Is CSCL the Missing Link between Education and the 21st Century Economy?

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Abstract: To foster discussion that links CSCL to policy and practice (per the conference theme), we ask: what can CSCL research contribute towards preparing learners for the future economy? Building on the knowledge base we developed in a 2-year research project involving both learning scientists and economists, we first briefly review some of the challenges in establishing strong links from educational innovations to economic impacts. We postulate that the promise of linking CSCL to economic concerns requires shifting attention from goals of efficiency to goals that balance efficiency and innovation – yet the outcomes most researchers seek and measure still focus too much on efficiency. To further catalyze discussion, we suggest more deeply theorizing innovation and developing assessments that are sensitive to cognitive diversity. We offer a definition of innovation tasks as those that require student to adapt resources and expertise to define and solve challenging problems for the benefit of others.

Introduction

This year's conference theme is "connecting computer supported collaborative learning to policy and practice." In China, as in other countries, policy leaders broadly see education as relating to the demands of a 21st century economy. For example, the official report of the Seventeenth CPC Central Committee Plenary Meeting of the Fifth which took place in October, 2010) pointed out that the next five years is the crucial period of economic development of China. In order to promote long-term stable and rapid economic development, China's leaders believe that China needs to further deepen the implementation of the "Rejuvenating the Nation through Science and Education Strategy", encourage scientific and technological innovation, and improve the existing science and technology innovation system and mechanism to speed up educational reform and development (http://tinyurl.com/ChinaEdEconPolicy). Similar beliefs are also articulated in the U.S. National Educational Technology Plan (US Department of Education, 2010) which opens by stating "Education is the key to America's economic growth and prosperity and to our ability to compete in the global economy." A wide range of policy documents from the range of geographic regions represented at a typical CSCL conference state this policy concern (e.g. Committee on Science, Engineering, and Public Policy, 2007, OECD 2006).

We acknowledge that CSCL researchers can adopt many valid rationales for their research, not limited to economic concerns. Although researchers are prone to retell the story of educational reform in purely economic terms, a major concern driving educational reform in the United States one hundred years ago was social assimilation of a booming immigrant population. At other times, nations have pursued reforms to increase their ability to reproduce the best of their cultural accomplishments. In the civil rights era, the major goals of educational reform were to increase the equity of access to educational opportunity. Although, transitioning to a future economy need not be the only way to link CSCL to policy and practice; it does appear to be what is on policymakers' minds right now.

The challenge of connecting CSCL to policy through the lens of economic concerns offers CSCL researchers a chance to operate in "Pasteur's Quadrant" (Stokes, 1997) -- to conduct research that is simultaneously foundational and applied to compelling societal needs. Much CSCL research emphasizes rather foundational concerns with how we can analyze collaborative discourse (Bohr's Quadrant); other CSCL research inventively explores the potential of new technology without necessarily advancing theory (Edison's Quadrant). What would it take for CSCL researchers deeply operate in Pasteur's Quadrant where the compelling societal need is the pressure leaders feel to prepare learners for an emerging Innovation Economy?

We phrase this last question with deliberate caution, because we believe that it is easy to superficially link CSCL research to a 21st century economy ("in the future, we all need to use technology and collaborate more") while overlooking the very real gaps in our knowledge base and methods – for example, that almost all CSCL research consists of cross-sectional studies (how students improve from pre-test to post-test over a short time period) and we have almost no knowledge of whether CSCL-based improvements persist beyond the initial intervention and have on-going longitudinal consequences in students' lives. If we are serious about operating in Pasteur's Quadrant, we need to advance knowledge and methods to make links between collaborative learning and the economic needs stronger and more plausible.

To engage the community in discussing this challenge, this paper shares highlights of a much longer manuscript to appear in the Journal of the Learning Sciences (Roschelle, Bakia, Toyama, & Patton, forthcoming) and further develops themes of collaborative learning and innovation beyond what we wrote in that paper. The JLS paper represents the work of a team of scholars with backgrounds both in the learning sciences and the economy to make sense of the existing literature, to probe the strength of existing evidence linking education and the economy, and to seek direction for how to strengthen research in the future. We advance beyond that paper by focusing here on how we could more deeply theorize connections among CSCL, innovation, and the needs of a 21st century economy.

