A review of the International Handbook of Computer-Supported Collaborative Learning 2021

Jeremy Roschelle

Springer

Springer

A review of the International Handbook
of Computer-Supported Collaborative Learning 2021

Jeremy Roschelle [1]

Introduction

The arrival of a major new handbook on CSCL, the International Handbook of Computer-Supported Collaborative Learning 2020 (Cress et al. in press-a) is clearly a landmark for this approximately thirty-year-old field within the learning sciences. Thirty years is an interesting period of time for a volume that aims to tell the story of how a scientific field has evolved. Thirty years is a span in which a field can evolve greatly, and in this case, scholars used the time productively to develop a progression of theories, designs, methods, and linkages to foundational concepts. Thirty years is also an amount of time that fits within the span of an individual career. This allows for the inclusion of authors who have been major contributors to the field since its early days and allows for an intellectual history that is still living, not a forensic matter. This Handbook fully takes up the opportunity to cover the field with full respect and accountability both to early precedents and to how its foundations, theories, designs, methods, and other components have evolved.

Rather than attempting a comprehensive review of this 35 chapter volume, I will comment on four themes that cut across chapters, with an eye towards how engaging with this Handbook could benefit those who wish to advance their scholarship and careers in computer-supported collaborative learning. In two brief discussions, I will celebrate the internationalism and intellectual histories prominent in the volume. Two longer discussions will build from the analysis in Thomas Kuhn's (2012) classic "The Structure of Scientific Revolutions."

In his book, Kuhn describes science as always evolving not a smooth linear progress, but rather in alternating phases of "normal" and "revolutionary" science, the latter of which gives rise to "paradigm shifts." The opening chapter of this Handbook (Cress et al. in press-b) evokes Kuhn by discussing Stahl's (2015) reflection that "CSCL began to develop at a time, when there was 'a pervasive sense of a paradigm revolution in learning research'." I will suggest that readers can see this Handbook as a consensus about the state of the art, upon which they can build a next layer of scholarship. Alternatively, I will suggest that readers can see this book as describing the disequilibria in CSCL—the unresolved tensions, unmet

✉   Jeremy Roschelle
jroschelle@digitalpromise.org

[1]   Digital Promise, San Mateo, CA, USA

challenges, unrealized opportunities—that present scholars within opportunities to make their mark in more creative, transformative, or potentially paradigm-shifting ways. The Handbook thereby gives two complementary resources to scholars who wish to advance the next 30 years of CSCL: a consensus they can build upon and disequilibria they can tackle with creativity and verve to make their mark.

Celebrating internationalism

The "international" that prefaces the title of this journal is not superficial. CSCL really is an international field. CSCL scholars are distributed worldwide, and conferenceshave regularly alternated among Asia, Europe, and the United States. In addition, many CSCL scholars also attended the ISLS conference in Australia in 2012. Although some handbooks have a chapter with a token chapter from a particular region, the international authors in this volume are not compartmentalized but rather co-authored chapters together. This reflects long-standing international collaborations in the field, which can only be developed in the decades-long spans covered here. Among the co-authored chapters, I noticed co-authors in Japan and Germany, Israel and the United States, Canada and Romania, Estonia and the UK, and the United States and Australia. The collection of authors is world-spanning, their credentials are world-class, and–perhaps as one should expect in a volume by scholars who study collaborative learning– their writing reveals international intersubjectivity. The internationalism of this field creates opportunities for early- and mid-career scholars to find colleagues and make important contributions that go beyond national and regional boundaries that can limit other scientific fields.

