Theories and Methods for Researching Interdisciplinary Learning

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Abstract: Interdisciplinary learning (IDL) has become widespread in schools, universities, workplaces and diverse R&D settings. However, it is a highly challenging, fragmented and underexplored domain. Research that examined it is dispersed across multiple theoretical and methodological traditions, and targets diverse research problems, yet generating little impact on practice. This workshop aims to create a more holistic understanding of this research field by enabling CSCL researchers to share their theoretical and methodological tools and practices. It further aims at outlining an agenda for synthesizing this work into an integrated theoretical and methodological toolkit that would allow researchers, designers and other practitioners in the IDL field to conceptualize their studies and design IDL environments more holistically and robustly. The workshop is co-organized by an international team of researchers with expertise in studying various aspects of interdisciplinary collaboration, knowledge co-creation and learning, and who operate within diverse research traditions. Participants will be invited through an open call, highlighting the need for contributions of conceptual, methodological and empirical nature.

Keywords: interdisciplinary learning; theoretical frameworks; analytical approaches

Organizers

The team includes researchers from 3 continents who have expertise in a range of theoretical and methodological approaches for researching CSCL and knowledge co-creation across disciplinary boundaries. All team members have extensive experience organizing workshops at ICLS, CSCL and other large international conferences.

Lina Markauskaite, Co-director of the Centre for Research on Learning and Innovation. Her research focuses on knowledge work across disciplinary and professional boundaries in higher education. She brings expertise in epistemic fluency. Lina chaired ICLS 2012 workshop committee and organized other workshops.

Hanni Muukkonen, Professor in Educational Psychology at the Faculty of Education. Her research focuses on collaborative knowledge creation, learning knowledge work practices in higher and secondary education, and learning analytics. She has organized and facilitated workshops at conferences and international R&D projects.

Crina Damsa, Associate Professor at the Department of Education and Member of ISLS Education Committee. Her research focuses on collaborative learning, design for learning and digital learning environments in higher education. Crina organized and facilitated various workshops at CSCL and EARLI conferences.

Peter Reimann, Professor of Education. His research in CSCL addresses questions of group awareness, design of learning environments, and methodological topics, such as analysis of temporal data. Peter helped to organize numerous ICLS and CSCL conferences.

David Shaffer, Vilas Distinguished Professor of Learning Sciences. He studies how to develop and assess complex and collaborative thinking skills. David leads development of methods for Epistemic Network Analysis.

Kate Thompson, Head of the Creative Practice Lab. Kate's research explores IDL in professional teams (e.g. scientists, research-practice partnerships), as well as school and tertiary education contexts (e.g. STEAM studios, makerspaces). She has organized numerous events bringing together researchers and practitioners.

Yael Kali, Director of the Taking Citizen Science to School (TCSS) center of excellence. Her work focuses on the role of design principles for supporting CSCL. Yael co-organized a number of ICLS and CSCL workshops.

Ady Kidron, Postdoctoral scholar at the GSE, UC Berkeley. His research explores collaborative learning as means to promote the development of interdisciplinary understanding in higher education and middle schools. Adi has organized and co-facilitated several workshops for the Knowledge Integration community.

Monika Nerland, Professor within the department of Education. Her research interests relate to knowledge cultures and learning in HE, professional education and workplace. A particular interest is the ways in which organization of knowledge in expert communities constitute practices of learning and identity formation.

Theme and goals

In recent years, interdisciplinary knowledge work and collaboration have become critical in many areas of R&D, work and life, such as healthcare, advanced manufacturing, and sustainable urban development (NAP, 2018). This surfaced a fundamental learning challenge. Many people, including skilled professionals, lack the capacities to work beyond their core domain of expertise (Frickel, Albert, & Prainsack, 2017), and discipline-focused education does not prepare students for learning and working across disciplines and contributing successfully to interdisciplinary teams (Ledford, 2015).

In response to this challenge, schools and universities have rapidly introduced a range of interdisciplinary learning (IDL) options, such as STEAM projects and university courses with industry and community (Lyall et al., 2015). However, as the UK Higher Education Academy's review of interdisciplinary provisions concludes: "there is a clear lack of theorizing about pedagogy"; a debate about, and evidence for, the underlying interdisciplinary pedagogical principles, ideas, and other "curriculum ideologies" is largely missing (Lyall et al., 2015, p. x). Other reports highlight an even deeper issue: a body of knowledge as to how people learn to integrate knowledge from different fields and work in interdisciplinary teams is lacking (Webber, 2013).

Over the years, the CSCL community has made significant progress in diverse fields of scholarship broadly related to IDL. However, important work needs to be done bringing together dispersed research agendas, sharpening theoretical constructs and methods and filling in existing theoretical and methodological 'gaps', so that researchers and practitioners are able to address the issues of IDL more rigorously and holistically.

Our **overarching goal** is to create a more integrated understanding of IDL by enabling CSCL researchers to share their theoretical and methodological tools and practices, and to set an agenda for synthesizing this work into a theoretical and methodological toolkit. Our purpose is to assist researchers and practitioners in the IDL field to conceptualize their studies/work and design IDL environments more holistically and robustly.

Theoretical background and relevance to field and conference

Interdisciplinary work often requires specialized knowledge in a particular discipline, but also the capability to integrate knowledge from several disciplines, together with people who have different expertise and who do not share same disciplinary culture (Boix Mansilla, 2017; Cooke & Hilton, 2015). How exactly those capabilities are learned, and how to facilitate their development are two broad questions that delineate the scope of IDL. Current theoretical and methodological challenges in this area involve three overarching aspects.

