Impact of a Cybersecurity Work-Related Course on Students' Career Thoughts and Attitudes: A PISCES Course Evaluation

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Introduction

The CNM program, situated within the School of Engineering, is a 120-credit program available in both online and on-campus formats.

The core courses including but not limited to Internet of Things, Digital Forensics, Incident Response, Threat Hunting, and Security Operations.

Murray State University, situated in western Kentucky, is a mid-sized public institution. As of October 2022, had a total enrollment of 9,489 students, spanning both undergraduate and graduate programs. One of MSU's notable programs is Cybersecurity and Network Management (CNM), previously recognized as Telecommunication and Systems Management (TSM), which was established in 1998. This program holds the status of being a Murray State University Program of Distinction.

Work-Related Experiential Learning in Cybersecurity

In the spring of 2023, the CNM program introduced both oncampus and online sections of the CNM 518 Threat Hunting and Security Operations course. CNM 518 is a work-related experiential learning course where students delve into the various stages of addressing a cybersecurity incident within a security operations center, encompassing both technical and managerial responsibilities.
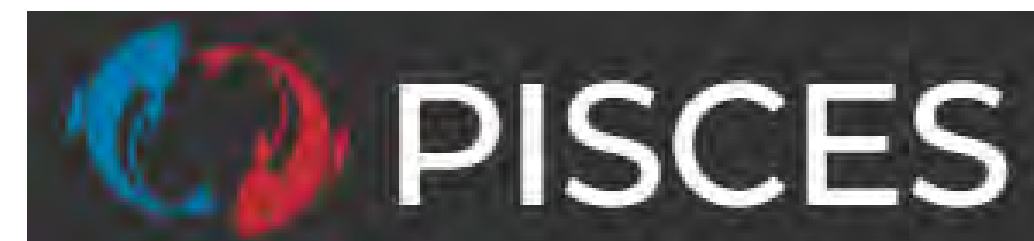
PISCES

Experiential Learning

CNM 518 course was specifically designed to align with the PISCES project, the adoption of an Experiential Learning (ETL) model became essential to fully leverage the hands-on learning opportunities within the course. The course modules were meticulously crafted using the Kolb learning cycle approach, a methodology that has demonstrated success in other cybersecurity programs

ETL Model

Active Experimentation

Stage 4:

Advanced threat hunting: Indicators of compromise and visualizations

Methods: group and individual work

Abstract Conceptualization

Stage 3:

Identification of best data types for query criteria

Methods: group and discussion

Coach   Facilitate

Guide   Teach

Concrete Experience

Stage 1:

Presentation of Elastic query or tool
Methods: Demonstration

Practicing the method/tool
Methods: individual work

Reflective Observation

Before Stage 2:

Review Lectures and demos

Methods: Self-study

Stage 2:

Presentation of theory
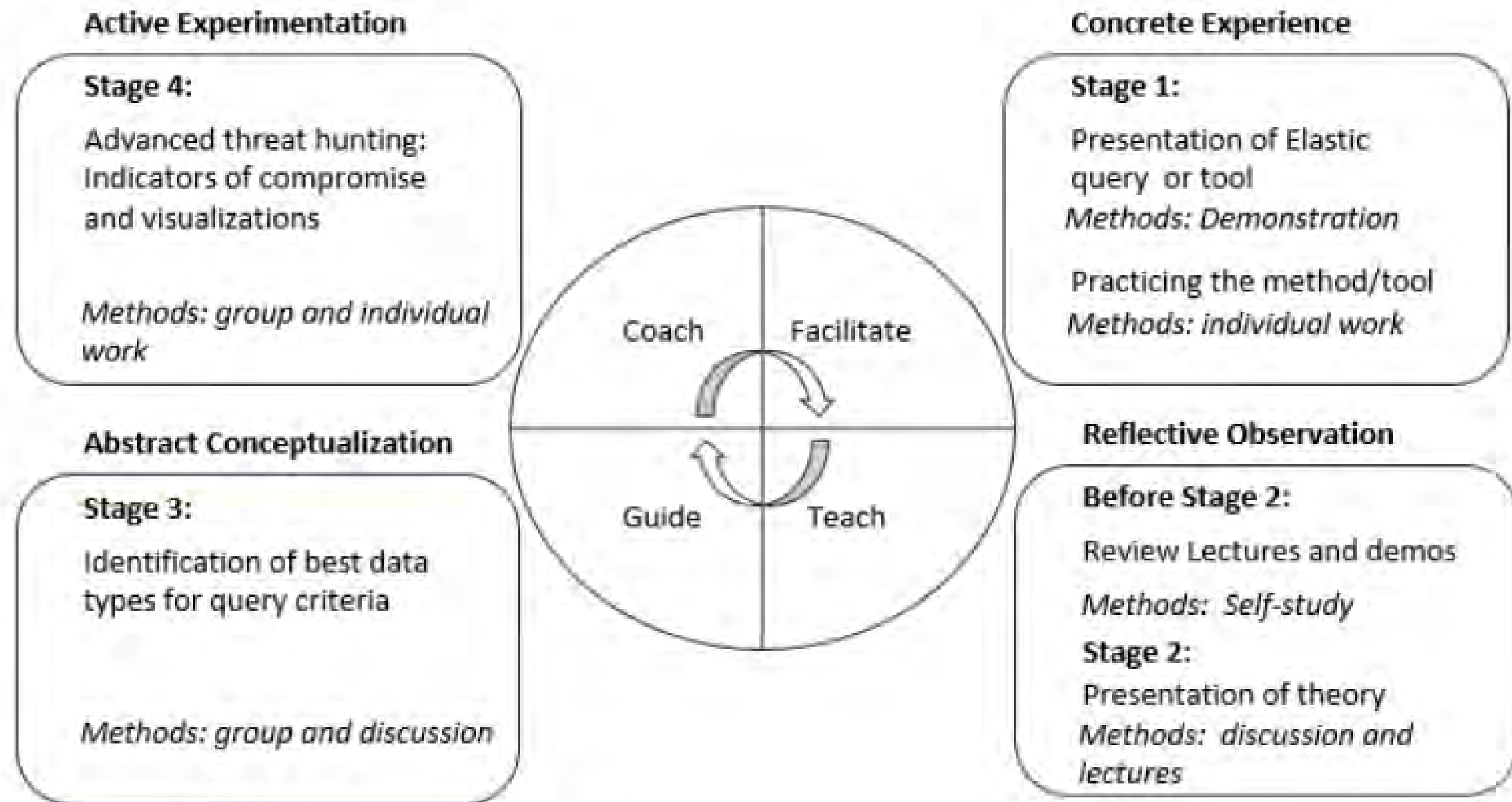Methods: discussion and lectures

