DATA AWARE redesigned:

using two learning sciences frameworks to restructure a high school research program

Project overview

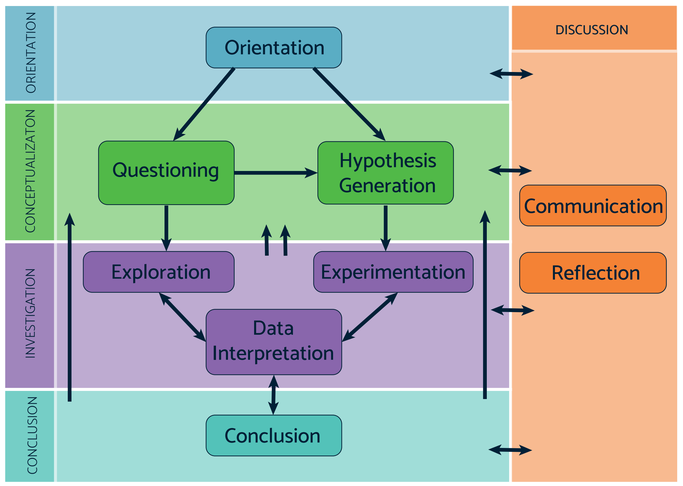
- DataAware: a summer research and training program in biomedical and health informatics (BMHI) for high school students, created by the Carolina Health Information Program (CHIP) at UNC
- Evaluation of first iteration of DataAware (midterm project):
  - Overall positive; research experience particularly valuable
  - Disconnect between two program phases:
    Phase 1 – data analytics training, Phase 2 – faculty mentored research
- Project goal: to redesign the DataAware program following two learning sciences frameworks – cognitive apprenticeship and inquiry-based learning

Guiding frameworks

Cognitive apprenticeship framework

Content	Methods
• Domain knowledge • Heuristic strategies • Control strategies • Learning strategies	• Modeling • Coaching • Scaffolding • Articulation • Reflection • Exploration
Sequencing	**Sociology**
• Increasing complexity • Increasing diversity • Global to local skills	• Situated learning • Community of practice • Intrinsic motivation • Cooperation

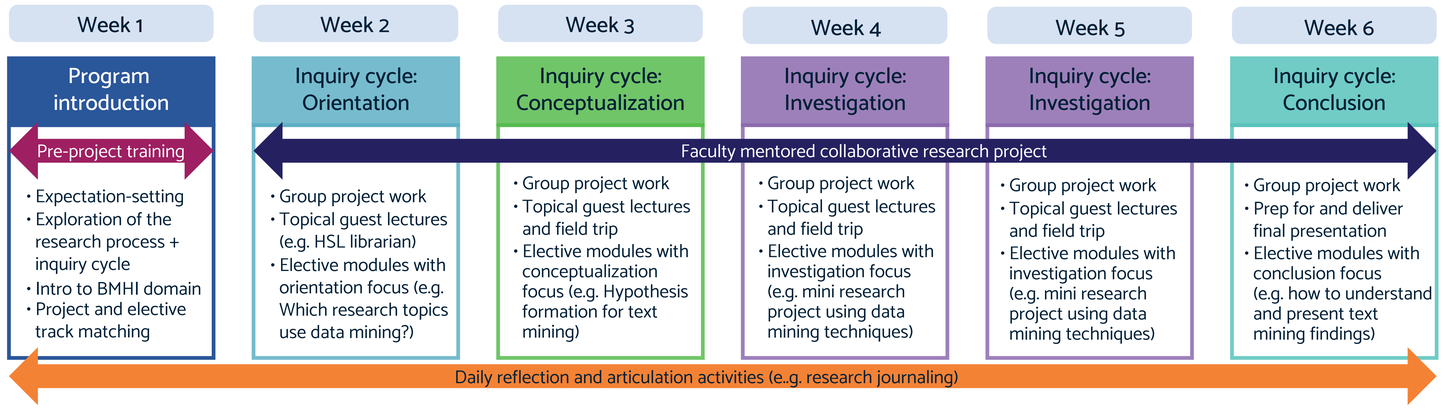
Inquiry-based learning framework



from Pedaste et al., 2015

Project outputs

Restructured program schedule



Research project template

- Faculty mentors develop student projects using this template
- Brief descriptions of topic and methodology
- Listed project tasks structured by the inquiry cycle
- Reflection prompts to elicit expert knowledge, structured by the cognitive apprenticeship framework content categories:
  - What are the most important facts, theories, and procedural skills you would call on for these tasks?
  - What are some tricks-of-the trade you would call on for these tasks?
  - Where would you anticipate running into trouble with these tasks and how would you manage it?
  - How would you approach learning new skills you needed to gain for accomplishing a research project?

Lesson plan template

- Graduate student instructors develop/redesign lessons using this template
- Lesson objective(s); make sure to connect to the inquiry cycle phase of the week as well as other lessons in this sequence (if in an elective track)
- Pre-planning:
  - What activity would help students achieve the lesson objective(s)?
  - For the proposed activity, are there any detailed skills that could be offloaded so that students will be able to complete the whole task? How will you do this?
- Outline of lesson:
  - Modeling the activity
  - Students engage in scaffolded version of activity, instructor plays coaching role (this should take up the bulk of the time)
  - Reflection + articulation: write 1-2 prompts for student discussion about the activity

Summary

- Primary changes to program:
  - Switch from disconnected 2-phase structure to single unified program structure
  - Lengthen research project by one week
  - Improve alignment of instruction and research activities
  - Increase consistency of expectations for mentorship and instruction
- Inquiry-based learning framework explicitly adopted as structure
- Cognitive apprenticeship framework infused throughout the program design:
  - Content: project template elicits expert content knowledge
  - Methods: all cognitive apprenticeship methods called upon for lesson plans
  - Sequencing: global perspective emphasized in first week, with later building of specific skills along with increasing complexity and diversity
  - Sociology:
    - Students develop as “legitimate peripheral members” of research community of practice
    - Elective tracks allow for intrinsically motivated learning
    - Research projects are collaborative among student teams and mentors
    - Learning is situated in a research project/inquiry cycle context at a research University

Key references:

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