Competency-Based Education Research Journal, 2025, 2(5).
https://journals.ku.edu/cberj/

Competency-Based Education Through Micro-Credentials Offerings: A Pilot Study

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This pilot study examined the implementation of Competency-Based Education (CBE) through micro-credentials at the Singapore Institute of Technology (SIT), focusing on the perspectives of learners, instructors, and employers. Despite a growing global interest in CBE, empirical research on its effectiveness remains limited. SIT's Competency-Based Stackable Micro-credential (CSM) program offers modular, industry-relevant learning for working adults, with micro-credentials functioning as standalone qualifications or stackable units toward a full degree. Findings from learner surveys indicated that the content was highly relevant to real-world jobs, and the learning could be applied to work. Instructors recognized the relevance of CBE to industry needs, despite the increased demands associated with content development, delivery, and learner support. Employers observed improvements in employee competencies and workplace engagement. The findings underscore the potential of CBE micro-credentials to offer flexible, industry-focused education pathways when supported by robust frameworks and comprehensive learner support services.

Keywords: competency-based education, micro-credentials, adult education, workplace, stackable, lifelong learning

We are deeply grateful to the Competency-Based Education Network, especially Dr. Charla Long, for her invaluable guidance in designing our Competency-Based Education (CBE) program, and to the University of Wisconsin and Southern New Hampshire University for generously sharing their expertise to help us get started. Special thanks go to A/Prof Forest Tan, A/Prof Goh Weihan, and their team for pioneering the Competency-Stacked Micro-credential {CSM) pathway, as well as to Dr. Anat Eshed for her critical input in developing a data dashboard that drives continuous improvement. Their contributions have been instrumental to our implementation study.
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Despite the growing interest in competency-based education (CBE) and the increasing number of CBE programs being offered globally, scholarly evidence for the efficacy of these programs is still lacking (Navarre Cleary, 2020; Parson & Rivers, 2016). "For CBE to be fully incorporated into higher education, the value of CBE credentials must be widely accepted, both by consumers (students and employers) and by providers (institutions and accrediting agencies)" (EDUCAUSE, 2014, p. 2). Parsons and Rivers (2017) recognized the difficulty in building evidence for CBE programs through rigorous evaluation, as the metrics for outcomes and success differ widely from those of traditional non-CBE programs. Scholars note that CBE lacks standardized metrics for defining learner success, making cross-institutional comparison difficult (Kelchen, 2015). The shift from seat-time to performance-based assessment necessitates the development of novel tools and frameworks for validating outcomes and ensuring quality (Carnegie Foundation for the Advancement of Teaching, 2024). Therefore, it is key that future research work toward bridging these gaps to clearly communicate and translate the efficacy of CBE from practice to outcomes.

CBE has emerged as an educational model aimed at equipping learners with demonstrable, job-relevant skills, marking a shift from traditional, time-bound frameworks to outcomes-based learning. It prioritizes mastery of competencies aligned with real-world and societal demands. Recent implementations of CBE align educational outcomes with labor market needs, where institutions assess learners based on their skill proficiency rather than duration of their studies (Abelha et al., 2020; Frank et al., 2010). The model draws from constructivist learning theories (Piaget, 1952; Vygotsky, 1978), advocating for active, personalized learning reinforced by formative assessments and practical applications (Surr & Redding, 2017; Wiggins, 1993). In parallel, instructional design in CBE is frequently guided by the revised Bloom's Taxonomy (Anderson & Krathwohl, 2001), which repositions the cognitive domain in a hierarchy of actionable learning outcomes from 'Remember' and 'Understand' to 'Apply', 'Analyze', 'Evaluate', and 'Create'. This action-oriented taxonomy supports the alignment of competencies to authentic assessment tasks, encouraging demonstrable performance beyond passive recall.

In higher education, CBE enhances employability by aligning curricula with industry standards and offering learner-centric pathways that accommodate diverse needs and promote engagement (Boritz & Carnaghan, 2003; Katoue & Schwinghammer, 2020). However, challenges such as institutional resistance, differing assessment practices, and digital inequities continue to hinder the broader implementation of these initiatives (Anderson, 2018). Nevertheless, technological advancements and flexible curriculum design present possible solutions for expanding CBE adoption (Lee et al., 2023).

