make teachers uncomfortable in attempting to understand, let alone implement any inquiry-based learning strategies. This paper will utilize Friesen's (2013) definition of inquiry-based learning as the "dynamic process of coming to know and understand the world in genuine and authentic ways that take their cue from how knowledge actually lives and works in the world" (p. 154). If teachers feel uncertain about inquiry-based learning, it might be safe to speculate that other stakeholders may have similar feelings. Having a consensus on the term itself may provide a starting point for greater understanding and critical discourse.

The final concept to define is scaling up educational innovation. Dede (2006) defines scaling up as "adapting an innovation that is successful in one setting to be effectively used in a wide range of contexts" (p. 551). He continues to state that scaling up innovation within educational settings can be very difficult given their complex nature. What works well in one classroom or school might not work well in others, given differences in local context. This paper will focus on principles that may affect the scaling up of educational innovations in relation to authentic achievement and inquiry-based learning.

Authentic Achievement and Intellectual Work

Inquiry-based learning and authentic student achievement and intellectual work share common ground. Although authentic intellectual work and authentic student achievement may not always be grounded in inquiry-based strategies and inquiry-based strategies may not always lead to authentic intellectual work and authentic student achievement there is great potential for connections between the two areas. Authentic achievement is a framework of standards for gauging the quality of educational endeavours implemented by educational systems and is based on the construction of knowledge, disciplined inquiry and the value of learning beyond school (Wehlage et al., 1996).

The first basic principle of authentic achievement is that students should be exposed to real world problems that replicate the types of tasks faced by adults (Carmichael, King, & Newmann, 2009; Wehlage et al., 1996). The construction of knowledge in contrast to the replication of knowledge is at the center of this idea. If an activity or teaching practice engages students in developing their skills by producing original conversations, writing, repairing and building or performing artistically than it may be considered authentic (Wehlage et al., 1996).

The second principle of authentic achievement is that students should undertake disciplined inquiry into the questions and problems that they are investigating. The utilization of discipline related prior knowledge may lead students to a greater in-depth understanding of the subject matter at hand. The evidence of which may take the form of sophisticated communication of newly constructed knowledge. Disciplined inquiry can mirror the procedures and practices of adult practitioners in the field of inquiry, such as scientists or engineers (Carmichael et al., 2009; Wehlage et al., 1996).

The third basic principle of authentic achievement centers on the value that an activity or lesson has beyond school. In this sense, the more an activity moves away from learning tasks that are contrived only for

assessment purposes the more authentic it may be. This principle emphasises the importance of trying to communicate ideas, produce products that have aesthetic, utilitarian or personal value beyond the demonstration of competencies (Carmichael et al., 2009; Wehlage et al., 1996).

Learning tasks can fall within any of the above mentioned principles or combinations of several different principles, but for a task to be truly authentic and have the greatest impact all three criteria would have to be met (F. M. Newmann, Marks, & Gamoran, 1996; Wehlage et al., 1996). Three separate categories of standards, based on these principles, have been formulated. When evaluating the authenticity of learning tasks the pedagogy, instruction, and student performance should be consider within this larger general framework of authentic achievement.

Finding the characteristics of authentic pedagogy in practice is rare in educational jurisdictions, in spite of the evidence of its positive effect on authentic achievement (Carmichael et al., 2009; F. M. Newmann et al., 1996; Roelofs & Terwel, 1999). Although it is rare, Wehlage et al. (1996) report that "when teachers taught from understanding and meaning rather than memorization and when they connected the material to students' experiences, their students consistently outperformed students in more conventional classrooms on advanced skills and did as well or better on traditional tests" (p. 43). Other research into the area further suggests that authentic pedagogical practices improve authentic academic performance regardless of their grade level and was reasonably equitable (Marks, Newmann, & Gamoran, 1996). Similar results have been replicated in Australia where Amosa, Ladwig, Griffiths and Gore (2007) report that "increasing the rigour of intellectual demands of assignments significantly enhances student authentic performance and has the capacity to close the achievement gap between poor and wealthy students" (p. 11).

What the framework does not do, is prescribe any set teaching methodology, which is important for the relationship between authentic achievement and inquiry-based learning. The standards of authentic achievement are neutral in this matter, therefore many paths can be taken for students to achieve in authentic intellectual work. The ability of individual teachers, schools and districts to develop and modify existing methods that align with their local context and the diversity of their student population is a powerful construct of these standards (Wehlage et al., 1996). This flexibility regarding teaching methodology and authentic and discipline based approaches to answering meaningful real world questions is an example of how inquiry-based learning can nest within authentic intellectual work.

