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Studying Interdisciplinary Collaboration as a Core Skill

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Abstract: At its core, collaboration is about bringing diverse perspectives together to create something new. Diversity may arise along a multiplicity of dimensions, leading to some very similar challenges, and other dimension-specific challenges, each of which require discrete skills to address. Interdisciplinary collaboration, while understudied, has particular workplace relevance. This research seeks to understand what is specific to interdisciplinary collaboration as part of a broader agenda to operationalize key underlying skills that enable interdisciplinary collaboration and subsequently assess and support interdisciplinary collaboration, both in the classroom and in the workplace. The aim of this poster presentation is to engage the community in an intellectual exchange about underlying questions to inform work in progress.

Introduction and scope setting

Just as research in the field of computer-supported collaborative learning (CSCL) calls out interaction processes that result in integration of diverse perspectives, *interdisciplinarity* is a key facet of research in the field of CSCL (Hmelo-Silver & Jeong, 2021), including novel methodologies it has produced to carry out this mission (Suthers, Lund, Rosé & Teplovs, 2013). Nevertheless, while a key argument in favor of adoption of CSCL practices in the classroom is the opportunity to foster skills needed in the typically diverse and multidisciplinary workplace and in the broader societal contexts of adult life, much remains to be accomplished in this transfer.

Informed by past work in CSCL on this topic (Peppler & Wohlwend, 2017), we conceptualize interdisciplinarity in the following ways: (1) Composition of a team (i.e., members with different disciplinary expertise); (2) Property of work (i.e., requiring expertise from multiple disciplines in order for the work to proceed successfully); (3) Property of a work product (i.e., evidence within an artifact that multiple bodies of work were leveraged in producing it); (4) Property of a thinking process (i.e., interaction practices that foster drawing from multiple bodies of knowledge in the mental construction of an idea or plan); (5) Property of a curriculum (i.e., course curriculum includes experiences that target impartation of knowledge from different disciplinary bodies of knowledge; and (6) Property of an individual (i.e., through measurements of group effectiveness during course activities, study participants demonstrate skills that enable them to participate in interdisciplinary teams, engaging in interdisciplinary work to produce products exhibiting interdisciplinarity by engaging in interdisciplinary thinking along with diverse others). The focus of our work is on the sixth aspect, namely *interdisciplinarity* as a core collaborative skill possessed by an individual that enables overcoming challenges and contributing towards effective collaboration in multi-disciplinary teams. While interdisciplinary collaboration is a long-time interest of the field of CSCL, there is a dearth of work targeting this critical aspect.

Unpacking interdisciplinary collaboration as a core skill

Unlike general collaboration between contributors from different perspectives, the joint work of interdisciplinary collaboration is more intensely jigsaw-shaped, where contributors not only have independent roles based on expertise but are also working within different resource constraints, reward structures, and expectations with respect to work practices, all of which result in the potential for different types and intensities of conflict within groups that must be anticipated, planned for, detected, and then mitigated. To aid in the teaching of this approach, interdisciplinary curricula may serve as one type of pathway towards development of these skills.

Our specific focus is on interdisciplinarity as a skill possessed by an individual, which can be assessed and further developed through collaborative experiences with diverse others. The bulk of relevant past work began in the field of Engineering, which has named this form of interdisciplinarity as a core competency for future engineers (National Academy of Engineering, 2004). The field of Engineering defines interdisciplinarity as the ability to understand designs as situated in complex social, historical, political, and cultural contexts, and to be able to access, understand, evaluate, synthesize, and apply information and knowledge from diverse fields in their designs (Lattuca, Knight, & Bergom, 2012). At the heart of the work is the operationalization and measurement

of interdisciplinarity as a core skill, which comprises a self-report questionnaire developed to ask individuals to assess their own values, beliefs, dispositions, and abilities (Lattuca, Knight, & Bergom, 2012). Lattuca & colleagues report some attempt to measure the reliability and validity of this instrument. Their instrument has been taken up and applied by others in a nationwide investigation of engineering programs. The predictions from the instrument are consistent with what one would expect from a valid measure of interdisciplinarity, namely that exposure to a diversity of experiences, especially outside of engineering as a field, contributes to its development over time as does a stated culture of openness and support of interdisciplinary values (Jamieson & Lohmann, 2012). The question of whether the individuals rated highly by this construct are able to go on to participate more effectively in interdisciplinary teams because of the qualities measured by this instrument remains open.

We build on this past work, delving into the psychological foundations of this conceptualization of interdisciplinarity as a core skill, connecting it with the broader conceptualization of skills enabling Socially Shared Regulation of Learning (SSRL) (Hadwin, Järvelä, & Miller, 2017). In particular, in addition to domain expertise to contribute to a collaboration and an interest in and appreciation for the expertise of diverse others, interdisciplinarity requires noticing where diverse values, interests, and knowledge may lead to conflict and then planning and executing steps to manage and navigate those encounters. In that light, we explore the limitations of this past operationalization and measurement instrument. To that end, we will report our work towards an observational measure developed to bolster the existing self-report measurement with more directly observable quantities. We report on an analysis of data from two college level courses bringing together matrix mathematics, mechatronics, computer science, and textiles. The analysis includes data from collaborative groups who share expertise as they negotiate trade-offs within collaborative design tasks. These data illustrate collaborative learning processes and challenges in the context of interdisciplinary collaboration. Our data includes video, audio, and chat from collaborating groups in which individuals have taken the Lattuca assessment as pre and post assessments. Thus, we align predictions from that assessment with the reality of collaborative work and find the Lattuca instrument lacking.

In addition to highlighting analysis of the data collected so far, at our poster presentation we will report work in progress towards a new theoretical framework that paves the way to needed research on interdisciplinarity as a core skill situated within learning sciences theories and methods, including an experimental study designed similarly to past studies of SSRL. In particular, we unpack this conceptualization through the lens of research on its assessment, and consider how research on collaborative support, processes, and outcomes relate to these operationalizations but leave challenges and opportunities for the field going forward. We consider how CSCL in the classroom might aim to prepare students for more challenging collaborations in the workplace and beyond.

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