Reconsidering Outcomes: Innovation and Efficiency

A focus on efficiency is pervasive in education and perhaps is most easily recognized by its distinctive pattern of means-ends thinking. In an efficiency orientation, the end (the goal) of an educational reform is known and set ahead of time—for example, we want to increase a particular test score. The question is how to accomplish that end most efficiently. For example, in a paper (Roschelle et al, 2009) that won an award at the last CSCL conference, we asked "will a mobile CSCL technology increase the efficiency with which students learn the challenging topic of fractions?" In this question, CSCL is a means and the end is a test score. In the preponderance of CSCL research, the measured outcome is how efficiently (e.g. with lower standard deviation and greater mean learning gains) did students achieve a defined knowledge or skill – and collaboration is seen as a mediating process.

A distinction between means-ends thinking and innovation goes back at least as far as John Dewey, who distinguished between ordinary problem solving and inquiry (Dewey, 1938). In inquiry, the problem frame itself is open to reconfiguration – new perceptions can be registered, new relationships formed, and new ends visualized. More recently, work of the LIFE Center team has resulting in an understanding that efficiency and inquiry are NOT in opposition or different modalities, but rather they can be two dimensions of the same flow of activity (Schwartz, Bransford & Sears, 2005). In reviewing the literature on "adaptive expertise," the team found that there is an "optimal corridor" of activity that balances between innovation and efficiency (Figure 1).

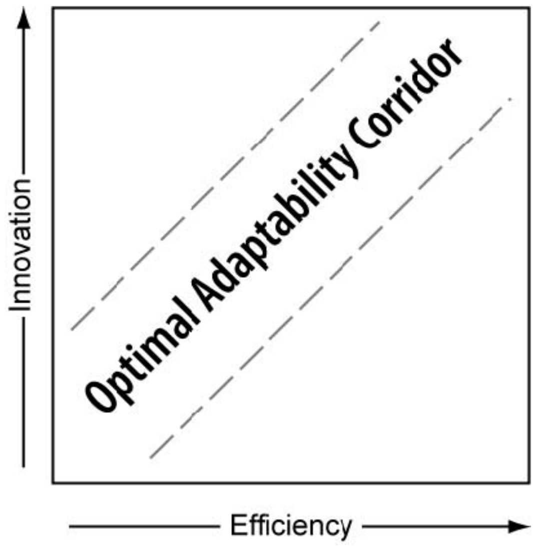

Figure 1. The Optimal Adaptability Corridor.
Source: Schwartz, Bransford, & Sears (2005).

We suggest that a concept of CSCL as a better means to efficient educational outcomes (e.g. raising today's standardized test scores) is highly unlikely to lead to lasting economic impact for participating children. However, we will also not advocate a concept of CSCL that is only focused on helping children learn to be more innovative. Instead, we suggest we need a CSCL that leads educators to be able to sustain long-term work with learners in the optimal corridor. A reformed education system cannot focus children on efficiency in routine problem solving (even through collaborative means) for a dozen years and then expect them to suddenly become innovative. Likewise, innovation requires and builds upon certain kinds of efficiency – therefore, we believe that a CSCL that offers isolated "innovation experiences" will have low net impact as well.

Now having set the stage, we broaden our perspective to consider the general problem of linking education and the economy, and then, with this in mind, consider what steps the field might have to take to move productively forward.

Difficulties in Linking Education and the Economy

In our JLS paper, which will be in print by the time of the conference, we problematize popular socio-political discourse around education and the economy. This discourse operates by coupling a “fear of falling” with a focus on education’s contribution to the economy in isolation from other more powerful factors, such as the quality of management, taxation regimes, regulatory environments, etc. If education were really the only factor that produces wealth in a society, then it becomes hard to explain why Brazil has people who are educated enough to build top-rated airplanes but not to run banks. Or why an automobile in Fremont, California went from the least productive to the most productive without changing its US-educated workers (the plant changed management from GM to a joint effort of GM and Toyota). We recapitulate three key ideas from our problematization, to set a context for the rest of the paper.

Rank Is Not Likely to Be the Answer

One commonplace context in which education is linked to the economy is around international test score rankings, such as the rankings on TIMSS or PISA. A focus on rankings overemphasizes the mean differences and underemphasizes the standard deviations. Indeed, newspapers tend to report national educational rankings as if they were as straightforward as baseball team rankings, when in fact the margin of effort around these rankings is so large that all one can really say is whether a country is in the top, middle, or bottom third. Second, a focus on improve a national ranking tends to align with educational research that is purely aimed at efficiency. Increasing mean scores is emphasized and decreasing societal gaps is de-emphasized even though gaps and not means may be a more important driver of the economy, as argued by Goldin & Katz (2008). More to the point, cognitive diversity may be the most important innovation asset a society has and societies with high mean test scores (e.g. in Asian) tend to struggle with how to unleash creativity and innovation. Just as medical research has helped broad populations to understand the difference between good cholesterol and bad cholesterol, CSCL may have a role in helping societies understand that achieving high standardization of human capital (and correspondingly low standard deviations in test scores) may be counterproductive: there is a difference between bad achievement gaps and good cognitive diversity.