Building upon the identified need for empirical evidence on the efficacy of CBE programs, integrating micro-credentials into CBE frameworks offers a promising avenue for addressing this gap. UNESCO defines micro-credentials as records of focused learning achievements that verify what the learner knows, understands, or can do (Oliver, 2022). Micro-credentials, as competency-based learning models, provide learners with certification upon completion, serving as tangible evidence of acquired

skills (Ahsan et al., 2023). By offering clear documentation of specific skills and learning outcomes, micro-credentials can facilitate the acceptance and validation of credentials among employers, educational institutions, and accrediting bodies (eucen, 2024). However, micro-credentials often face credibility challenges due to inconsistent recognition across industries and regions (OECD, 2021). Employers' trust depends not only on the perceived rigor of assessments but also on how clearly the credential communicates the demonstrated competencies (Oliver, 2019).

Moreover, establishing robust quality assurance mechanisms and standardized frameworks for micro-credentials is crucial to ensure their credibility and portability across different educational and professional contexts (ENQA, 2023). Such standardization can help align micro-credentials with national qualification frameworks, thereby enhancing their legitimacy and facilitating their integration into formal education systems (QUATRA, 2023). Comparative initiatives such as the European Approach to Micro-credentials (EAM) and the Australian Qualifications Framework (AQF) Review, similarly, aim to integrate modular, stackable credentials into national systems, supporting lifelong learning and workforce mobility (European Commission, 2020; Noonan, 2019). Incorporating micro-credentials into CBE programs not only supports the assessment and documentation of learner competencies but also promotes lifelong learning by enabling learners to accumulate and stack credentials over time. This modular approach to credentialing aligns with the evolving needs of the labor market and the increasing demand for flexible, skills-oriented education pathways (Tan, 2023).

Understanding the perspectives of faculty, learners, and employers is critical for evaluating the real-world relevance and scalability of CBE programs (Dubé et al., 2023). Stakeholders' buy-in, particularly from faculty and employers, has been identified as a key factor to successful implementation (Henrich, 2016; Prokes et al., 2021). Faculty perspectives influence curriculum design, assessment integrity, and instructional quality, factors that support CBE but require significant shifts from traditional pedagogical norms (Gervais, 2016). Without adequate organizational support and training, faculty may struggle to transition from content deliverers to facilitators of competency development, making their abilities and preparedness crucial to the successful implementation of CBE (Dubé et al., 2023; Kelchen, 2018; Prokes et al., 2021). Prokes et al. (2021) explored faculty experiences in implementing CBE and found that faculty often shifted from traditional teaching roles to more mentoring-focused positions, a transition many found challenging. The study highlighted faculty concerns about the fragmented nature of their responsibilities in CBE environments. Institutional support emerged as crucial, particularly through targeted learning opportunities that enable faculty to both learn and continually refine CBE teaching approaches. Interviewed faculty recommended formal training, mentorship, and structured opportunities for experience-building.

Equally important are learners' and employers' experiences, which are important components for the relevance, rigor, and industry alignment of CBE implementation. For instance, studies have shown that learners' perceptions of competency-based portfolios and self-directed progression significantly influence their engagement and

learning outcomes (Oudkerk Pool et al., 2020). Employers, on the other hand, assess the workplace performance of CBE learners and are a key external assurance of certification quality. Their trust in micro-credentials hinges on the competency frameworks and assessment rigor in CBE learners' performance at the workplace (Henrich, 2016; Oliver, 2019). Clerkin and Simon (2014) argue for the importance of partnerships between educational institutions and employers. Henrich's study in 2016 examined employers' perspectives. It emphasized the importance of designing degree programs that clearly define and integrate field-specific competencies within the curriculum, ensuring CBE learners acquire the necessary skills to meet industry demands. The research highlights that employers not only seek candidates who possess the right competencies for a position but also expect a satisfactory level of proficiency in each skill area. Consequently, Henrich suggests that universities should actively engage with employers to attract their attention, solicit their guidance, and incorporate their feedback as they develop high-quality academic programs aligned with workforce expectations.

