Life-long Life-wide Learning Within and Beyond the Disciplines

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Abstract: Does the learning sciences community need to question its epistemic values and reconceptualize its stance on the content and structure of formal schooling? Many researchers in the learning sciences investigate learning environments that center on disciplinary practices. Yet, professional settings often involve the meeting of minds and of expertise that require the ability to shift between perspectives. Is a disciplinary focus a good model for preparing learners for these roles? How well does a disciplinary apprenticeship prepare learners for their everyday lives? This symposium includes theoretical, methodological and design presentations that set the stage for engaging the audience in a conversation over a number of overarching questions that include: What motivates broadening our gaze beyond the disciplines? What methods can help us understand the meaning of a beyond the disciplines perspective? How might subject-matter learning be reconceptualized to adopt a beyond the disciplines approach? What costs are involved in adopting such an approach?

Overall focus

Is the existing disciplinary focus of K-12 and Higher Education still an apt model for formal education? In what ways does this focus prepare learners for a multitude of vocations, for the future of work and for their everyday lives? In this symposium, we aim to understand the role that K-12 and Higher Education might play in enabling learners to pursue both personal and professional goals. Specifically, we examine whether and how disciplinary learning may need to be reconceptualized. We invite the audience to join us in this process. To this end, we include three presentations to set the stage for this discussion, and allocate a large part of the session to a structured and moderated discussion with the audience. One presentation is devoted to a retrospective and prospective framework of research on learning in the disciplines in the learning sciences. A second presentation offers a novel reflexive methodology for studying mixed expertise that can be used to identify knowledge and skills that are involved in team encounters that transcend disciplines, and that can be used to study learning environments that might emulate such encounters. A third presentation proposes design principles for designing disciplinary curricula that cultivate practices that can serve professional as well as everyday goals. Against the backdrop of the possible framework, methodology and design offered in these presentations, we will consider, with the audience, how aspects of disciplinarity, inter-, trans- multi-disciplinarity, multivocality and multiliteracy, which were raised in the presentations, coalesce with changing views on the roles of K-12 and Higher Education.

Motivation and major issues addressed

Characterizing the nature of knowledge and practice in a discipline, and designing learning environments that are sites of apprenticeship into these respective sets of disciplinary practices are hallmarks of research in the learning sciences (Bransford, Brown, & Cocking, 2000; Bransford & Donovan, 2005; Bruer, 1993; Collins & Kapur, 2014; Herrenkohl & Polman, in press; Sawyer, 2014 [Part V]). These foci arose in part as a challenge to formal learning environments in which school subjects seemed to consist of a set of knowledge and procedures that learners should master but that bore loose ties to professional values and practices. Regardless of how well the knowledge and practices of school subjects cohered with professional practice, the set of underlying values and purposes of these practices were rarely shared with learners. The idea was that making these values and purposes explicit, and orchestrating classroom activities around practices that cohered with these values and purposes would enable learners to take an intentional stance to their learning that would have both cognitive and affective learning benefits (Berland & Hammer, 2012; Lampert, 1990). Learning a discipline was seen as learning about the nature and professional practice of the discipline as much as it was about acquiring specific knowledge and skills.

This approach seems most beneficial when there is a clear and continuous trajectory (Wenger, 1998) from formal educational settings to more advanced educational settings or to professional practice (Roberts, 2011). However, few learners follow such trajectories. Learners face a multitude of possible paths. In addition to pursuing different career paths, projections concerning the future of work suggest that pursuing *any* career path will involve collaboration with different multi-professional teams, as well as mobility between different forms and topics of expertise (Gratton, 2010; Malone, 2004). A disciplinary focus may provide opportunities for team work and argumentation that draws on perspectives within the discipline (Osborne, 2010), but does not require communicating underlying assumptions across perspectives, and considering shared information in light of multiple perspectives. Moreover, K-12's and Higher Education's ability to adequately prepare learners not only for the future of work, but for the knowledge and skill demands of everyday life is increasingly questioned (e.g., Feinstein, Allen, & Jenkins, 2013). For example, the public is unlikely to design and execute a scientific experiment in order to understand the factors that underlie a natural phenomenon, but is likely to seek information online in order to decide whether to get vaccinated (Tabak, 2016). It is not clear whether learning science from a disciplinary apprenticeship perspective prepares learners for such everyday practices.

Working, playing, or learning in groups or teams where participants have different types of expertise, but a common goal begins early in school and continues through adulthood, yet K-12 and Higher Education rarely specifically teach the skills that are needed for participants to function well in groups. Particular attitudes and skills are needed in order to benefit from being in a team, but there are also challenges, some of which are specific to context, others which are generalizable (DeHart, 2017; Rosé & Lund, 2013). In addition, the transfer of the different types of knowledge gained from working in one group to another group, or from one type of stakeholder to another is a practical as well as a methodological challenge (Adler, Hirsch Hadorn, Breu, Wiesmann, & Pohl, 2017).