The Answer Is Not Necessarily in School

Our literature review also found that employers tend to value social and collaboration skills very highly, once students have achieved a sufficient educational credential (Bowles & Gintis, 2020). For example, in the Toyota management methods that improved autoworkers productivity in the Fremont, California plant, workers collaborate to improve vehicle production quality. The Toyota management did not need higher math or science scores to produce more innovative autoworkers; they needed workers who could solve problems collaboratively (Lewis, 2004). Further, we observe that as tests such as PISA introduce more real world problem solving, the test creators readily acknowledge that the tests are no longer measuring the quality of school; rather PISA is said to measure the cumulative learning opportunities a society provides to children through the age of 15. Consequently, it is not necessarily the case that the impact of CSCL that eventually reaches the economy must be mediated by in-school learning experiences, nor of CSCL applications that focus on school-like knowledge. It could be that CSCL’s most important impacts will be felt outside of school. In a small example, one of the authors has observed the effects of a research-based program on youth sports in his region (http://www.positivecoach.org/); by emphasizing collaborative improvement of sports skills and teamwork rather than “winning,” sports have been transformed to provide an environment in which kids learn a lot more about leveraging each others’ diverse skills instead of focusing on the young star athletes.

Longitudinal Programs May Matter Most

Our literature review also noted that educational researchers tend to implicitly trust in “pipeline” concept; that students are in a pipeline from childhood to productive STEM careers and that our job is to improve one section of the pipeline. There are indeed a few studies that show that very positive early experiences can have dramatic long-term effects. For example, in the famous Perry Preschool Study (Schweinhart, Montie, Xiang, Barnett, Belfield, &. Nores, 2005), young children experienced a school setting that valued creativity and social skills as well as academic skills and parent participation. Years later, the students had higher high school graduation rates and achievement levels—and at age 27, participating students had high incomes than a comparison group (and groups were initially assigned to the Perry Preschool Program randomly). However, by and large it is rare to find longitudinal impacts from interventions that are designed only to increase a short-term measure and that are only tested cross-section ally. Indeed, most educational interventions have very poor prospects for making any noticeable difference longitudinally. Even more importantly, because we rarely measure longitudinal impacts, our field would have no way of knowing whether our best designs influence participating students’ trajectories later in their studies or in their careers. We note that CSCL could have an advantage relative to subject matter specific interventions; our approaches could span multiple subject matters and multiple years. To realize this impact, we may need to focus less on improving a particular, short-term test score and more upon what it takes to achieve consistent engagement in a productive CSCL environment over the course of many years and across many topics.

Innovation and Efficiency in Existing CSCL Approaches

In this section, we discuss three existing CSCL approaches that balance goals of innovation and efficiency. Subsequently, we discuss how researchers might go beyond these approaches to more thoroughly address innovation.

Knowledge Building

Scardamalia and Bereiter's knowledge building approach (Scardamalia & Bereiter, 2006) aims at enabling school communities to attain a knowledge building character similar to that of innovation-generating organizations by providing teachers and students with an online environment called “Knowledge Forum” and a set of pedagogical principals. In this approach, all ideas are viewed as improvable and students are seen as capable of actively participating in collective idea improvement process. The online communal knowledge spaces and discourse tools make the idea-improvement process visible to everyone, thereby enabling students to contribute to collective knowledge base just as scientists and professionals of creative work do. To capture student progress in Knowledge Forum, researchers have used not only traditional summative assessment measures such as standardized tests (Scardamalia et al., 1992) but also novel formative tools such as social network analysis tools (Teplovs, Donohaue, Scardamalia, & Philip 2007; Zhang, Scardamalia, Reeve & Messina, 2009). More specifically, the latter type of measures capture the degree to which students take *collective cognitive responsibility* (Scardamalia, 2002)—being aware of others’ contributions, building on rising above or referencing others’ ideas, and participating in top-level planning decision making, and community coordination (Zhang, Scardamalia, Reeve, & Messina, 2009). These tools are not only used by the researchers but are also offered to the teacher and students to gain just in time feedback that transform on-going practice (Teplovs, Donohaue, Scardamalia, & Philip 2007).