In the recent work by DeBacker et al. (2025), the group suggested an agenda that guides, coordinates, and promotes empirical research on CBE programs. The suggested research agenda is organized in a four-part framework: (1) conceptualization research, (2) design research, (3) implementation research, and (4) efficacy and efficiency research. Our paper presents an implementation research study that is centered on understanding how CBE is implemented through micro-credentials, with attention to the feedback from different stakeholders about the design features within the program. Examining triangulated feedback from these three stakeholder groups, that is, learners, instructors, and employers, helps bridge the often-cited theory-practice divide in CBE research, informing improvements and reinforcing CBE implementation.

Context

Examining triangulated feedback from these three stakeholder groups helps bridge the often-cited theory-practice gulf in CBE research, informing improvements and reinforcing CBE implementation. Since 2023, the Singapore Institute of Technology (SIT) has offered CBE micro-credentials to in-employment adult learners. SIT micro-credentials are designed to provide learners with the opportunity to gain specific skills and knowledge in a focused area. These micro-credentials are part of SIT's Competency-Based Stackable Micro-credential (CSM) pathway, which allows learners to accumulate credits that can be stacked towards a full bachelor's degree.

Micro-credentials are structured around specific competencies that are in demand by the industry. Each micro-credential is a standalone qualification that focuses on a particular skill set or knowledge area. Learners receive a specialist certificate after completing 18 credits (equivalent to 18 ECTS in Europe or nine credits in the United States) worth of learning and demonstrating the required competencies. Each micro-credential is designed to be completed within four months, but learners can take up to eight months to demonstrate all required competencies without incurring additional fees. The micro-credentials are designed to meet the evolving demands of

the job market. They cover competencies that are highly sought after by employers, enabling learners to perform new or higher-level job roles requiring greater competence.

With such micro-credential offerings, the university can offer flexible learning pathways. Learners have autonomy and have the option to choose between taking a standalone micro-credential or stacking their micro-credentials towards a degree. In relation to instruction, the university offers a blended approach of online and face-to-face learning. Each in-employment learner is supported with wrap-around service by an assigned success coach (Chow et al., 2023). The dedicated success coaches are hired to support the learners in managing their studies alongside other commitments.

To support the transition to a CBE model, SIT established a structured faculty development initiative, including hands-on workshops on backward curriculum design, writing competency statements, and designing authentic assessments. Instructors were guided to align module outcomes with real-world job tasks using reference frameworks such as the Singapore Skills Framework (SkillsFuture Singapore, 2022). When training instructors to design micro-credentials, it is important to consider relevancy, flexibility, and sizing to prepare them for the new model of teaching (Lim, 2023).

The micro-credentials analyzed in this paper are part of the first bachelor's degree program, Applied Computing, introduced in 2023. Most participants are employed full-time in roles relevant to the program and are often sponsored by their employers to pursue this degree through the CSM pathway. Following the launch of this initial program, two additional CBE degree programs with similar design features have been introduced: Electrical and Electronic Engineering and Infrastructure and Systems Engineering.

Research Aim

This research aims to assess the effectiveness of CBE micro-credential offerings from the perspectives of three key stakeholders—learners, instructors, and employers. For these programs to remain impactful and in demand, it is crucial to evaluate their success holistically. Learners must perceive the value of their CBE degrees, both personally and in terms of career advancement. Instructors should find the process of teaching and designing CBE-based curricula both effective and rewarding. Employers, in turn, need confidence that CBE graduates possess skills, knowledge, and competencies equivalent to those of their peers from traditional educational pathways.