Intellectual history

Within CSCL, there have been periodic efforts to provide the field with an intellectual history, such as Stahl et al. (2006) or Dillenbourg et al. (2009). This Handbook goes further and is essential reading for the intellectual history of the field. It includes both a set of foundations chapters (which cover the intellectual history of the field) and in addition, most topical chapters include a section on the history and development. These multiple recounting of history are not redundant; rather, each reveals the specific influences upon a focal concept. For example, a chapter on the meanings of "community" and "participation" in CSCL follows influences from the neighboring field of Computer Supported Cooperative Work (Hod and Teasley in press), including both how this defined the state of the art, and led to new unresolved tensions arising from a "spatial turn" in scholarship. In another example, several chapters refer to CSCL as interested in learning as "polyphonic." The chapter on Dialogism traces this back to the work of Mikhail Bahktin (Trausan-Matu et al. in press) and reveals the intellectual history of how the term came to be used in CSCL. Some chapters describe the state of the art as arising by combining multiple perspectives, such as the chapter on "group structuring," which notes influences of scaffolding, structured independence, scripting, an intervention perspective, and broad orchestration (De Wever and Strijbos in press). Others do not provide a story of smooth assembly of the state of the art, but rather of touchpoints and tensions between CSCL and adjacent fields. Chapters on diversity, equity, and inclusion (Gomez et al. in press) andlearning analytics (Wise et al. in press) have this character. Even scholars who are well-grounded in the

state of the art on a particular CSCL topic would do well to read the relevant intellectual histories of their topic and related topics for a deeper understanding of the field's roots, influences, and intersections.

A consensus to build upon

A scholar coming to CSCL could see the intellectual excitement and foment of the early days of CSCL as having settled down from its early paradigm shift—which involved going beyond relating learning technology to individual students and individual minds to a commitment to exploring the synergies between shared computational media and socially constructed learning. The field has settled into a consensus around the key stances, theories, design advances, and methods that make up its state of the art. I particularly enjoyed reading the clear and comprehensive chapter on metacognition in CSCL (Järvelä et al. in press) to catch up on my knowledge of this important strand and because it reflects a deeply important complementary between "collaborating to learn" and "learning to collaborate." Social regulation in support of learning and learning how to regulate social interaction are both of great importance. In the technology section, even for those who know quite a bit about "scripts" in CSCL, the chapter on collaboration scripts is authoritative, compelling reading (Vogel et al. in press), which would be useful in designing any set of supports for collaborative learning. I found the next technology chapter, on representation, to be equally powerful (Ainsworth and Chounta in press), as it offersfour-part guidance on the different ways in which representations can be helpful in CSCL. This sort of framework provides a useful lens with which an emerging scholar can make sense of a complex field. Other technology chapters will be discussed later. The methods chapters provide in-depth primers on all the major research methods one might use in CSCL, ranging from case studies to quantitative experiments and from log file data to artifact analysis. These chapters should be consulted before planning an investigation.

As a consensus document, I have two criticisms of the Handbook. First, this Handbook comes up short in communicating to teachers and other practitioners. Some research handbooks do seek to support multiple audiences. Further, some of the individual chapters hit the mark. Ainsworth and Chounta (in press) discuss the four uses of representations in a way that I believe teachers could find useful. The chapter on structuring groups also presents a clear framework that could be useful to teachers (De Wever and Strijbos in press). Law et al. (in press) discuss scale and sustainability in a way that very much includes practitioners. Yet, the Handbook does not do a good enough job of either discussing the role of teachers in CSCL investigations or deriving implications that could be considered by authors who want to translate aspects of this body of work for practitioners.

Second, the Handbook misses an opportunity to consider policy implications more deeply or to make policy arguments. Research funding for CSCL has been available because policymakers see how collaborative learning and collaborative work will be increasingly important to a knowledge society. It would be good for a handbook also to summarize what the return on that investment looks like. In one example that is in the Handbook, Rosen et al. (in press) discuss how collaborative learning has been incorporated into assessment topics and methods, most notably in PISA 2015, where it is administered as computer-based collaborative learning tasks. Rosen et al. (in press) note the definition in PISA for collaboration is "the capacity of an individual to effectively engage in a process whereby two or more agents attempt to solve a problem by sharing the understanding and effort required to come to a

solution and pooling their knowledge, skills and efforts to reach that solution" (OECD 2017). This builds quite directly and intentionally on an early definition that described collaborative learning as "coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem" (Roschelle & Teasley, 1995).