Group Scribbles

Group Scribbles is a CSCL tool developed by SRI International in collaboration with the Learning Science Laboratory at the National Institute of Education, Singapore (Roschelle et al, 2007). Using Group Scribbles, a classroom can type or use a style to write virtual sticky notes. These sticky notes can be stored privately, shared with a team, or posted to a public display. The notes can be posted in flexible spatial configuration, and thus meaning can be established by their relative position or position relative to a background image (such as a map, diagram or template). Group Scribbles activities often focus deliberately on tapping into cognitive diversity within a classroom. For example, in one common demonstration activity (Roschelle et al, 2007), students are asked to generate fractions between 0 and 1. Then the classroom can focus on generating multiple representations of particular fractions that show the equivalence, for example, of 2/3 and 4/6. The variety of representations that students create is often wider than those shown in a textbook and comparing the meaning of 2/3 across representations is a very powerful cognitive activity. Presently a team in Singapore is scaling up Group Scribbles within local science and language arts classrooms, according to a Rapid Collaborative Knowledge Building (Ng, Looi, & Chen, 2008) approach that shares some similarities with Scardamalia and Bereiter's knowledge building approach. Research with Group Scribbles in Singapore has found that it can both improve test scores and dramatically increase the students’ innovativeness and participation of classroom discourse. For example, students in GroupScribbles classrooms contribute more often and generate more unique ideas, as well as being more likely to build on each others’ ideas.

Productive Failure

In a third example, Dr. Manu Kapur has done significant research establishing the concept of “Productive Failure” (Kapur, 2008). In an instructional sequence organized according to this concept, students are first placed in teams and given a difficult problem in the target domain of knowledge, such as “standard deviation” in statistics. For two class sessions, they collaboratively struggle to solve the problem but ultimately fail. They then receive two lectures on that present the target concept in manner that builds upon a learning progression from students’ naïve concepts to a more expert understanding. Comparison groups receive four lectures from an equally well-qualified instructor. In Dr. Kapur’s research, students in “productive failure” conditions consistently outperform students in more traditional conditions, particularly with regard to more advanced understanding and transfer of what they have learned (Kapur, 2008). One can also imagine that if collaborative “productive failure” was a more common feature of classroom instructional sequences, students would develop great comfort with one of the maxims of innovators everywhere: “Fail early and often.” Thus, although it is not instrumented by a CSCL tool, productive failure provides another example of an approach that straddles the optimal adaptivity corridor.

A Modern Concept of Innovation

The existing approaches we have cited still stay fairly close to the assumptions we critiqued earlier. Results focus on ranking (which approach produced higher mean learning gains?), the context is school, and the longitudinal impacts are rarely evaluated. Thus, we would suggest that the overall balance of the focus is still on efficiency of school learning in localized moments, and not on the broader, long-term gains in innovation capacity in a society's stock of human capital.

To move beyond an efficiency perspective in connecting the economy to education, in general, and CSCL in particular, we need to consider the challenge of the other dimension of the optimal adaptability corridor: innovation. What is required to meet the challenge of preparing our students to innovate? What are key characteristics of tasks that would require students to innovate? What is required to support students in their development of innovation capacity, that is, learn to innovate?

In a rubric our colleagues at SRI are using to examine teacher assignments and student work developed by schools, they have found this definition to be exceptionally productive:

Tasks that require students to innovate are ones that require them to:
Adapt **resources and expertise**
To **define and solve challenging problems**
To **benefit others**

The definition is inspired by research on what successful innovation looks like in the business world, and by examination of SRI's experience with innovation over its long history. It is framed in terms of what kinds of things we need to ask students to do (and support them in doing) if they are to be prepared to recognize and participate in innovation in work, in life, and in learning. Unhappily, student opportunities to take on tasks like these are quite rare, and, in the U.S. at least, those opportunities are quite inequitably distributed.

Norton Grubb, in his analysis (Grubb, 2008) of longitudinal data linking a wide range of factors with student success, makes the key theoretical distinction between simple and more complex resources The primary simple resource, money, is a poor predictor of the quality of schooling (Hanushek, 1989). However, money can be used for different purposes, and when school leaders use it and teachers to build more complex resources for instruction, those resources can be quite relevant to school quality. By complex, we mean not that such resources are hard to understand or use, but that they have multiple interlocking aspects and that they often require some amount of adaptation by local leaders and teachers – and, for innovation tasks, by students. Not simply a novel pedagogical approach, for example, but such an approach together with access to external (and possibly conflicting) expertise, mentoring, or coaching.