Fig. 1. Kolb's Learning Cycle

Spring 2023 Findings

The course spanned a duration of 16 weeks, involving two-hour and fifteen-minute sessions each week. The initial PISCES student Spring 2023 cohort consisted of nine participants with 22% female and 68% male. As the course neared its conclusion, students were encouraged to participate in an evaluation process where they provide qualitative feedback on both the faculty and the course itself. The following is some of the feedback from the students.

Example of Student Feedback

"The course allowed me to work with tools that I have never used before, being able to use them and do multiple things was
really cool."

"The lab assignments and walkthroughs really helped with the courses and being able to create the dashboards and visualizations helped with my learning."

"More hands-on activities in the PISCES will help get more use to using Elastic."

Spring 2024

In an effort to align it more closely with Kolb's experiential learning theory, the following adjustments will be added with the goal of creating positive attitudes toward the student's skill set in the PISCES environment while encouraging growth in the field.

• Adding new reflection assignments to the modules to help students identify negative thoughts about labs in PISCES.

• Adding on-demand recordings of PISCES Lab walkthroughs with the lab assignments.

• Create group work PISCES lab assignments.

Examples of Reflection Quesions

• Reflect on your PISCES lab assignment XX. Were there moments when you encountered negative thoughts or self-doubt about your abilities or decisions? Can you describe these thoughts and the specific situations that triggered them?

• Think about how you addressed the negative career thoughts during the PISCES lab assignment XX. How did you challenge these thoughts, and what strategies did you use to improve your decision-making abilities? Share any instances where you overcame self-doubt and made a well-formed decision.

• Describe an example where you transformed a negative thought into a positive action during the PISCES lab assignment XX. How did this positive action contribute to your overall experience and outcomes? Additionally, discuss how you made effective use of support from colleagues, mentors, or peers to enhance your learning and decision-making.

Hypothesis Statement

H0: There is no significant difference in Career Thoughts Inventory (CTI) scores between students who participate in work-related experiential learning (Group A) and those who do not (Group B).

H1: There is a significant difference in Career Thoughts Inventory (CTI) scores between students who participate in work-related experiential learning (Group A) and those who do not (Group B).

It is expected both the sample size for each group will be less than 30, therefore a Mann-Whitney U test will be employed to analyze and compare the distributions of CTI scores, allowing us to either accept or reject the null hypothesis.

Conclusion

In conclusion, the CNM 518 course through PISCES offers students a valuable opportunity for self-growth and confidence in their career pathway through the completion of practical labs in PISCES and reflection assignments. These assignments encourage students to identify, challenge, and transform negative career thoughts into positive actions, ultimately enhancing their decision-making skills and overall learning experience. Furthermore, this research project, set for Spring 2024, aims to provide empirical evidence regarding the impact of work-related experiential learning on students' career thoughts and decision-making

Thank You