Further, the PISA results are now in and show clear and strong correlations between collaborative learning and science learning (OECD 2017), as well as correlations to other subject matters. Additionally, our field has a meta-analysis that shows a robust effect size for CSCL as a way to improve science learning (Jeong et al. 2019). We have both a large scale correlation between CSCL and science learning and a meta-analysis that establishes causality from CSCL to science learning. Policy makers almost always want to improve both science learning and collaborative skills. We could be making a strong, evidence-based policy argument that CSCL and science learning should be implemented together, as a matter of educational policy. We could also be doing more to summarize the policy implications of CSCL work when systems have reached the level of scale that policymakers notice. Some that are mentioned in the Law et al. (in press) chapter include the work of Michael Sharples in designing the FutureLearn platform in the UK, Chee Kit Looi's leadership of an initiative to scale collaborative learning in Singapore, the WISE platform in the United States, eTwinning in Europe, and the Knowledge Forum in multiple countries and regions.

A disequilibrium handbook for educational revolutionaries

Near the end of the introductory chapter, Cress et al. (in press-b) create an opening for seeing the field in tension, having omissions and potential blind spots, and working towards transformation. They write, "What comes next? That is up to all of us, including you."

In closing, they offer:

> At a moment when the world is facing extraordinary challenges and divisions in societies, we leave you with three questions: Why is CSCL important to consider? What does CSCL have to offer the world? What could CSCL do for different communities? The answers to these questions can help shape the problems we choose to work on, the approaches we adopt to address them and consequently what the field will look like in 2030. In this way, we connect full circle back to the early visions that initially inspired the start of CSCL: a desire for transformative impact on education through research that goes beyond existing practices to use technology as a tool to explore ways to elevate learning, teaching and collaboration.

For scholars looking to make a major contribution to CSCL, an unusual and crossing-cutting theme in this Handbook is its willingness to openly discuss disequilibria in the field—unresolved tensions that could lead to transforming the field. Reading the Handbook for these disequilibria could raise important discussion about possible alternative futures for the field and enable scholars to orient their work to the opportunities that lie in these directions. Below, I tour several of the notable disequilibrium chapters (and the idea of unresolved tensions can be found in many more chapters).

Gomez et al. (in press) tackle the role of CSCL in diversity, equity, and inclusion (DEI). They tie CSCL to DEI through scale: "to genuinely understand the demands of DEI we must look beyond small-scale examples of use and access for small groups of users towards projects that touch the lives of many users from a variety of backgrounds and abilities and tools that

intentionally aim to understand and accommodate the interests, learning, and social interaction needs of all learners." Their critique is twofold. "First, while the concerns with equity and access are deep, ongoing work to actively address these issues is not widespread. Second, much of what was reported, in the CSCL 2017 published proceedings, was broadly connected to DEI, rather than DEI being the focus of the work." We have work to do, and these authors make the case we should tackle issues of identity, differentiation, and language within policy-relevant systems.

Law, Zhang and Peppler (in press) take up what a CSCL that focused on scale and sustainability might look like (and in doing so, build on some of the DEI issues). They offer seven recommendations. These start with harnessing the best of CSCL: principled designs, integrating scaffolds into learning platforms, and making learning visible through visualization and analytic tools. But their principles push beyond this to focus on the co-evolution at the nexus of research and practice, a shift of ownership to practitioners, and developing organizational structure and effective ecosystems. As with the DEI concerns, these themes come up only sporadically in the rest of the Handbook, suggesting a need for a paradigm shift in the field if it is to achieve "transformative impact."

Chen, Håklev and Rosé (in press) continue the theme of scale, examining what is already happening in terms of massive scale and noting how CSCL might have to change to get involved. They write, "In mass collaboration contexts, learning may not necessarily be the primary concern for people who participate; learning could very well be a 'means to an end,' a 'by-product,' or an end-goal in itself—depending on how learning is contextualized. The second challenge is with regard to the conceptualization of collaboration. Since its inception, the CSCL community has held a high standard, both theoretically and epistemologically, for what can be considered collaboration." They consider moving away from the aforementioned Roschelle & Teasley (1995) definition to " A coordinated activity guided towards a shared vision, with support from rules and tools, mediation by representations and artifacts, and dependence on intersubjectivity." They note the importance of looking across informal and formal learning spaces. Across many chapters, there is an interest in reconceptualizing the goal of CSCL to achieve more transformative impacts.

