

Developing an Integrated Flexible Learning Model for Mechatronics & Industry 4.0 Certifications at UBC Okanagan

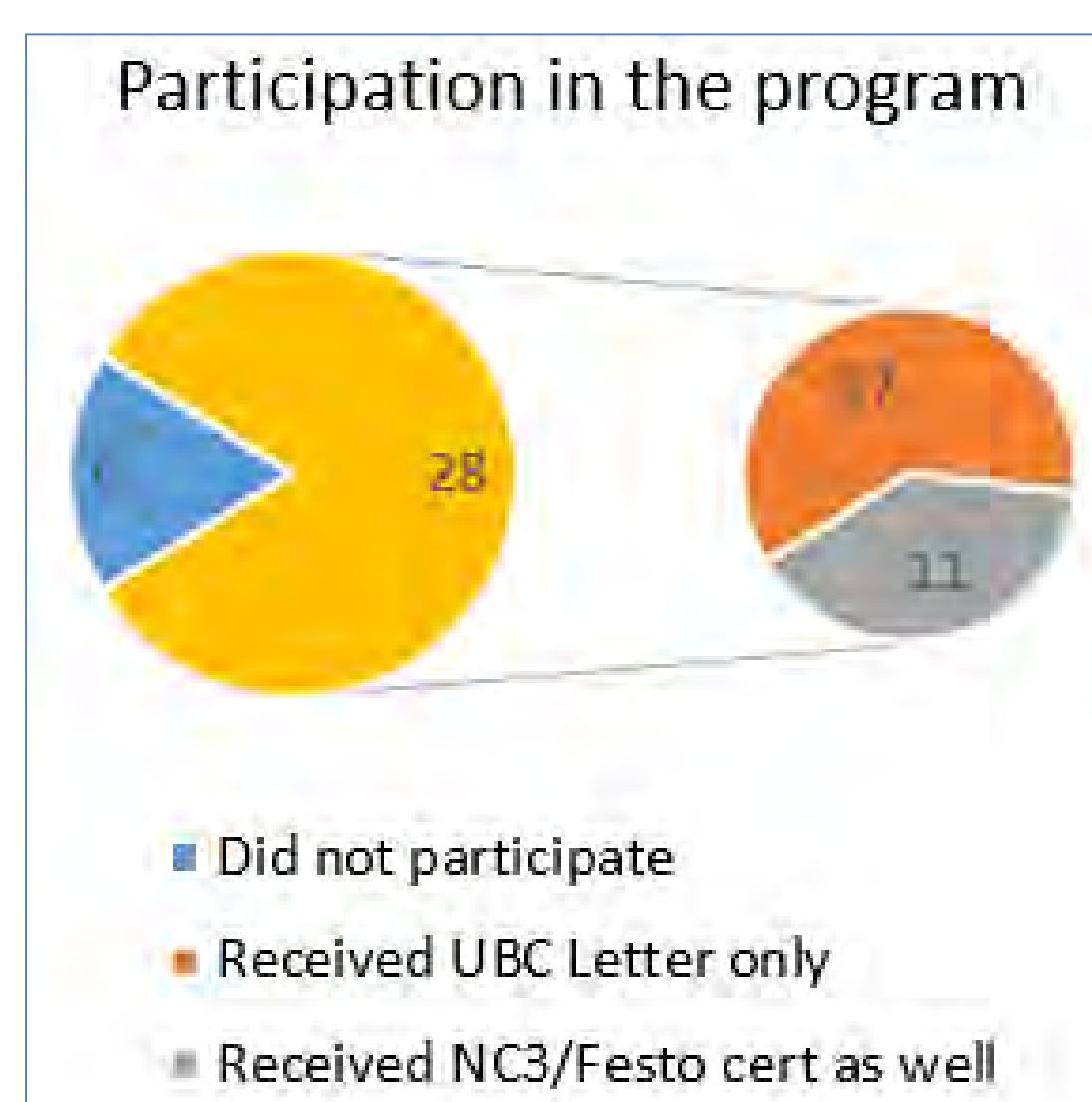
Dean Richert*, Carolyn Szostak**, Ayman Elnaggar*

