

Targeted Sessions Schedule

Thursday 3:30 – 5:00 PM

| Title | Understanding STEM Disciplinary Culture: A Tool for Change | Research speed dating | Institutionalizing Course-Based Undergraduate Research at the Introductory Level | What does an interdisciplinary DBER community look like? Structural issues |
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| Organizers | Dan Reinholz and Renee Cole | Warren Christensen | Alexis Knaub (Western Michigan U), Elizabeth Sandquist (Iowa St U) | Scott Frankin |
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| Abstract | <p>Institutional change in STEM departments is of increasing emphasis for DBER scholars. However, at present, most efforts are focused at STEM fields broadly without explicitly addressing disciplinary differences. Given our collection of cross-disciplinary scholars here at TRUSE, this gives us a unique opportunity to move beyond generalities and look at specifics of disciplinary and institutional culture and how it may impact the change process and strategies that are likely to result in effective propagation of evidence-based teaching practices. In this session, we will discuss similarities and differences across STEM disciplines and institutions and how this can inform efforts to enact systemic change. This is a step forward in getting more specific about the culture of STEM departments, and for interested participants we may pursue this further after the session.</p> | <p>This session will facilitate and promote future research collaborations via a research speed dating format.</p> | <p>Course-based undergraduate research experiences (CUREs) are one way to engage students in authentic research at the introductory level. While course-based research allows for a greater number of students to participate in research than one-on-one exposures, it requires change at the institutional level in order to provide the support needed for long-term implementation. Aspects to consider are curricular integration, TA support, faculty course load, and positive student outcomes. At this session, the Freshmen Research Initiative at Iowa State University will be a starting point for discussion of effective strategies for sustainability of CUREs. Participants will have the opportunity to share their experiences with implementation and receive feedback. They will also learn how to effectively promote change according to the following strategies: prescribed versus emergent outcomes, changes in individuals, and changes in institutions and structures. The product of this session will be a summary of strategies using this change framework that have been used to integrate course-based research at the introductory level.</p> | <p>The purpose of this targeted session is to develop a collection of specific research questions of interest to participants and to foster connections among researchers in pursuing those questions. To put some initial structure on this challenge we can envision the DBER community engaging in five basic research activities: Develop understanding of other contexts (DBER field 2 requires understanding of DBER field 3 to improve work in DBER field 2; Transfer of research ideas/methods (DBER field 1 learns ideas and approaches from DBER field 2 to improve work within DBER field 1); Collaborative research (DBER fields 3 and 4 collaborate on cross disciplinary research that improves work in both DBER fields); Cross-cutting research (DBER fields 4, 5, and 6 collaborate on research that spans and improves all DBER fields); and Research community development (Multiple DBER fields interact to set norms (implicit or explicit) for DBER research.</p> |

Friday 1:30 – 3:00 PM

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| Title | Professional Development for Diversity and Inclusion | Scripting approaches across STEM Disciplines (Session 1) | Good Disciplinary Problems | Are you reading what I'm reading? Promoting cross-disciplinary researcher communication |
| Organizers | David Kung | Dov Zazkis (ASU), Rina Zazkis (Simon Fraser U.) | Daniel Reinholz and Chris Rasmussen | Luanna Prevost |
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| Abstract | <p>Women and minorities continue to be under-represented in all STEM fields (with the exception of women in Biology). Most professional development programs now include discussions of how issues of race and gender impact interactions in classrooms, labs, departments, and institutions. What do we know about the effectiveness of such sessions? How does the awareness of social science research (including stereotype threat and implicit biases) frequently included in such sessions impact participants' behavior? What research do we need to improve the effectiveness of professional development regarding issues of diversity and inclusion?</p> | <p>Script writing (or scripting) is a valuable pedagogical strategy and an innovative research tool. We adopted and developed this strategy in the context of mathematics teacher education and undergraduate mathematics education. Our goal is to extend this to other STEM disciplines. In the scripting approach we present students with a prompt that describes a problematic situation, a disagreement, a student error, or inappropriate reasoning. The script-writing task is to devise a dialogue between the characters that leads to a resolution. The scripts serve as research data and as springboards for consequent class discussions. We refer to scripting as a form of role-playing in one's imagination. We will share with participants the evolution of scripting in pedagogy and research and seek their active engagement with the approach.</p> | <p>Problem solving is at the heart of the STEM disciplines. Yet, what constitutes a "good" problem may differ considerably between disciplines. A mathematician may emphasize proofs that build up mathematical theory, a physicist problems for building up theoretical models of the world, and an engineer design challenges that help students make important tradeoffs for bringing a useful product to fruition. In this interactive session we will compare and contrast good problems across these disciplines. The organizers will bring some problems to get us started, but all participants are encouraged to bring "good" problems from their disciplines to further the conversation.</p> | <p>With the plethora of journals with each STEM education research discipline, we may not always be up to date on techniques, major findings, and innovations occurring in other disciplines. In this session, we will discuss ideas for sharing, summarizing and synthesizing research findings across the STEM education research disciplines. Discussion will center around formats (e.g. online digests), potential contributors, working with STEM Ed research journals, and other ideas for developing an online resource.</p> |

