

Theorizing and Analyzing Productive Disciplinary Engagement as a Collaborative Phenomenon

Toni Kempler Rogat (co-organizer), Purdue University, (trogat@purdue.edu)
Britte Haugan Cheng (co-organizer), Menlo Educational Research, (bcheng@menloedu.org)

Abstract: This pre-conference workshop aims to introduce and subsequently apply a multi-dimensional theoretical framework and rubric for evaluating group-level engagement quality observed during collaborative activity. We draw on Engle and Conant's (2002) *productive disciplinary engagement* (PDE), defined as making collective intellectual progress related to core ideas and disciplinary practices during authentic tasks, but extend it to account for engagement in collaborative groups. Evaluating the quality with which students jointly engage is interrelated with their learning of core disciplinary content and practices in STEM. Furthermore, examining group engagement during STEM disciplinary activity is essential for assessing whether students are meeting goals set by national standards documents and instructional design. Participants will be actively involved in applying the rubric to observational data. Through workshop activities, participants will further their understanding and contribute to the developing conversation about the study of disciplinary engagement that moves CSCL research forward, and ultimately informs curriculum design principles.

Collaborative group productive disciplinary engagement

Productive disciplinary engagement (PDE) was articulated by Engle and Conant in 2002 as students' making collective intellectual progress related to core ideas and disciplinary practices during authentic tasks. PDE exemplifies developments in the learning sciences, including a situative view of engagement, as (1) negotiated and constructed in particular activity systems and (2) comprised of instructional opportunities that support and constrain engagement (Greeno, 2006). This view of engagement significantly extends research which has been grounded in an individual difference paradigm and has been conceptualized as general sense making (e.g., Zimmerman, 1990). Thus, these developments advance engagement as embedded within domain-specific and disciplinary contexts, and central to and inseparable from learning (Gresalfi, et al., 2009). Here, the quality of collective persistence in the face of challenge, positive affect and interest in the ideas and doing of activity, and interpersonal interactions while making meaningful connections are central to what students come to understand; highlighting the various interdependencies of learning processes, a central aim of CSCL research. In Engle and Conant's seminal paper, PDE was an emergent phenomenon that the particular learning environment was able to support.

The organizers and their project team extend this past research to theorize *collaborative group* productive disciplinary engagement, addressing the CSCL 2019 conference theme. Collaborative groups exhibit deep-level engagement to the extent that their joint efforts yield conceptual progress in the context of meaningful disciplinary activities. Importantly, new conceptualizations consider engagement as conjoined with group processes, adding a social dimension (Hickey, 2015; Sinha, Rogat, Adams-Wiggins, & Hmelo-Silver, 2015).

Resulting from a theoretical review, as well as analysis of group work in varying project datasets representing mathematics, science and engineering classroom activity, the workshop organizers have developed a theoretical framing of PDE that consists of 5 engagement facets that extends prior work on individual engagement (Fredricks, Blumenfeld & Paris, 2004) and PDE (Engle & Conant, 2002; Sinha, et al., 2015), again, reflecting the CSCL 2019 conference theme of interdependent learning processes. The 5 engagement facets are: behavioral engagement, social engagement, emotional engagement, metacognitive engagement, and disciplinary engagement. These results have been operationalized in a rubric to measure PDE using quality indicators on a 3-point scale.

Five PDE Facets

Behavioral engagement is the degree to which groups are characterized by on-task engagement and persistence as evidence by both verbal and non-verbal behaviors (e.g., gaze, gesture). *Social engagement* is the degree to which interactions are responsive, coordinated, and equitable, where members are viewed as competent contributors to the group's activity. *Emotional engagement* is the extent to which the group climate is respectful, inclusive, cohesive, and expressed positive or negative affect stimulates further productive engagement. *Metacognitive engagement* is shared task regulation focused on disciplinary content and/or practices, which is

supported by regulation of behavior and task progress. Finally, *disciplinary engagement* refers to contributions aimed at making intellectual progress toward a larger consequential task that integrates students' conceptual and disciplinary competences.

Workshop description, aims, and expected outcomes

The goal of this full-day workshop is to introduce a multi-dimensional framework and operationalization for evaluating group PDE during science, mathematics, and engineering classroom activity. Initial background will provide an introduction to our guiding theoretical framework for conceptualizing collaborative group PDE. Next, the organizers will provide rubric training using illustrations of coding categories and by differentiating rating distinctions. Following this introduction, workshop participants will actively participate in applying the rubric to either their own video or other forms of data (e.g., transcripts, asynchronous discussion), or data shared by other workshop participants and/or co-organizers. Through workshop activities and discussion, participants will further their understanding of disciplinary engagement, and contribute to the developing conversation about the study of disciplinary engagement that moves CSCL research forward, and ultimately informs design principles.

The intended audience for this workshop is CSCL researchers who analyze video or other interactional data involving dyads or collaborative groups, or other relevant social interactions. Our aim is to observe and subsequently apply the quality ratings of a multi-dimensional conceptualization of group PDE. Accordingly, we encourage participation from those who have previous experience in observing or coding group activity, to enable participants to delve into coding issues specifically related to group PDE. Background knowledge related to student engagement and/or science, math, and engineering classroom disciplinary activity would be beneficial, especially that focuses on disciplinary practices as integral to developing understanding. We are very much interested in drawing from a diversity of perspectives within the CSCL community, including participants with varying interests related to domain and discipline, grade-level, integrated technologies, form of social interaction data, and available scaffolds and structures for group activity. Graduate students are welcome to participate.

Intended audience and participant requirements and facilities

Interest in theorizing and analysis of observational, and other interactional data, of collaborative group engagement is recommended. If participants are interested in making accessible their own project video or interactional data for use by other participants, a willingness to engage in pre-workshop preparation activities with workshop organizers is required.