Summary

It is becoming increasingly important for students to graduate with strong theoretical knowledge, critical thinking proficiency, and with practical skills that support manufacturing growth as outlined in recent BC Job Plans. The project responds to this challenge by developing innovative and flexible learning modules that integrate the Festo curricula into the existing engineering curricula. Festo Didactic, the educational division of Festo, a leader in advanced manufacturing automation, Industry 4.0, and Mechatronics, has developed an in-depth curriculum complemented with applied experiential learning that ensure students have internationally recognized qualifications upon completion of Festo certification. Additional rich supplementary learning resources will be developed that will allow the Mechanical, and Electrical Engineering students enrolled in the Mechatronics Option, and the Manufacturing Engineering students on both UBC campuses to follow different learning pathways that guide them to qualify for the Festo certification along their engineering degrees.

Certificate Integration

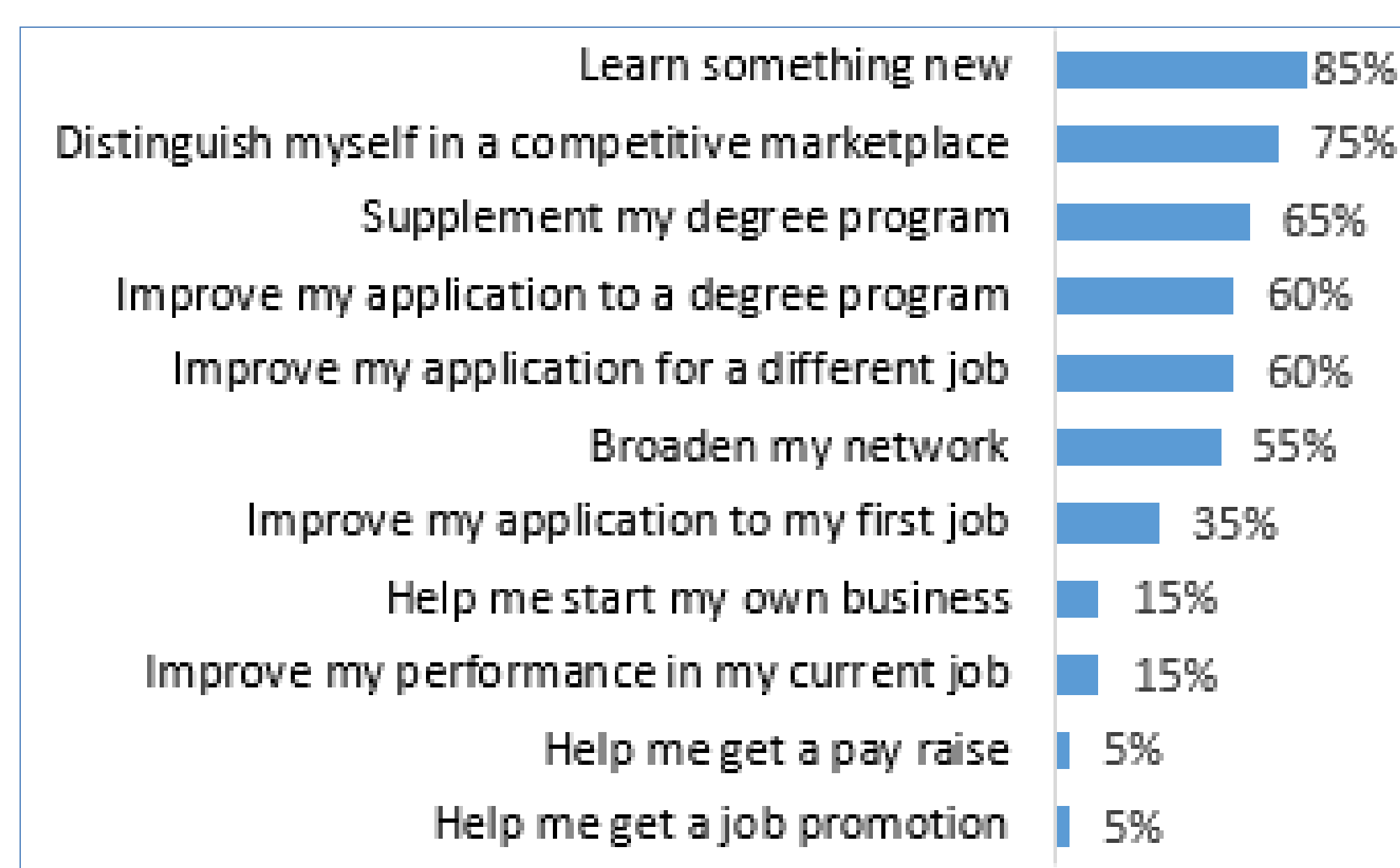
UBCO has partnered with the National Coalition of Certification Centres (NC3) to offer students in MANF 386 (Industrial Automation) the Festo Fundamentals of PLCs – Siemens certificate. Students who completed the course labs and achieved at least 70% on the midterm (2 attempts) received a UBCO Letter of Proficiency and became eligible to write the Festo industry exam. Participation is summarized below:



