TRU SoTL Scholars Program

2025 Cohort

Snapshot B

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CELT will share your project title and summary on its website and in reports. Please notify the Director if you have concerns or questions.

Project title

Impact of an Industry-Aligned Cloud Computing Course on Software Engineering Students' Professional Identity and Emergence as Cloud Practitioners

Purpose of your research project. What do you want to accomplish or learn?

This research aims to understand how redesigning a "Practical Cloud Computing" course to align with current industry competencies affects the development of professional identity among undergraduate software engineering students. Grounded in a theoretical framework of professional identity, the study will specifically assess the course's impact on three core constructs: students' knowledge and familiarity with expectations of the field, their development of technical skills relevant to the field, and their capacity for self-evaluation and continued learning. Furthermore, the study will explore how the course influences students' broader professional identity as software engineers and, concurrently, whether it fosters the emergence of a more specialized identity or interest related to cloud practitioner roles.

Project summary for the non-expert (2 sentences maximum)

This project first redesigns a cloud computing course to teach skills directly identified from industry job postings. We then investigate how this real-world alignment impacts students' professional identity, looking at their views as software engineers and whether a new identity as cloud engineers emerges.

Research question(s)

How does the redesign and implementation of a "Practical Cloud Computing" course, grounded in industry-aligned competencies, influence the development of professional identity among undergraduate software engineering students?

a. In what ways does this course experience shape their understanding of, and identification with, the broader software engineering profession?

b. To what extent does this course experience foster an interest in, or identification with, specialized cloud practitioner roles or career pathways within software engineering?

Literature that provides background to the project.

1. Assyne, N., Ghanbari, H., and Pulkkinen, M. (2022). The state of research on software engineering competencies: A systematic mapping study. Journal of Systems and Software
2. Dobslaw, F., Angelin, K., Öberg, L.-M., and Ahmad, A. (2023). The gap between higher education and the software industry–a case study on technology differences.
3. Foster, D., White, L., Adams, J., Erdil, D. C., Hyman, H., Kurkovsky, S., Sakr, M., and Stott, L. (2018). Cloud computing: developing contemporary computer science curriculum for a cloud-first future.
4. Foster, D., White, L., Erdil, D. C., Adams, J., Argüelles, A., Hainey, B., Hyman, H., Lewis, G., Nazir, S., Nguyen, V., et al. (2019). Toward a cloud computing learning community.
5. Ozyurt, O., Gurcan, F., Dalveren, G. G. M., and Derawi, M. (2022). Career in cloud computing: exploratory analysis of in-demand competency areas and skill sets.
6. Tomlinson, M., & Jackson, D. (2021). Professional identity formation in contemporary higher education students.
7. Fitzgerald, A. (2020, July). Professional identity: A concept analysis.

The following sections are for you to communicate with the CELT team the emerging design for your project.

Project Methodology (list references lower in this section)

The core of the methodology involves the redesign and implementation of a "Practical Cloud Computing" course and data collection from students to see the impact on their professional identity framework components.

The redesign is based on an analysis of recent literature identifying industry-aligned cloud-related competencies, which are then grouped into knowledge areas suitable for a one-semester undergraduate course.

The course content, learning activities (labs, exams, reflective writing, group projects), and assessments will be intentionally designed to align with these industry-validated knowledge areas and mapped directly to the three constructs of professional identity (Knowledge and familiarity with expectations of the field; Technical skills of the field; Ability to self-evaluate and engage in continued learning).

Data will be collected throughout the semester using pre-/post-surveys, alongside ongoing collection of course data (exam scores, lab marks) and qualitative data (reflections, interviews).

Participant inclusion criteria, and exclusion criteria (if any)

- Undergraduate software engineering students enrolled in the redesigned "Practical Cloud Computing" course.
- Students who provide informed consent to participate in the research aspects of the course.

How will you recruit your participants? Who will interact with the participants during data collection?

- Participants will be recruited from students enrolled in the "Practical Cloud Computing" course. To minimize any potential power imbalance between the course instructor (PI) and student participants, and to ensure voluntariness, a RA, who is not registered in the course and is independent of course grading, will manage research-specific interactions and data collection.
- At the beginning of the course, the RA will explain the research project to the students. This will cover: the purpose of the study, the types of data to be collected, how data will be used, stored securely, and protected, the strictly voluntary nature of participation, and their right to withdraw from the research at any time without penalty.
- The RA will administer all research-specific surveys, conduct individual interviews, and be responsible for managing and anonymizing all research-specific data.
- The PI will be responsible for delivering course content and administering regular course assessments (e.g., exams, labs, projects) as part of normal teaching duties.