All the chapters in the technology section are strong in a disequilibrium sense, and the two last chapters are particularly noteworthy.

Wise, Knight and Buckingham Shum (in press) look at the disequilibria arising as learning analytics and CSCL come closer together. The authors note there is both a story where they merge smoothly and a story that is more disruptive due to clashes in values and capabilities (e.g., intensive understanding of tiny samples or intensive analysis of larger samples). They provoke wonder about what would happen if we substituted "analytics" for "computer" in CSCL – would analytics-supported collaborative learning be an evolution of CSCL, a paradigm shift for CSCL, or a new kind of field?

Rosé and Dimitriadis (in press) take the conversation in another important direction, openly pondering why CSCL is a field in which researchers mostly stay in their own boxes, using their own tools to explore their own favorite designs, theories, and methods. They offer the Language Tools Consortium as an example of a community that has shared platforms, and that is not so different from CSCL. In the learning sciences broadly, one can sense an emergent shift to research that leverages shared platforms and data sets, as these can reduce barriers to conducting studies, allow larger scale studies, and enable a division of labor that allows the work to accelerate. Thirty years from now, might we look back on this era of CSCL as overly fragmented and observe the greater progress we achieved by adopting more commonality in our tools, platforms, and methods?

There are many more chapters worth digging into to explore disequilibria in CSCL and how our field might shift and transform. I'll close with just one more, by Kali and Hoadley (in press), who examine design-based research, a methodological tradition at the core of CSCL. They look unflinchingly at the flaws and critiques of this tradition, such as the lack of a common argument structure across studies. They articulate the difficult tension between having one foot in design and the other in science, and call for a renewed effort to create a methodologically-coherent approach across the field. Conjecture mapping (Sandoval 2014) is one method that fits well into their proposal. The chapter includes a clear conceptual diagram that helps re-situate design-based research. Yet, to achieve methodologically-coherent methods that are shared across the CSCL community would be a least a modest paradigm shift worthy of the attention of emerging scholars.

Conclusion

One concept that reverberates through many chapters in this Handbook is "uptake" (Suthers et al. 2010); uptake reminds us that what really matters is how others grasp, think about, and build on the ideas of others. For emerging and mid-career scholars interested in contributing further to CSCL, this volume offers rich uptake opportunities. Scholars can *value* this volume for its integrative internationalism and rigor in attending to intellectual history; these characteristics signal that this is the kind of intellectual community worth belonging to. Scholars can *refer* to this volume for its high-quality consensus summaries across all key CSCL topics, including theory, processes, technologies, and methods. Whether writing new proposals, designing new studies, or writing up work for publication, the careful groundwork in this volume can help scholars conceptualize stronger contributions. Finally, scholars can accept the invitation to *explore disequilibria* and work towards *paradigm shifts* that enable the field of CSCL to realize its ambitions of transformative impact. Could we take a stronger stand on deeply integrating diversity, inclusion, and equity issues? Could we reckon with the challenges of scale and sustainability not later in a program of research, but right from the onset? Should we let analytics and AI reshape CSCL – and in doing so, could we find a happy middle ground between lots of interpretation of very little learning and broader interpretations of a whole lot of learning? Could we work collectively on shared platforms or with communal datasets? Could we rethink what a methodologically-coherent design research enterprise would be? Could we redefine our work so that we produce stronger, clearer implications for practice andpolicy?

References

Ainsworth, S., & Chounta, I. A. (in press). The roles of representation in computer supported collaborative learning. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.

Chen, B., Håklev, S. & Rosé, C.P. (in press). Collaborative learning at Scale. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), International handbook of computer-supported collaborative learning. Berlin: Springer.

