A HERMENEUTIC PHENOMENOLOGICAL PROJECT EXPLORING THE ADOPTION OF CYBERSECURITY HAS INTO LIBERAL ARTS COMPUTING PROGRAMS

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A DEFINITION OF A LIBERAL ARTS EDUCATION WAS HAVING THE OUTCOME OF PEOPLE WHO CAN "THINK, LEARN, BE CREATIVE, AND ADAPT TO CHANGE" (DETWEILER, 2021, P. 31)

RESEARCH PROBLEM VISUAL

Incoming bachelor's degree students	**Liberal Arts Institutions and Computing Programs**	Bachelors Degree: IT Career or Grad School

- *Liberal Arts computing faculty typically teach one or more courses outside of experience or education such as cybersecurity.*

- *When designing, revising, or even teaching a course – what have curricular decisions been based on?*

- *What was the lived experience of faculty in liberal arts computing programs in addressing those two elements?*

HOW HAS CYBERSECURITY BEEN ADOPTED INTO LIBERAL ARTS COMPUTING PROGRAMS

Liberal Arts Computing Program

Don't all programs include Cybersecurity?

Academic Guidelines such as ACM/IEEE:
Computer Science (2013)
Cybersecurity (2017)

Lived Experience forms reasoning and justifications for the WHY or WHY NOT of curricular content and provided a basis of understanding for other faculty (re)developing Liberal Arts Computing Programs

Governmental Guidelines such as:
NIST
ISO 27001

Industry Certifications such as:
CISSP
Security+

HOW HAS CYBERSECURITY BEEN ADOPTED INTO LIBERAL ARTS COMPUTING PROGRAMS

PURPOSE STATEMENT

Purpose and type of project:

- Hermeneutic Phenomenological Qualitative Study

- Little guidance in the combination of Liberal Arts curricula and the specific topic of cybersecurity

  - *Discovery of the justifications behind other programs – Current state of cybersecurity adoption (how/why?)*

  - *Are there guidelines that are being followed that others should use as well – Future State*

FRAMEWORK AND LENS

Framework and theory:

- Phenomenological Grounding Framework
- Technological "lens" was Diffusions of Innovation (DOI)

RQ'S

Research Questions:

- *RQ1: "Compared to the growth of the cybersecurity academic discipline, what was the lived experience of faculty in liberal arts computing programs with the adoption of cybersecurity concepts into liberal arts computing programs, and could the degree or rate of integration constitute an innovative program?"*

- *RQ2: "Compared to the growth of the cybersecurity academic discipline, what was the lived experience of faculty in liberal arts computing programs when adopting cybersecurity concepts into liberal arts institutional programs outside of dedicated computing programs demonstrating overall innovation and cross-disciplinary education?"*

POPULATION

- Population Recruitment
  - Listserv *(SIGCSE-LibArts & SIGCSE-Members)*
  - Snowball *(word of mouth)*

- Criteria
  - From a Liberal Arts institution
  - Instructor or Curriculum Designer*

- Population Breakdown:
  - 15 participants (plus 2 incompletes)
  - 3 pilot tested
  - 12 participants completed
  - Observed sex: 83% male, 17% female
  - Years teaching: Min – 2, Max – 47, Mean – 15
  - Region: Midwest – 4, NE – 7, Pacific – 1
  - Institutional Size: Min – 950, Max – 3600, Mean – 2223

All participants indicated "both"

DATA COLLECTION

Data Collection & Methodology

- Pre-Interview Survey

- Semi-structured interview
  - Conducted via Zoom
  - Transcribed via software and manually reviewed/corrected for accuracy

- Journaling pre/during/post-interview to capture researcher impressions

- Cyclical Process coding
  - Identify one theme, code all transcripts for that, discover another trend, and repeat the process

FINDINGS

- Uniformity was not present, nor ideal
    - Curriculum in liberal arts computing programs was viewed as the most robust when mission and values were approached first (Top-down versus Bottom-up)

- 10 themes presented themselves
    - Some minor themes were only minor due to their implicit nature such as resource constraints

- Present was still the need to explain/justify, not only liberal arts but also computing in liberal arts programs
    - Semantics and terminology had an outsized impact on literature, discussions, and experiences

THEMES – PART 1

Theme 1 – Career Preparation	• *Liberal Arts tradition versus Liberal Arts*
Theme 2 – Cross-Discipline	• *Bringing other disciplines into CS (tech) or CS (tech) into other disciplines (major theme)*
Theme 3 – Curriculum Development	• *What guidelines to follow when developing a course or overall curriculum (major theme)*
Theme 4 – Ethics and Philosophy	• *Increased frequency in the literature for both topics and present in many programs*
Theme 5 – Flexibility	• *Flexibility of instructors and allow for flexibility of programs (major theme)*

THEMES – PART 2

Theme 6 – Mission and Values
- *Need to find identity before being concerned with specific curriculum such as cybersecurity*

Theme 7 – Recruitment and Retention
- *What makes a program attractive to prospective students… or keeps students in a program?*

Theme 8 – Resources
- *Resource constraints, limited faculty and equipment, can be a strong implicit driver of programs*

Theme 9 – Semantics and Terminology
- *Simply what we call things has an outsized impact on acceptance. A very surprising theme that emerged*

Theme 10 – Writing
- *An unexpected theme, but many participants stressed the increased importance of discipline-specific writing being incorporated into programs*

PROJECT LOOKED AT CONTENT – NOT STARTING POINT

- *Adoption of Cybersecurity analogy:*
- *Railcar being curricular content – what was the faculty experience in including that as part of their train?*
  - *Separate cars or mixed into others or integrated into the whole train (degree)*
- *However, the findings of the study indicated this wasn't the right starting point – make sure we are at the right station first!*
  - *Mission & Values*

TRANSFERABILITY OF FINDINGS
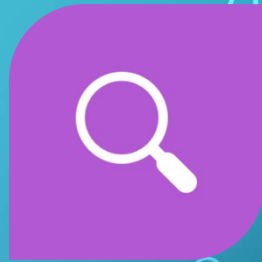
- Justifications for why approaches may or may not work at other liberal arts institutions

- Project supported both reasoning to include curricular content such as cybersecurity, ethics, and philosophy if not necessarily methodology or to what extent

- Project also supported why programs might be justified in excluding such content if student outcomes match institutional and programmatic goals

SUGGESTED FUTURE STUDIES

- A quantitative study examining liberal arts computing program student exit data. Are student outcomes matching the program's stated goals in light of a program goal. (Could be longitudinal in nature.)

- A quantitative study of liberal arts computing program employers. Are their employees from such programs meeting the expectations of a holistically developed student that is capable of a broad range of work?

- A quantitative survey to collect relevant information for both the task of advocating the ACM/IEEE curriculum development task force and informing the paper making recommendations about the adoption of the new curriculum within liberal arts institutions.

QUESTIONS?

- Any questions?

- Thank you for your time!