Learners should be able to understand why common disciplinary practices such as argumentation are important and how this practice might be similar and different across disciplines and problem-based contexts. Learners should also be able to appreciate the different values and stances, or what's worth knowing or doing, that disciplines bring to shared problems and then learn to select the most vital approaches or synthesize across perspectives in order to offer productive solutions or explanations to particular problems. In addition, learners should understand that the knowledge they gain rests upon assumptions that are made about what knowledge is, but also about what kinds of evidence are acceptable, and this may depend on the discipline (Stevens, Wineburg, Herrenkohl, & Bell, 2005). And since this is also the case for others with different knowledge and expertise, it follows that working well in groups entails that collaborators make their assumptions clear. In order to understand the knowledge of others, one must understand the assumptions others make about the world.

Here, moving from multi-disciplinary perspectives and practices to inter- and trans-disciplinary ones can sometimes be productive; Stember (1991) describes *multi*disciplinary work as involving people from different disciplines collaborating, with each drawing on their disciplinary knowledge; *inter*disciplinary work as involving knowledge integration and synthesis and methods from different disciplines; and *trans*disciplinary work as creating unified frameworks transcending disciplinary perspectives. This approach suggests that cultivating an anchoring in particular disciplines should be accompanied by opportunities for different forms of encounters across disciplinary boundaries. Yet, other takes on these constructs carry alternative instructional implications. For example, some see inter- and trans-disciplinarity as a new thought style, moving further away from the disciplinary anchors and including elements such as modes of interaction, and a pluralism of actors that challenges traditional power structures (such as symmetrical collaborations between scientists and the public) as defining elements in these constructs (e.g., Darbellay, 2015). Such definitions might carry different instructional implications, and might offer greater continuity between preparing for work and preparing for life.

Increasingly, different strands of research in the learning sciences (Herrenkohl & Polman, in press; Lund & Suthers, in press) recognize that a disciplinary approach intended to apprentice learners into academic research-oriented work in a single discipline does not respond well enough to the full range of current K-12 and undergraduate learning needs. However, it not clear whether abandoning disciplinary foci as a driving curricular structure is the solution. There are also many open questions concerning the nature of disciplines and of inter-, trans- multi-disciplinarity (Lund & Frandji, 2017). We need to engage with these questions in order to reconceptualize how disciplinary learning is contextualized within a broader scope.

In this symposium, we seek to discuss how we may think about learning within and beyond the disciplines, as well as define and support pedagogical tasks that create conditions that correspond to these emerging pedagogical visions. We consider:

- What motivates broadening our gaze beyond the disciplines?
- What methods can help us understand the meaning of a beyond the disciplines perspective?
    - How is this anchored in differing views on multi- inter-trans-disciplinarity (MITD)?
    - How can novel ways of studying teams help us converge on pedagogically productive views of MITD?
- How might subject-matter learning be reconceptualized to adopt a beyond the disciplines approach?
    - How can we create conditions for learners to gain competence in working together in groups where participants have different expertise?
    - How can we create conditions for learners to be able to connect the underlying values, stances, and professional practices of particular disciplines to purpose-driven action in the world?
- What costs are involved in pursuing these reconceptualizations?

Symposium session structure

The session is designed to devote equal time to presentation and to discussion with the audience:

- 10-minutes introduction and overview of the session. (Session moderator; Adi Kidron).
    - In addition to presenting the key issues and motivation for the session, each presenter will contribute questions that arise from their presentation and that concern broader implications or controversies. These questions will be presented in the introduction, prior to the presentations, in order to set the stage for the subsequent discussion.
- 45-minutes individual presentations (12-minute presentation; 3-minute clarifying questions).
- The remaining 35 or so minutes will be devoted to a discussion with the audience.
    - The session chair will present the set of discussion-prompting questions, and the discussion will follow these questions as well as questions and issues raised by the audience. With the audience's permission we will record the discussion, in order to maximize the future knowledge construction potential of the session. We will also make use of social media tools in order to incorporate the audiences' thoughts and considerations, as they arise and are shared digitally throughout the session, into the discussion.

To the disciplines and beyond: Shifting epistemic stances and values in learning sciences research

Leslie Rupert Herrenkohl, University of Washington, and Joseph L. Polman, University of Colorado Boulder

This presentation briefly explores the history and fruitfulness of learning sciences research on learning in the disciplines. It also explores how recent and emerging work in both formal and informal settings indicates the importance and promise of moving beyond strictly disciplinary boundaries. The field has and continues to shift toward a more human science view (Flyvbjerg, 2001; Penuel & O'Connor, 2010) where the values, purposes, and goals of learning as well as who has the power to decide such matters are critically important to examining and understanding learning. Borrowing the concept of phronesis, or wise action, from Aristotelian philosophical thought (Nussbaum,1997; Toulmin, 1992; Flyvbjerg, 2001) and the practice of improvisation from Holland (Holland, Lachicotte, Skinner, & Cain, 1998), we argue that learning scientists are increasingly emphasizing the role of everyday individuals-operating-with-mediational-means (Wertsch, 1998) as a way to understand personal learning and development as well as cultural change. This stands in contrast to earlier research in the learning sciences that emphasized understanding the development of expertise and then applying this knowledge to create opportunities for non-experts to learn and ultimately approximate expert performances (Bransford et al., 2000; Dreyfus & Dreyfus, 1986; Perkins & Salomon, 1989). We offer examples from our own research in journalism (Polman & Hope, 2014; Polman, Newman, Saul, & Farrar, 2014) and science learning (Herrenkohl & Mertl, 2010) as well as emerging research from scholars in the field (Peppler, 2010, 2013; Shapiro, Kelly,

Ahrens, & Fiebrink, 2016; Taylor, 2017) to surface epistemic values and stances at the heart of contemporary research in the learning sciences.