Interested participants will submit a brief statement indicating their goals for participation and interest in the purposes of our CSCL workshop. Should more than the maximum number of participants apply, participants will be selected to gather a mix of voices in the session, from more senior perspectives to junior voices with fresh perspectives, as well as according to diversity of interests. As part of the solicitation, we will also request that applicants indicate whether they plan to use their own project data of small group activity, and whether they are willing for other workshop participants to share these data. A brief description of this project data will be requested. If applicants indicate yes, we will plan to follow-up to ensure that the data matches with the CSCL workshop goals and that all necessary privacy measures will have been undertaken before data are shared.

Participants will be solicited via ISLS, SoLAR, and AERA SIG ATL/LS listservs as well as via social media. A draft of the call for participation is below.

Relationship to similar events conducted in the past and experience examples

This workshop builds on prior projects and community synthesis efforts supported by ISLS in the past including: 1) What Is "Engagement" in Math and Science Learning? An Evidence-Centered Design Workshop to Develop Working Definitions and Measurement Approaches. ICLS 2012 workshop conducted by Nicole Shechtman and Britte Cheng (SRI International at the time), and K. Ann Renninger (Swarthmore College); and 2) Establishing a Foundation for Collaborative Process Evaluation and Adaptive Support in CSCL. CSCL Workshop conducted in 2017 by Cynthia D'Angelo, SRI International; Cindy Hmelo-Silver, Indiana University; Marcela Borge, Pennsylvania State University; Alyssa Wise, New York University; Bodong Chen, University of Minnesota). In addition workshop organizers have experience conducting learning science workshops. Cindy Hmelo-Silver has been chair of ICLS and CSCL workshops, the doctoral consortium, and early career workshops. Britte Haugan Cheng has run a series of workshops on temporal data analysis at ICLS 2010, LAK 2015, LAK 2016, Learning Analytics Summer Institute (LASI) 2016, and LASI 2017.

Pre-Conference Draft Call for Participation

Come spend the day doing interactive analysis of CSCL collaboration data! The goal of this full-day CSCL workshop is to become familiar with and then apply a rubric for evaluating the quality of group-level engagement observed during collaborative activity. We conceptualize engagement drawing on Engle and Conant's (2002) *productive disciplinary engagement* (PDE), as making collective intellectual progress related to core ideas and disciplinary practices during authentic tasks, but extended to account for engagement in collaborative groups. Evaluating the quality with which students jointly engage is interrelated with their learning of core disciplinary content and practices in STEM. Furthermore, examining group engagement during science, mathematics, and engineering classroom activity, among other disciplines, is essential for assessing whether students are meeting goals of national standards documents, curriculum, or other interventions involving group work.

Following theoretical introduction and rubric training, participants will be actively involved in applying the rubric to data (e.g., video data, transcripts, asynchronous discussion). Participants can choose to code their own data or data shared by other workshop participants and/or co-organizers. The data to be made available from the co-organizers involves middle schoolers collaborating during STEM curricular units. Through workshop activities and discussion, participants will further their understanding of disciplinary engagement, and contribute to the developing conversation about the study of disciplinary engagement that moves CSCL research forward, and ultimately informs curriculum design principles.

If you are interested, please complete the workshop application (<https://menloedu.org/cscl-pde-workshop/>), including a brief statement to indicate your goals and interests in the purposes of this CSCL workshop. In addition, you will be asked to indicate whether you have and are interested in sharing data with other workshop participants for use during the session and briefly describe these data. The organizers will plan to follow-up with you regarding these data and the potential alignment with the CSCL workshop goals and activities.

Proposed Schedule

9:00 - 9:15 Introductions and goals
9:15 - 10:30 Introduce PDE framework and Rubric
10:30 – 11:00 Break
11:00 – 11:30 Introduce datasets and bids to form small groups
11:30 -12:15 Behavioral engagement and emotional engagement coding
12:15 -12:30 Feedback
12:30 – 2:00 Lunch
2:00 – 3:00 Social and Metacognitive Engagement Coding
3:00 - 3:30 Feedback, discussion
3:30 – 4:00 Break
4:00 – 4:45 Disciplinary Engagement Coding
4:45 - 5:30 Discussion and Reflections

Minimal and maximal number of participants expected

To facilitate rich discussion both in small and the large group during this proposed workshop, we plan to cap participation at 20. To run the workshop, a minimum number of eight participants would be required.

Facilities and equipment required

We require a typical setup with internet and projectors. It would be helpful to have moveable tables and multiple points of access to power for participants' laptops.

References

Engle, R. A., & Conant, F. R. (2002). Guiding principles for fostering productive disciplinary engagement: Explaining an emergent argument in a community of learners classroom. *Cognition and Instruction*, 20, 399-484.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of educational research*, 74(1), 59-109.

Greeno, J. G. (2006). Learning in activity. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 79–96). Cambridge: Cambridge University Press.

Gresalfi, M., Martin, T., Hand, V. & Greeno, J. (2009). Constructing competence: an analysis of student participation in the activity systems of mathematics classrooms. *Educational Studies in Mathematics*, 70, 49-70.

Hickey, D.T. (2015). *The value of focusing on productive forms of disciplinary engagement*. Paper presented at the biennial conference of the European Association for Learning and Instruction (Earli) Conference, Limassol, Cyprus.

Sinha, S., Rogat, T. K., Adams-Wiggins, K. R., & Hmelo-Silver, C. E. (2015). Collaborative group engagement in a computer-supported inquiry learning environment. *International Journal of Computer-Supported Collaborative Learning*, 10(3), 273-307.

Zimmerman, B. J. (1990). Self-regulating and academic achievement: An overview. *Educational Psychologist*, 25, 3-17.