Inquiry-Based Learning as a Means of Authentic Student Achievement

Inquiry-based learning is more than a teaching method, it is philosophical world view that can be brought into the classroom to enhance learning on a deep level (Clifford & Marinucci, 2008). Within an inquiry-based learning environment rote memorization and worksheets fall away to students working and learning hand-in-hand with their teachers and external experts as they construct knowledge in a disciplined manner and explore new ideas and share their findings (Clifford & Marinucci, 2008). But how do teachers with no experience move towards implementing these learning tasks in their classrooms and schools? What supports are necessary and what type of community is needed? In the short term, how do stakeholders respond to the myths and criticisms associated with inquiry-based learning? If inquiry-based learning is a living philosophy as Clifford and Marinucci (2008) suggest there will be challenges in changing teacher practice and school culture. First, what type of characteristics embody inquiry-based learning at a classroom level? How does inquiry-based learning relate to authentic student achievement and what barriers exist for scaling up successful implementations? Clifford and Marinucci's (2008) examination of the role genuine questions, intellectual rigor and curriculum connections have in supporting inquiry-based learning can also provide a concrete framework for implementation.

Inquiry-based learning approaches frame learning opportunities within genuine questions regarding real world issues and have the potential to change the power structure of classrooms to allow equal collaboration between students and teachers (Becker, 2000; Jacobsen et al., 2013; Owens et al., 2002). This statement alone can cause anxiety, even in experienced teachers. What is a genuine question and how big of a real-world issue should be tackled by a class on a regular basis? Everything introduced with the inquiry approach does not need to start with worldwide issues, but by framing simple questions or allowing students' experiences to guide the questioning process classes may end up delving deeply into uncharted territory that may involve a greater awareness within larger cultural, social, scientific, or political contexts (Becker, 2000; Clifford & Marinucci, 2008). The idea that every question does not have a yes or no, true or false, or objective answer is one of the underlying principles of inquiry-based learning. When genuine questions arise, either through purposefully crafted units of study or through students' responses to what is happening in class or through their personal experiences they can offer starting points for deep exploration and the construction of knowledge (Clifford & Marinucci, 2008). Thus, generating and following

genuine questions can be the impetus for delving into rigorous intellectual work that may lead to authentic student achievement.

Inquiry-based learning is not open ended discovery learning that allows students to attempt to construct knowledge and meaning without supports, structures and boundaries along the way (Hmelo-Silver, Duncan, & Chinn, 2007). In contrast, inquiry-based learning focuses on a balance between content knowledge, procedural knowledge and problem solving skills. Teachers need to be very aware of the supports and scaffolds that need to be put in place to maximize the potential of each learner. These scaffolds can include, but are not limited to teachers providing just-in-time content, mini-lectures, technology, peer-mentoring and external experts (Clifford & Marinucci, 2008; Hmelo-Silver et al., 2007). These scaffolds can allow students to expand their individual and collective knowledge in a multitude of domains while developing soft skills related to collaboration and self-directed learning, which have been identified as priorities in many educational jurisdictions (Hmelo-Silver et al., 2007). Inquiry takes on a disciplined approach to learning. Modeling professional procedures developed to suit students' developmental progress is one key to this approach. This can be enhanced by forming partnerships with professional experts that can help guide students in their inquiry. By using this disciplined approach students can move away from step-by-step instructions and reproduction and develop genuine and authentic pieces of work that exhibit the characteristics of authentic student achievement (Clifford & Marinucci, 2008, Wehlage et al., 1996).

How is inquiry-based learning connected to mandated curriculum? This investigation opened with the proposition that many curriculum documents place a high emphasis on inquiry, but there may be a gap between policy and practice. If teachers are going to take on the challenges of inquiry-based learning it is important to relate this approach to curriculum standards. Many curriculum documents focus on outcome based learning and teachers may focus heavily on outcomes (Newfoundland and Labrador Department of Education, 2005, 2010, 2011a, 2011b, 2012, 2013).

Teaching is a very stressful profession and there are many sources of stress, one of which is the anxiety created by trying to cover material and outcomes in a specified time while under the scrutiny of principals, district personnel and external sources (Chris Kyriacou, 1987; C. Kyriacou & Sutcliffe, 1978; Richards, 2012; Shernoff, Mehta, Atkins, Torf, & Spencer, 2011). So how can inquiry-based learning be situated as a tool to cover outcomes that does not add to an already full workload for teachers? Experienced teachers can overcome this challenge through the process of mapping outcomes to inquiry-based learning projects and understanding

that outcomes are only base level objectives. In Alberta teachers are accountable to outcomes, but not to the methods they use to reach the outcomes (Clifford & Marinucci, 2008). The same holds true for Newfoundland and Labrador. With these things in mind teachers may develop inquiry-based learning activates that not only meet, but may exceed outcome standards without raising the specter of increased stress. If inquiry-based learning is perceived as an add-on and another source of stress, teacher buy-in may be low which may add weight to critics' arguments.