Key successes:

- Working with NC3, in-person training requirement were waived with the promise to offer in-person training when the UBCO automation labs re-open;
- UBCO has become the first Canadian institution to become an NC3 member institution and qualified to offer NC3 certificates;
- Full online implementation and Canvas integration. We used digital twin technology (3D simulation) for students to visualize automation system and test PLC programs;
- Many technical IT challenges were overcome to allow remote access to the necessary software and licenses;
- Overwhelmingly positive student feedback on how the course was run and its benefits;
- Partnership with NC3 opens up the possibility to offer certificates backed by other industry collaborators such as Trane, Snap-on, etc.;
- UBCO instructors are now qualified to issue Applied PLCs, Sensors, Data Analytics, Robotics (fundamental and applied levels);
- A new course, MANF 486: Mechatronic Systems Laboratory, has been designed to enable more certificate integration.

Survey results: “What motivated you to participate in the micro-credential program?”



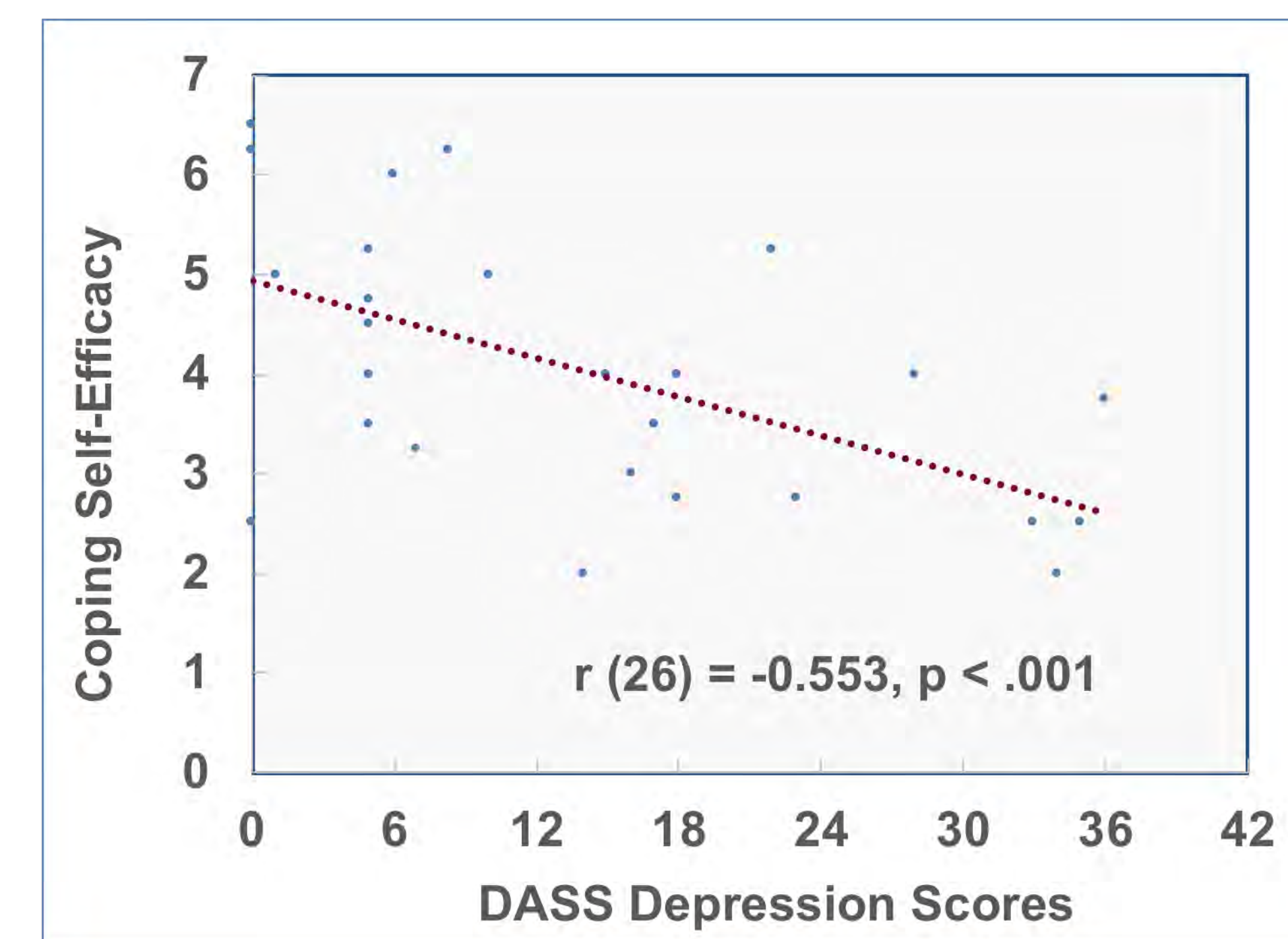
Students’ Wellbeing & Self-efficacy

APSC 255 (Electric Circuits and Power) is a pre-requisite for those wanting to major in Mechatronics or Manufacturing. Students were invited to complete an online survey at the end of 2020W T2. The survey included an assessment of students’ current wellbeing, self-efficacy, and open-ended questions about the certification opportunity.

Students’ Levels of Stress and Distress

On average, APSC 255 students (n = 28) reported mild levels of stress and anxiety but symptoms of depression were moderately severe.¹ 21% of the sample reported moderate levels of depression while 29% reported severe to extremely severe symptoms.

Coping Self-efficacy as a Function of Depression



Coping self-efficacy, and more specifically one’s confidence in being able to stop unpleasant thoughts and emotions, was inversely related to number of depressive symptoms reported. A similar relationship was found between academic self-efficacy (one’s confidence in handling academic stress) and DASS depression, $r(26) = -0.423, p < .04$.

