Students' Experiences and Identity Formation in the UIC STEM Initiative CoLab Program

Adrian Wierzchowski, awierz2@uic.edu
Department of Chemistry, University of Illinois Chicago, U.S.A.
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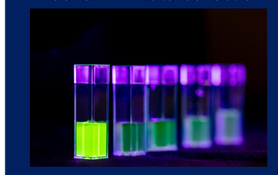
Introduction

- Course based undergraduate research experiences (CUREs) provide students with authentic research experiences in a classroom format.[1-3]
- Early and positive research experiences are key to STEM retention.[2-4]
- The UIC STEM Initiative CoLab Program applies the principles of CUREs in a workshop format for incoming freshmen and transfer students.[5]

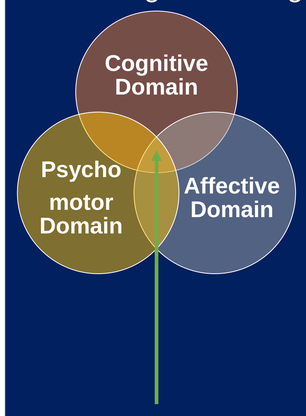
CoLab Format:
Week 1: Introduction to CoLab topic
Weeks 2-4: Data collection

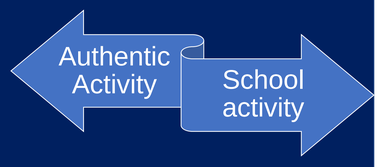


Week 5: Data analysis
Week 6: Poster presentation

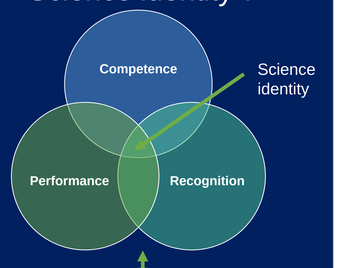
Discovery | Relevance | Iteration | Collaboration | Use of scientific practices

- Research questions:
- **How do students in the UIC STEM Initiative CoLab Program experience the Program?**
- **How do students in the UIC STEM Initiative CoLab Program describe their science identity and sense of belonging?**
- Theoretical frameworks:
- Meaningful learning[6]: Situated cognition[7]:





Science identity[8]:



Data Collection and Analysis Methods

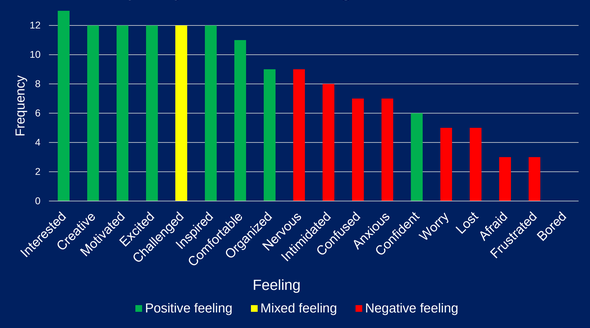
- 13 students consented to participate in the study.
- Students filled out the VNOS-C survey[9] and participated in semi-structured interviews with use of affective word matrix from *Galloway et al.* 2016.[6]
- Main interview topics: Steps involved in research process, views of nature of science, feelings towards CoLab/towards science, sense of belonging and science identity, poster session at end of CoLab.
- Interviews were transcribed via Zoom.
- Methodological Framework: Phenomenography
  - Seeks to describe the ways people experience a phenomenon (second-order perspective).[10]
  - Student responses are treated as truthful with little interpretation from researcher.[10]
  - Goal is creation of an outcome space (hierarchical or developmental).[10-12]

VNOS-C Survey → Semi-structured interviews → Inductive and Deductive Coding → Theme Elaboration/ Generation → Elaboration and creation of outcome space categories → Elaboration and creation of outcome spaces (tabular and graphical)

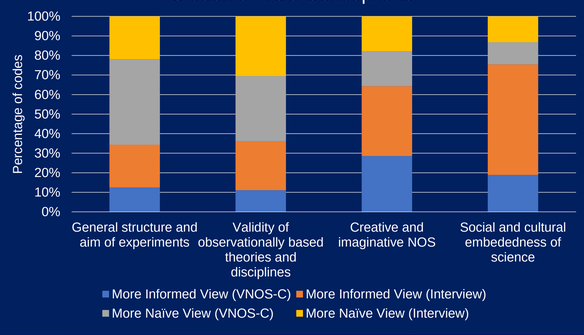
Results

Cross-cutting themes: 1. How students viewed their understanding of the research process 2. How students viewed their understanding of how science is done 3. How students viewed the poster creation and presentation process 4. How students viewed their integration into the science community. 5. How students viewed their scientific skill progression

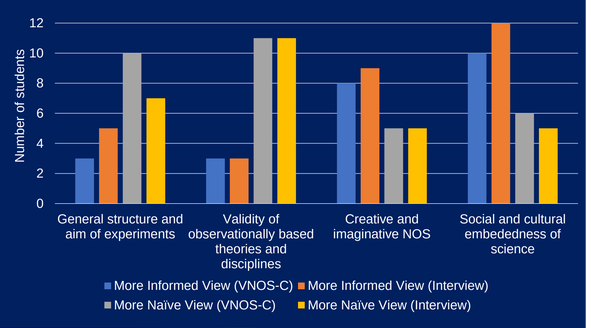
Frequency of students' feelings towards CoLab



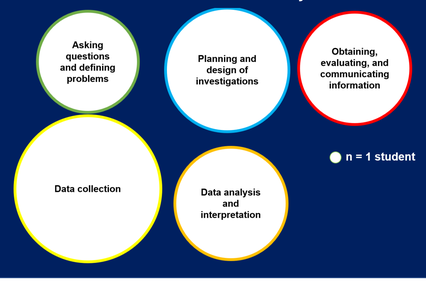
Students' NOS Conceptions



Students' NOS Conceptions



Steps in Research Process As Described By CoLab Students:



Meaningful Learning was Impeded Due to CoLab | Meaningful Learning was Neither Impeded Nor Enhanced Due to CoLab | Meaningful Learning was Enhanced Due to CoLab

How students viewed the poster creation and presentation process:

Onyx: "I feel that my understanding of the topic definitely deepened a lot…It's going to be how to explain this to someone else, and it's [sic] kind of reminds me of the saying like you learn best when you teach someone else."

Science Identity was Not Developed | Science Identity was Developing | Science Identity was Well Developed

How students viewed their integration into the science community:

Laine: "Um, I've had doubts, I'll say, but I think um throughout like not only like college right now, but I think throughout the years, I've gained more of like a foundation in science, and I've become more confident with it. So, I think….I generally do feel that I do belong in the science field.

Tabular Outcome Spaces QR Code:

Conclusions and Future Directions

- Students detailed several steps in the research process as outlined by the Next Generation Science Standards Practices for K-12 Classrooms with the biggest emphasis on data collection and planning and design of investigations.
- Student held mixed views on nature of science: more informed views about creative and imaginative NOS as well as social and cultural embeddedness of science, more naïve views regarding general structure and aim of experiments and validity of observationally based theories and disciplines.
- Students had majority positive feelings towards the CoLab with very positive feelings towards the poster session at the end of CoLab.
- Most students reported feeling they did not belong in science yet or being at a middle ground due to lacking competence and performance even if they were recognized as science people.
- One year follow-up with students in the fall of 2023.
- Pre/post design with control group for summer 2023 CoLab.

Works Cited