Kirschner, Sweller, and Clark's (2006) analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching sheds some light into the legitimate debate that surrounds the nature of learning. From their perspective learning is a discrete process that can be measured in controlled experiments involving the individual recall of long-term memory to solve problems and build new knowledge. Based on empirical evidence, they suggest students can know less after open instruction, that students may be more likely to incorporate misconceptions about basic concepts into their mental schemas in inquiry-based learning environments and that direct, strong instructional guidance of novice to intermediate learners is empirically supported. These findings must be taken seriously and placed into context as they represent genuine inquiries into the nature of teaching and learning.

Hmelo-Silver et al.'s (2007) rebuttal of Kirschner et al.'s arguments may help place these criticisms in context. They argue that lumping inquiry-based learning into the broad category of minimally guided instructional methods is a mistake. They also argue that much of the analysis conducted by Kirschner et al. is actually applicable to genuine inquiry-based learning. Genuine inquiry-based learning environments provide great levels of support through scaffolding. Inquiry-based learning is not a free-for-all where students are left to wander the wastelands of discovery, only to become frustrated and give up. Inquiry-based learning also strives to go beyond the traditional measurements of knowledge and application and promotes reasoning, problem-solving and collaboration. Many of the instructional methods viewed by Kirschner et al. as effective are completely compatible with inquiry-based learning (Hmelo-Silver et al., 2007).

The nature of learning and how best to instruct students to gain authentic achievement can be a highly contested area of study. This is not a bad thing. The more robust the arguments and debate, the more we can collectively know about the nature of learning. One could argue that the process itself is akin to a global inquiry-based learning project were practitioners, researchers, and other stakeholders all pose genuine questions, pursue those questions with intellectual rigor and share their

findings with the whole community to better our collective knowledge on the topic. Regardless of the criticism and debate, one area is left to discuss. If educators wish to move innovative and beneficial inquiry-based learning models throughout larger contexts what are the main challenges to overcome and is there any guidance to be found in the research?

Scaling Up Inquiry Based Learning Approaches

As outlined before, the issue of scaling up educational innovation is very complex. Multiple challenges await any educational organization that attempts to scale up an innovation. Identifying a local innovation that has potential to be transformative is the simple part. Moving that innovation through a school, district or other jurisdiction is challenging. Merely changing policy is no guarantee of success and simple compliance to a policy does not necessarily indicate a successful reform (Carrigg, Honey, & Thorpe, 2005; Elmore, 1996). What general themes, if any, should be considered before attempting to scale up an educational innovation? Dede and Honan (2005) offer four areas of priority based on the literature that could be utilized to construct a framework for moving forward with educational innovations on a larger scale. These areas include coping with change, promoting ownership, building human capacity and effective decision making. Specifically, this investigation is interested in how these areas could possibly influence scaling inquiry-based learning with a focus on authentic student achievement throughout larger contexts.

There are many misconceptions surrounding change. Social, cultural, political, and market pressures can all act as catalysts for change. The idea that people and organizations resist change is overly simplistic as many people embrace change, such as deciding to have children. This type of change is dramatic, but the results, in most cases, are very worthwhile (Heath & Heath, 2010). Educational systems are in constant flux and it can be very difficult to see a scaling up initiative through a cycle that will allow it to sustain itself (Dede & Honan, 2005). Through stable leadership at multiple levels within an organization and the realization that innovations must be adapted to local contexts over time, scalability efforts can be boosted (Carrigg et al., 2005). Adapting to local contexts is just one side of a two way street. Educational organizations must be prepared to adapt to the innovation as well and be prepared to nurture professional communities that can help sustain an initiative (Dede & Honan, 2005).

Ownership at all levels is essential in terms of sustaining an initiative. Understanding and agreement concerning roles and responsibilities between initiative designers, educational partners and teachers is a key for success. All stakeholders have diverse backgrounds and may harbour pre-

conceived notions and concerns related to what is believed to be most important for scaling up an innovative approach. Creating a sense of ownership among these stakeholders is another key element (Blumenfeld, Fishman, Krajcik, Marx, & Soloway, 2000). With a sufficient body of verifiable data regarding student success and when a large number schools have made the innovation a part of their regular routines the effort may reach what Fishman (2005) calls a tipping point. At this point an innovation may have a greater chance of moving through an entire system. Stakeholders also need to find common ground and work together toward their shared goals. Differences in the interpretations of scale and success can be a challenge as well. Institutions need to find mechanisms for nurturing success so future innovations can be boosted by the past success of others (Dede & Honan, 2005; Goldman, 2005). Community can act as a springboard for this type of ownership.