Theoretical approach / framework

The study is grounded in professional identity development framework and focuses on three core constructs: knowledge and familiarity with expectations of the field, i.e. students' understanding of the roles, responsibilities, norms, values, and career pathways within the cloud computing industry, and how this understanding informs their view of the broader software engineering profession; technical skills of the field, i.e. the practical, hands-on competencies and abilities required to perform tasks and solve problems in cloud computing environments, as identified by industry needs, and how mastery of these skills contributes to their confidence as software engineers; and ability to self-evaluate and engage in continued learning, i.e. students' capacity for critical self-reflection on their skills and knowledge, identifying areas for improvement, and developing strategies for lifelong learning in a rapidly evolving field like cloud computing.

Data Collection Methods

- Construct 1: Knowledge and familiarity with expectations of the field

    - Midterm and final exam scores (quantitative): Categorized by knowledge area to assess understanding of core concepts.
    - Pre- and post-semester surveys (quantitative and qualitative): To measure changes in students' self-reported understanding of field expectations (both general software engineering and specific to cloud), career paths, and industry demands.
- Construct 2: Technical skills of the field
    - Lab assignment marks (quantitative): To assess practical application of technical skills.
    - Lab self-reflective reports (qualitative): To gather students' insights on their skill development process, challenges faced, and problem-solving approaches during labs, and how this impacts their confidence as future software engineers and cloud practitioners.
- Construct 3: Ability to self-evaluate and engage in continued learning
    - Group project written report (qualitative): To understand how students approached learning new concepts for the project and how they plan to continue their learning journey, both as software engineers and potentially within cloud specializations.
- Impact on professional identity (Overall)
    - To assess shifts in students' professional identity, focusing on their identification as software engineers (including confidence and alignment with professional values) and any emerging identity as cloud practitioners.
    - Observational notes from instructor and RA throughout the term (qualitative): To capture insights on student engagement, participation, and informal indicators of identity development related to both general and specific professional roles.
- End-of-semester individual interviews (qualitative): To conduct in-depth exploration of students' experiences in the course, their perceived development of professional identity (as software engineers and potentially as cloud practitioners), and the impact of specific course elements on these identities.

Data Analysis Methods

- Quantitative Data:
    - Descriptive statistics will be calculated for exam scores, lab marks, and survey Likert-scale responses.
    - Inferential statistics (e.g., paired t-tests) will be used to compare pre- and post-semester survey data to identify statistically significant changes related to both general software engineering identity and cloud-specific identity aspects.
- Qualitative Data:
    - Qualitative data from open-ended survey questions, lab self-reflective reports, group project reports, observational notes, and interview transcripts will be analyzed using thematic analysis.
    - NVivo or a similar qualitative data analysis software may be used to manage and code the data.

Additional Human Research Ethics Considerations

- A clear and comprehensive informed consent process will be implemented. Participants will be informed that their participation in the research component is voluntary and that their decision will not affect their grades or academic standing. They will be informed of their right to withdraw at any time without penalty. The purpose of the research will be clearly communicated. All survey, interview, and data analysis will be performed by RA.

Supporting literature sources for your theoretical approach, methodology, and methods.

- Fitzgerald, A. (2020, July). Professional identity: A concept analysis. In Nursing forum (Vol. 55, No. 3, pp. 447-472).
- Tomlinson, M., & Jackson, D. (2021). Professional identity formation in contemporary higher education students. Studies in Higher Education, 46(4), 885-900.
- Trede, F., Macklin, R., & Bridges, D. (2012). Professional identity development: a review of the higher education literature. Studies in higher education, 37(3), 365-384.
- Pluff, M. C., & Weiss, V. (2022). Competency-based education: The future of higher education. New models of higher education: Unbundled, rebundled, customized, and DIY, 200-218.
- Impagliazzo, J., & Xu, X. (2024). A competency-based transformation in computing and engineering education in the digital era. Frontiers of Digital Education, 1(1), 97-108.
- Creswell, J. W., & Clark, V. L. P. (2017). Designing and conducting mixed methods research. Sage publications.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative research in psychology. Qualitative research in Psychology, 3(2), 77-101.
- Felten, P. (2013). Principles of good practice in SoTL. Teaching and Learning Inquiry: The ISSOTL Journal, 1(1), 121-125.

Expected Outcomes

- Graduates better prepared to meet the demands of the rapidly evolving cloud computing industry, potentially addressing skills gaps.
- Increased student engagement and motivation resulting from a curriculum perceived as highly relevant to their career aspirations.
- Contribution to the SoTL literature regarding the impact of industry-aligned curriculum on professional identity formation in undergraduate software engineering programs.
- Presentations at national or international SoTL or engineering education conferences.
- Peer-reviewed publications in relevant education or engineering education journals.

Knowledge Mobilization

- Findings will be shared with current and future students.
- Results will be disseminated through presentations/publication at teaching and learning conferences/journals.

- Findings will be shared with departmental curriculum committees to inform curriculum development and pedagogical practices within software engineering education.

Research Team

- Principal Investigator: Sina Keshvadi, Engineering Dept., TRU
- Research Assistant: TBD

Additional References

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Questions, concerns, anticipated challenges

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