In his book, "The Difference" (Page, 2007), Scott E. Page lays out a powerful theoretical framework for understanding the key role of cognitive diversity in collaborative problem-solving and innovation. The components, mechanisms, and conditions of his theorem "Diversity Trumps Expertise" sheds light on all parts of the above definition of innovation, but none more so than on the issue of adapting resources and expertise. While we might suppose that in learning to adapt resources and expertise students would be learning to gain new knowledge quickly and expand the range of experts' tools they had available to them. And these, of course are good and important things. However, these are not at the heart of the matter. Embedded in both the resources and the expertise are a diversity of perspectives (more precisely, topologies) applicable to the problem space at hand. It is the iterative (and non-destructive) application of diverse perspectives – either by the individual or, as Page has it, collaboratively – that powers the triumph of diversity over expertise – for hard problems like innovation - and informs our view of adapting resources and expertise.

SRI's CEO, Curt Carlson, in his book on Innovation (Carlson & Wilmott, 2006) makes a strong case that an essential element of innovation not simply problem solving, but equally problem identification. Speaking economically, an innovation is only as significant as the problem it solves. The discipline of identifying problems, and iteratively validating, reframing, and revising them with the goal of perfecting their importance has clear value. Moreover, importance is a reasonable proxy for the "hard" or "challenging" condition of Page's theorem. In important problem that not also "hard" is not likely to be a problem for long. Both of these inform our view of the role of students self-defining the challenging problems.

No caring teacher would assign tasks at which their students would be assured to fail. And yet in tasks for which innovation is required, local failure is inevitable even while long-term success is assured. Even if students are adept at perfecting important problems, and adapting resources and expertise to leverage cognitive diversity, local "failures to advance a solution" are endemic to the process. Page's theorem assures that from *some* perspective, an advance is nearby and reachable with the available tools, not that from *every* perspective such an advance is at hand. Many perspectives will lead one in what can be seen, in retrospect, as exactly the wrong direction - but only in retrospect. Testing and validating these potential advances to a solution, then learning from and valuing them – whether they advance the solution directly or not – this is an aspect of solving challenging problems we term "productive failure." Outside of school settings, it is well understood that productive failure itself, especially when combined with problem (re-)identification, can be powerful driver of innovation (as in the classic story of the invention of Post-It® Notes.) But in school, the challenge of engaging students in solving important problems remains one of teaching and managing productive failure.

It may seem odd to see the final clause – “to benefit others” - in a rubric inspired by research on innovation in the business world, but through the writings of Doug Engelbart, and research by our colleagues at SRI on the social aspects of innovation, we have come to understand that its importance – from social, cognitive, and, frankly, practical perspectives. From the business perspective, as noted, an innovation is only as significant as the problem it solves. And that significance does not belong to the innovator but to the owner of the problem – the customer. It’s not an innovation unless, and until, it “adds value” for the customer. But that’s not the end of the story. In problem identification, a particularly powerful use of cognitive diversity is “seeing the problem through the eyes of the intended beneficiary.” Moreover, as Page points out, while cognitive diversity trumps expertise, goal diversity (diversity in “utility” or “goodness” metrics on potential solutions) wreaks havoc on collaborative problem-solving. Externalizing the beneficiary provides a transparent – and validatable – approach to achieving commonality of “goodness” metric across all the collaborators, and enabling the development of a trust network among participants. All of these inform our view of the role of externalizing benefits of innovation.

We observe that a deeper view of innovation would distinguish a CSCL of innovation from a CSCL that purely focuses on “shared meaning” or a “community of practice” as well as from more generic accounts of 21st century skills. We suggest that further developing a CSCL of innovation would more strongly address issues of policy and practice.