Cress, U., Oshima, J., Rosé, C., & Wise, A. (Eds.). (in press-a). *International Handbook of Computer-Supported Collaborative Learning*. Berlin: Springer ISBN 978-3-030-65291-3.

Cress, U., Oshima, J., Rosé, C., & Wise, A. (in press-b). Foundations, processes, technologies, and methods: An overview of CSCL through its handbook. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.

De Wever, B., & Strijbos, J.-W. (in press). Roles for roles for structuring groups for collaboration. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.

Dillenbourg, P., Järvelä, S., & Fischer, F. (2009). The evolution of research on computer-supported collaborative learning. In N. Balacheff, S. Ludvigsen, T. Jong, A. Lazonder, & S. Barnes (Eds.), *Technology-enhanced learning* (pp. 3–19). Berlin: Springer. https://doi.org/10.1007/978-1-4020-9827-7_1.

Gomez, K., Gomez, L., & Worsley, M. (in press). Interrogating the role of CSCL in diversity, equity, and inclusion. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.

Hod, Y., & Teasley, S. (in press). Communities and participation. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.

Järvelä, S., Malmberg, J., Sobocinski, M., & Kirschner, P. A. (in press). Metacognition in collaborative learning. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.

Jeong, H., Hmelo-Silver, C. E., & Jo, K. (2019). Ten Years of Computer-Supported Collaborative Learning: A meta-analysis of CSCL in STEM education during 2005-2014. *Educational Research Review*, 100284.

Kali, Y., & Hoadley, C. (in press). Design-based research methods in CSCL: Calibrating our epistemologies and ontologies. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.

Kuhn, T. (2012). *The structure of scientific revolutions* (4th ed.). Chicago: University of Chicago Press ISBN 978-0-226-45811-3.

Law, N., Zhang, J., & Peppler, K. (in press). Sustainability and scalability of CSCL innovations. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.

OECD. (2017). *PISA 2015 results (volume V): Collaborative problem solving, PISA*. Paris: OECD Publishing. https://doi.org/10.1787/9789264285521-en.

Rosé, C. P., & Dimitriadis, Y. (in press). Tools and resources for setting up collaborative spaces. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.

Roschelle J., & Teasley S.D. (1995) The Construction of shared knowledge in collaborative problem solving. In: O'Malley C. (Ed.) Computer supported collaborative learning (pp. 96-97). NATO ASI Series: Computer and Systems Sciences, Springer. https://doi.org/10.1007/978-3-642-85098-1_5.

Rosen, Y., Stoeffler, K., Simmering, V., Has, J. & von Davier, A. (in press) Development of scalable assessments for collaborative problem solving. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), International handbook of computer-supported collaborative learning. Berlin: Springer.

Sandoval, W. (2014). Conjecture mapping: An approach to systematic educational design research. *Journal of the Learning Sciences, 23*(1), 18–36. https://doi.org/10.1080/10508406.2013.778204.

Stahl, G. (2015). A decade of CSCL. *International Journal of Computer-Supported Collaborative Learning, 10*(4), 337–344. https://doi.org/10.1007/s11412-015-9222-2.

Stahl, G., Koschmann, T., & Suthers, D. (2006). Computer-supported collaborative learning: An historical perspective. In R. K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 409–426). Cambridge: Cambridge University Press.

Suthers, D. D., Dwyer, N., Medina, R., & Vatrapu, R. (2010). A framework for conceptualizing, representing, and analyzing distributed interaction. *International Journal of Computer-Supported Collaborative Learning, 5*(1), 5–42. https://doi.org/10.1007/s11412-009-9081-9.

Trausan-Matu, S., Wegerif, R., & Major, L. (in press). Dialogism. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.

Vogel, F., Weinberger, A., & Fischer, F. (in press). Collaboration scripts: Guiding, internalizing, and adapting. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.

Wise, A. F., Knight, S., & Buckingham Shum, S. (in press). Collaborative learning analytics. In U. Cress, J. Oshima, C. Rosé, & A. Wise (Eds.), *International handbook of computer-supported collaborative learning*. Berlin: Springer ISBN 978-3-030-65291-3.