Students acknowledged that the pivot to the online academic environment had been challenging.

Reactions to asynchronous sessions were mixed; some liked the flexibility while others found the lack of structure difficult to manage. Almost everyone liked being able to review the recorded lectures.

Thoughts About Festo Certification

Initial coding of the open-ended questions indicated that most students were *not* aware of the Festo Certification opportunity associated with specific upper-level courses. While several students indicated that they thought it would help with employment opportunities, students were concerned about the workload given that they already have a heavy workload or that it would influence what was taught:



Recommendations

To promote the success of the Festo Certification program it will be important to ensure that students are familiar with this opportunity.

To foster the wellbeing and resilience of students, brief workshops that focus upon self-efficacy and expectations may be helpful.

References

1. Lovibond, SH & Lovibond, PF (1995) *Manual for the Depression Anxiety Stress Scales (2nd ed.)*. Psychology Foundation.

Biography

Dr. Richert’s interests lie in developing competency based curriculum and integrating active learning into his classes. He is leading the mapping and the development of Festo certifications into the curricula of Mechatronics and Manufacturing Engineering. Dr. Szostak has expertise in psychological assessment, and substantive experience with both qualitative and quantitative research. She is leading the assessment of students’ wellbeing and their perceptions and experiences with the new curriculum. Dr. Elnaggar is managing and coordinating the development and implementation of the many activities of the project.

Acknowledgements

This project is supported by the Aspire-2040 Learning Transformations (ALT-2040) Fund at UBCO.