Firstly, the CSCL community has been studying diverse integrative learning practices and advancing a range of theories and research methods, such as knowledge integration (Linn, 2006; Pennington, 2016), knowledge building and knowledge creation (Scardamalia, Bereiter, 2014), knotworking (Engestrom, 2014), epistemic fluency (Markauskaite & Goodyear, 2017; Morrison & Collins, 1996), shared epistemic agency (Damsa et al., 2010) and epistemic network analysis (Shaffer, Collier, & Ruis, 2016). This work has usually focused on general issues of collaborative learning, without addressing key challenges related to interdisciplinarity. This scholarly work, while very relevant to IDL, now requires clearer delineation, mapping and synthesis.

Secondly, producing a better understanding of how students develop interdisciplinary capabilities and how to facilitate their formation is not just a matter of deploying existing theories and research approaches. Some issues that need to be addressed are themselves interdisciplinary and fundamental. Many educational theories, including in CSCL, have been developed in the context of mono-disciplinary learning. Neither cognitively-oriented frameworks for studying how students learn disciplinary concepts, nor socio-culturally oriented approaches for investigating how they become enculturated into existing disciplinary practices can provide a satisfactory explanation of how students learn to make new connections across multiple disciplines and create hybrid interdisciplinary knowledge practices and cultures (Markauskaite & Nerland, 2019).

Thirdly, research in this domain is complicated even further by the complexity of contemporary environments for interdisciplinary work. These environments are increasingly distributed, not only across networks of humans with different expertizes, but also across diverse 'intelligent' tools (Säljö, 2018; Trede, Markauskaite, McEwen, & Macfarlane, 2019). Conceptual learning, collaboration and tool-use cannot be easily separated or studied independently. Developing integrated theoretical approaches and methods that allow investigating this phenomenon holistically is an urgent matter and CSCL community is well placed to address it.

It is our intention to use this workshop not only for sharing approaches and methods, but also for building integrated lines of work for addressing these conceptual and methodological challenges.

Expected outcomes and contributions

Our **concrete aims** are to: 1) enhance participants' understanding of the current IDL research landscape; 2) identify relationships between existing research and opportunities for cross-fertilization; 3) identify common themes of high importance for researchers, designers and practitioners; 4) commence setting the agenda for future synthesis and collaboration; and 5) establish a network of CSCL scholars contributing to research and development of IDL. Accordingly, we expect that this workshop will enable participants to achieve the following **outcomes** ranging from immediate to longer-term benefits:

1. **to share** ideas, identify new connections and enhance participants' research agendas;
2. **to identify** related lines of work and seed partnerships for future joint projects;
3. **to map** current theoretical, methodological and empirical IDL research landscape;
4. **to frame** a proposal for a special journal issue and plan activities for developing it within 2-years;
5. **to plan** other joint activities for creating a sustainable IDL network within the CSCL community.

Workshop themes

The workshop will be organized around four broad themes that will be guided by, but not limited to, the following questions:

1. **Concepts and theories**: How do we conceptualize IDL? How do we delineate the scope of IDL and relationships with related aspects? What are our main objects of investigation? What kinds of theoretical approaches do we use for framing IDL research?
2. **Research methods:** What kinds of methodologies and analytical tools do we use for studying IDL? What kinds of analytical issues do we face? How do we assess IDL processes and outcomes? How do we take into account the extended, embodied and enacted nature of interdisciplinary work?
3. **Pedagogies and design:** What are key pedagogical approaches for teaching interdisciplinarity? What are the main design principles for designing IDL environments and courses?
4. **Empirical cases:** What kinds of empirical work is done by the CSCL community developing and investigating IDL? What does it say to us? What kinds of challenges does it reveal?

Workshop structure

The workshop will be structured into five main sections that are aligned with the planned outcomes.

1. **Sharing: Participant presentations** of their work and interests (Pecha Kucha style, 5 slides in 5 min).
2. **Identifying: Group activities** structured around the themes identified on the basis of participants' submissions using an object-focused synthesis technique adapted from socio-environmental IDL workshops (Pennington et al., 2016).
3. **Mapping: Group activities** using an adapted Progressive Brainstorm technique facilitated by the organizers for mapping out known theoretical and methodological approaches for IDL research and design.
4. **Framing: Synthesizing outcomes** in the whole-group interactive session: integrating suggestions from small-group activities, mapping the space, identifying themes for framing the special issue and follow-up work.
5. **Planning future steps**: Discussing plans for next workshop and symposium at ICLS 2020; planning specific steps for developing the special journal issue, discussing best ways for collaborating online.

Audience

The workshop aims to involve participants from HE and authentic interdisciplinary work and learning settings (e.g. citizen science, living labs, interdisciplinary innovation projects, workplace learning, STEAM studios).

The main audiences are researchers, designers and facilitators (incl. teachers) whose work directly addresses the questions of IDL or intersects with IDL as a part of broader research and development agendas (e.g. through developing theoretical ideas and analytical methods that are relevant to the questions in IDL).

Different types of contributions will be welcomed, ranging from initial ideas, to work in progress and to mature or finished projects, and situated within and across diverse disciplinary perspectives (e.g. anthropology, science and technology studies, cognitive science, organizational science, linguistics, design, computer and data science, the learning sciences).

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