Saturday 3:30 – 5:00 PM

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| Title | Social network analysis in DBER and RUME: A new(ish) approach | Scripting approaches across STEM Disciplines (Session 2) | Partial Derivatives across STEM | Moving Beyond a Single Identity |
| Organizers | Naneh Apkarian (SDSU), Melody McConnell (NDSU) | Dov Zazkis (ASU), Rina Zazkis (Simon Fraser U.) | Corinne Manogue & Tevian Dray | Matt Voigt |
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| Abstract | <p>Social network analysis (SNA) is a theoretical and methodological approach to studying interaction patterns. It has been used extensively in a variety of fields, and recently both RUME and DBER scholars have begun to explore its utility in the context of STEM instructors in higher education. This session will start with a brief overview of SNA and some of its uses in DBER/RUME, including ongoing projects that represent interdisciplinary collaboration and the study of institutional culture and change. We will discuss coordinating SNA with other theoretical perspectives and research methodologies to build rich data sets, how SNA can be used to promote change, the different utility of student vs. instructor networks, and opportunities for collaboration. At this stage, SNA has not been widely used in DBER or RUME, so there is the rare opportunity for interdisciplinary development of an approach for cross-discipline coordination.</p> | <p>Script writing (or scripting) is a valuable pedagogical strategy and an innovative research tool. We adopted and developed this strategy in the context of mathematics teacher education and undergraduate mathematics education. Our goal is to extend this to other STEM disciplines. In the scripting approach we present students with a prompt that describes a problematic situation, a disagreement, a student error, or inappropriate reasoning. The script-writing task is to devise a dialogue between the characters that leads to a resolution. The scripts serve as research data and as springboards for consequent class discussions. We refer to scripting as a form of role-playing in one's imagination. We will share with participants the evolution of scripting in pedagogy and research and seek their active engagement with the approach.</p> | <p>Partial derivatives are used in different ways by experts in different disciplines, and even in different subfields of the same discipline. We are developing learning trajectories documenting how students learn to use partial derivatives; the goal of this session is to document and discuss expert usage across multiple STEM disciplines. During the first part of this session, we will present our findings to date about the different ways in which partial derivatives and differentials are taught and used in both lower- and upper-division courses in mathematics and physics. The bulk of the session will then consist of group discussions around identifying typical undergraduate problems from a variety of disciplines together with an attempt to categorize the different uses of partial derivatives and differentials in multiple disciplines, drawing on the expertise of the participants. Possible categories include the geometric derivatives used in electromagnetism, the nongeometric derivatives used in thermodynamics, and the many variations of the chain rule in these and other contexts. The session will conclude with a wrap-up that would also be suitable for sharing with all conference participants. This work represents ongoing research at Oregon State University as part of the Paradigms in Physics project; further documentation is available on the project</p> | <p>Understanding issues of equity and diversity is critical to recruiting and retaining high-quality STEM candidates and a necessary component to transform learning environments to benefit historically marginalized students. What do we know about issues of equity within our STEM discipline? What unique challenges or efforts are underway in our local context and within our respective fields? Finally, how can we leverage our collective knowledge to support and understand the experiences of multiply marginalized communities (e.g. Latinas, Queer Black Men) to promote an intersectional identity framework in STEM? Anyone interested in equity is invited to attend this targeted session, regardless of expertise or subject knowledge.</p> |

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