Assessment: A Key Challenge on the Road Ahead

To develop a CSCL that more tightly links to innovation and the economy, we believe that CSCL researchers will have to focus on developing assessments that capture the qualities of “Human Capital” we are developing beyond academic knowledge and skills. For example, CSCL researchers need to continue developing and refining assessments to capture student capacities for collaborative problem finding and problem solving. Some of these assessments need to be summative in nature for accountability purposes, but others need to be formative, providing meaningful feedback to teachers, students, and designers of learning environments to improve their on-going practices. Additionally, these assessments need to be able to capture not only pre-determined set of student knowledge, skills, and abilities, but also their emerging capacities as they engage in CSCL. Two lines of work are particularly noteworthy to further advance this effort. First is “preparation for future learning” (PFL) approach to assessments. This approach reconceptualizes the idea of transfer from direct application of well-defined routines and facts to students’ abilities to learn in a new setting with greater agility and success (Schwartz & Bransford, 1998; Schwartz, Lindgren, & Lewis, 2009). To accomplish this, learning environments must balance goals of “efficiency” and “innovation” (Schwartz, Bransford, & Sears, 2005) in order to help learners become “adaptive experts” (Hatano, 1988). Schwartz, Bransford, and Sears not only theorized about innovation and efficiency, but they also introduced a measurement paradigm for “preparation for future learning,” allowing measurement of the extent to which an environment prepares students for future learning. Assessments based on the PFL approach may provide opportunities for students to try out hunches to “find” or “frame” a problem, receive feedback, and revise their work using the feedback. Such assessments may also focus on learning process and trajectories by, for example, evaluating the sophistication of questions learners ask about a topic or assumptions that they reveal in their discussions (Bransford et al., 2006). Data from such assessments are likely to provide better linkage between learning and innovation.

A second line of work that is noteworthy is the ongoing work by Knowledge Forum researchers to develop computer-assisted content analysis tools to visualize group cognition (Sha, Teplovs, & van Aalst, 2010; Teplovs & Scardamalia, 2007). This work employs Latent Semantic Analysis and Social Network Analysis to create a visual representation of student-generated notes in terms of their structural as well as semantic relationships. Uniqueness of this approach lies in its focus not only on the surface relation between student actions (i.e., note reading and writing) but also on the relation between student ideas. The approach also takes advantage of computer-automated processes to reduce labor intensity required for this type of analysis. Resulting visualizations enable one to assess how student online discussions are unfolding in terms of shared mean making and weather their ideas are becoming more coherent with one another over time. Moreover, the tools enable an examination of similarities between student discourse and the curriculum guidelines or expert discourse.

Conclusion

In this paper, we asked what it might take for CSCL researchers to operate more deeply in Pasteur’s Quadrant, with foundational advances in understanding of collaborative learning and important policy and practice advances with respect to developing human capital for the evolving economy. We noted that it is easy to superficially advocate a constellation of collaboration and technology as relevant to the future, but more difficult to establish an actual causal chain from the kind of research we do to the pressing questions of policy and practice.

We have argued that for CSCL to link education to the economy, the field could productively focus on the optimal adaptivity corridor – the balance between goals of innovation and efficiency in the approaches we advocate. This focus would downplay a view of CSCL as a means only to achieving higher mean knowledge gains or to reduce standard deviations in knowledge and thus further standardize our stock of human capital. When trying to show a statistically significant effect, a large standard deviation is bad. But not all cholesterol is the same, and neither is all spread among learners to be minimized; indeed respecting and growing cognitive diversity may be one of the most important factors in increasing the innovativeness of a society. Thus a future CSCL might downplay rankings as the key measure we seek to influence and instead provide alternative measures of the cognitive diversity we are nurturing and growing, as well as the growth in collaboration, teamwork, and problem solving skills which are much desired by employers. We suggest a concurrent need to focus our efforts longitudinally and beyond school.

We have highlighted that this pathway for CSCL is grounded in established foundations through approaches like Knowledge Building, tools like Group Scribbles, and instructional sequences like Productive Failure. Further, we have argued that insights from research on innovation in the workplace could more strongly influence and direct the future of CSCL. For example, we have suggested a definition for innovative tasks that has emerged across multiple projects at SRI: innovative tasks require students to adapt resources and expertise and to define and solve challenging problems for the benefit others. We have further suggested that a key challenge for a CSCL of innovation is to advance assessments so that we can better measure students' longitudinal growth in innovation capacity.

We see the opportunity for this conference in Hong Kong to mark a turning point in the relevance of CSCL to policy and practice. As our contribution to doing so, we suggest that CSCL needs to acknowledge the strength of its past, but also move beyond a CSCL that is merely about learning gains on standardized tests, increased shared meaning among dyads and enculturation in to a disciplinary community of practice. We need to move towards a CSCL of innovation that respects cognitive diversity, emphasizes longitudinal development of human capacities, and connects more deeply to insights about how "innovation" is more than a generic 21^{st} century skill. By doing so, we could give policy makers theory, tools, and exemplars of what it would mean to truly prepare students for their future and give practitioners insights about how to balance the needs for efficiency and innovation in their students' learning.

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