Proposed discussion questions: (1) How do equity-oriented and emancipatory values play into decisions about designing learning environments "beyond the disciplines"? In other words, what are the potential advantages and disadvantages to learners of taking a view that emphasizes agency and action over predefined disciplinary learning goals? (2) How can we as researchers and designers understand enough about emerging practices and communities to harness their potential in a rapidly changing world?

Integrating aspects of disciplines through multivocal analyses of group interactions

Kristine Lund, University of Lyon, Ecole Normale Supérieure de Lyon, and Dan Suthers, University of Hawai'i at Manoa

In this presentation, we describe a collaborative approach to analysis of interaction in which analysts from multiple traditions dialogue to achieve not only a richer understanding of the data, but also to understand how their methods construct the object of study and provide alternate ways of producing evidence for arguments about analytic claims (Suthers, Lund, Rosé, Teplovs, & Law, 2013). We begin with a brief review of a selection of analytic traditions that offer alternative perspectives on understanding interaction, and that researchers have used to focus on the study of learning in groups. Illustrating the diversity of traditions allows us to make the case for countering tendencies towards fragmentation and for working toward some level of coherence across traditions that study group interactions. In doing so, we define what constitutes a discipline, as well as multi- inter- and transdisciplinarity (Lund & Frandji, 2017; Darbellay, 2015; Klein, 1990), addressing the debate that exists around these constructs. We then present the origins and tenets of multivocal analysis, and summarize ten practical strategies for achieving productive multivocality. Discussion will center on how our own insights (Suthers, Lund, Rosé, Teplovs, & Law, 2013; Rose & Lund, 2013) as well as research from the Science of Team Science (e.g., Fiore, 2008) can be leveraged to reconceptualize K-12 and undergraduate teaching and learning.

Proposed discussion questions (1) As a researcher, what are the benefits in venturing outside of disciplinary boundaries? What are the drawbacks to doing so? How is our understanding of the nature of knowledge influenced if we take a multi- inter, or transdisciplinary stance? (2) How do we go about teaching the skill of making connections between broad areas of inquiry — at different age levels — and why is this viewed as having more or less value than digging deeply into a single area?

Multiliteracies within and beyond the disciplines

Josh Radinsky, University of Illinois – Chicago, and Iris Tabak, Ben-Gurion University of the Negev

In this presentation, we broach the tension of learning within or beyond the disciplines from a design perspective. We consider how higher education instructors, charged with teaching a particular discipline, might redesign their courses to provide functional as well as disciplinary literacy in undergraduate education. In using the term *functional literacy* we refer to the knowledge, skills and dispositions that people might use in their everyday lives (e.g., Burgess & Hamilton, 2011; Nutbeam, 2008; Ryder, 2001). In using the term *disciplinary literacy* we refer to the knowledge, skills and dispositions that approximate those that are used by professionals in the discipline (Bransford & Donovan, 2005; Goldman et al., 2016; Herrenkohl & Polman, in press; Moje, 2007). We focus in particular on the interpretation and sensemaking of multimodal texts (e.g., prose, images, graphs, and dynamic displays). There seems to be a false assumption that contemporary multimodal networked resources can be straightforwardly interpreted by individuals with at least rudimentary competence in reading texts and graphs (for a similar argument see: Wineburg & McGrew, 2016). However, we contend that the public encounters numerous complex data representations in a variety of everyday information contexts, such as entertainment, real-estate, weather, health and general news reports that have literacy demands that are not readily addressed through most existing K-12 and undergraduate curricula. Thus, existing curricula may privilege disciplinary literacy at the expense of adequate preparation for civic participation. Yet, we suggest that there is often an overlap between disciplinary and functional literacy, and that disciplinary learning can be redesigned to cultivate both disciplinary and functional literacy. We propose a set of design principles for such curricular redesign. We first present a critique of the presumed facility of contemporary networked resources. We then present our proposed principles, as well as an example illustrating how they can be used to design

activities within a social science discipline. We conclude with a discussion of the promises and pitfalls of this approach.

Proposed discussion questions: (1) Delving deeply into a discipline and understanding its values and standards of evidence can provide broader insights into the nature of knowledge. Is this an important learning goal and do we run the risk of not meeting this goal if we shift our focus away from disciplinary apprenticeship? (2) Teaching as disciplinary apprenticeship is not a simple feat, and even after much research in this area we have many open questions. What type of supports will instructors need in order to not only consider disciplinary practices, but also the points of contact between disciplinary practices and purpose-driven action in the world?

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