The idea of a professional community that supports innovation is a recurring theme within the literature reviewed for this paper. Whether they are identified as professional communities, professional learning communities, communities of practice or any other number of identifiers these communities all share the common thread of enabling teacher and stakeholders to work together toward the achievement of a common goal (Carrigg et al., 2005; Clifford & Marinucci, 2008; Dede, 2006; Dede & Honan, 2005; Goldman, 2005; Louis, Kruse, & Marks, 1996; Peters, 2005; Stringfield, Wayman, & Kakimowski-Srebnick, 2005; Wehlage et al., 1996). The development of genuine professional communities that encompass all stakeholders and have common goals aligned with the objectives of the initiative is paramount for successful sustainability. These communities go beyond one-shot professional development sessions and become a part of the cultural fabric of an organization. They are used to reflect, refine and re-implement strategies based on evidence and data and can rely on technology to facilitate this process. They are robust enough to deal with external and internal criticism and provide guidance and support for all members (Carrigg et al., 2005; Dede & Honan, 2005; Lock, 2006).

One final overarching factor may help scale up educational innovation. The ideas surrounding effective decision making can be complex. Often there can be an absence of data driven decision making at the school level (Stringfield et al., 2005). Some researchers would also argue that even if teachers and administrators do have access to data that they lack the training to interpret the data in a correct and meaningful way. This argument assumes that teachers and administrators may make poor operational choices based on misinterpreted data (Dede & Honan, 2005). Revisiting the earlier idea of professional communities, it may be wise for researchers and practitioners to form partnerships wherein the data that is

collected can be interpreted in a meaningful way and that this information can then help guide operational decisions. Useable knowledge is important for scaling up educational innovation. In educational research, knowledge that can be applied immediately to practice can have the greatest impact and help guide further research and practice. Leadership, research and practice are important factors for making effective decisions (Dede & Honan, 2005). Together, the ideas and principles related to change, ownership, community and decision making can be very useful in developing frameworks for scaling up inquiry-based learning initiatives that promote authentic student learning.

Further Questions and Conclusions

The idea of school reform is not new, but the systematic study of the principles involved in successfully scaling up educational innovation is relatively new. This new approach focuses on the how and why of adopting new innovations and the mechanisms that can be put in place to support initiatives becoming self-sustaining over time. A better understanding of the relationships between local context and design, teacher workload and perceptions of inquiry-based learning, and teacher stress and anxiety in relation to implementing new approaches is an area that could be further explored. How does the role of informal and formal leadership and technology integration effect scaling up efforts of inquiry-based learning environments? Many studies note that inquiry-based learning initiatives are incubated in closed systems with many external supports and do not replicate realistic classroom situations. With this in mind, the idea of how to develop frameworks that would allow the scaling up of innovations without a great deal of external intervention is an important area that deserves further study. Investigating the research methodologies that could be most suited to help develop such frameworks is another important area of consideration. These are all questions that remain unexamined in this paper, but are of great relevance to the idea of scaling-up educational innovation within the context of inquiry-based learning and authentic student achievement and offer avenues for follow-up investigation.

One of the original questions posed by this paper concerned the possible gaps between the inclusion of inquiry in the Newfoundland and Labrador intermediate curriculum and its implementation. If inquiry-based strategies are to be deployed as these curriculum documents suggest there has to be a clear link between the methodologies and student achievement. On a much more basic level there has to be a consensus about the fundamental nature of inquiry-based learning and to which standards it should be measured. Because these are provincial policies an even bigger

question remains, how to scale up inquiry-based approaches across the jurisdiction that will have a positive impact on student achievement? It is clear from the research surveyed that there are many potential connections between inquiry-based learning and authentic student achievement. Well-structured inquiry-based approaches that rely on letting students ask genuine questions related to the world around them that focus on academically rigorous and disciplined based work and have direct connections beyond school can help students produce intellectual work that is authentic and measurable by the standards of authentic student achievement. Taken within the context of the principles of scaling up educational innovation it is possible to develop a framework for moving initiatives of this nature through any system. The research indicates that it takes a concerted, organized and systemic effort and in the end only minimal sustainable change may be achieved (Louis et al., 1996). This paper has given a general survey of inquiry-based learning, authentic achievement and scaling up educational innovation, but many questions still remain.

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