This study primarily adopts an implementation research lens, focusing on the initial delivery and reception of SIT's CBE micro-credential program. In particular, it examines the experiences and feedback of learners, instructors, and employers to understand how the program has been operationalized, what has worked well, and what areas require refinement. While some outcome indicators, such as learner satisfaction, perceived job relevance, and employer observations of skill application, are discussed, these findings are intended to support an evaluation rather than constitute a comprehensive effectiveness study. As such, the methodology, centered on

stakeholder surveys, qualitative feedback, and triangulated perspectives, aligns with implementation research aimed at informing continuous improvement in program design and delivery.

This study's significance is its contribution to valuable empirical evidence about the effectiveness of such offerings, as well as the satisfaction levels of various stakeholders. It highlights the practical advantages, challenges, and the growing acceptance of competency-based micro-credentials within the higher education landscape.

As it will take three to four years to complete the entire bachelor's degree through stacking micro-credentials, this early study explicitly investigates the experience of completing micro-credentials and not the degree completion.

Methods

Prior to the initiation of this study, ethical approval (RECAS-1029) was obtained from the university's Institutional Review Board (IRB), and participation in the study was voluntary.

The CSM program evaluation employed a three-pronged data collection strategy to measure impact on learners, instructors, and employers. Feedback was gathered from these groups through surveys and interviews, providing a comprehensive view of the program's effectiveness. The evaluation took place at various points during the first year of introducing the Applied Computing CSM program, with the aim of generating informed recommendations to improve the CBE programs offered at SIT moving forward.

Participants

Learners

Surveys were administered to CSM learners across multiple trimesters to capture their satisfaction and experiences. Feedback was gathered on various aspects of the program's design features, including the micro-credentials content, the Learning Management System (LMS), the instructional modality, and the support provided by instructors and success coaches.

Instructors

Parallel with learner feedback, the program team collected insights from teaching staff to triangulate findings and build a more complete understanding of how the CSM program is performing. This approach not only validates learners' reported experiences but also surfaces instructional realities that may not be visible through learner surveys alone. Instructors' feedback was gathered through surveys and qualitative analysis of their teaching experiences across multiple trimesters.

Employers

An important facet of the CSM evaluation focuses on employers, specifically the reporting supervisors of learners enrolled in the CSM degree program. Recogniz-

ing that not all learners would want their employers to know that they are studying, only employers who have sponsored the learners for the study were approached. The collection of employer feedback is descriptive and qualitative. A pilot survey with several supervisor respondents has yielded encouraging results.

Tools

To ensure rigor and alignment with international best practices, the tools used for collecting data from learners, instructors, and employers were developed referencing the Competency-Based Education Network's (C-BEN) Quality Framework for CBE Programs (CBEN, 2022). This framework outlines key dimensions of quality in CBE design and delivery, including clear, measurable competencies, collaborating with external partners, and intentional learner experience. Drawing on these dimensions, the research team identified a comprehensive set of potential impact indicators for learners, instructors, and employers. Building on the foundational work, this study adopts a structured approach to indicator development for CBE programs, informed by the Delphi method, a technique well supported in the literature for facilitating stakeholder-driven consensus (Linstone & Turoff, 1975; McIntyre-Hite, 2016; Skulmoski et al., 2007). In particular, SIT's CBE core steering team, comprising senior academic leaders and instructors, drew upon a modified Delphi process to identify and refine key indicators across design, delivery, and assessment dimensions. The final set of indicators informed the development of survey instruments and interview protocols tailored to different stakeholder groups. This work is situated within a broader conversation on faculty and employer engagement in CBE, echoing studies by Prokes et al. (2021), who examined faculty readiness for implementation, and Henrich (2016), who explored employer perceptions of CBE graduates. Using a modified Delphi method (Linstone & Turoff, 1975; Skulmoski et al., 2007), the university CBE core steering committee (which includes senior academic leaders and instructors) was asked to rank these indicators and agree on the most critical aspects to assess. The final set of indicators directly informed the design of survey instruments and interview protocols, which were tailored to capture stakeholder-specific experiences and outcomes over time. Table 1 summarizes the participant groups, the sample size, and the instruments used for data collection.

Table 1
Participant Group, Sample Size, and Survey Instruments for Applied Computing Program

Group	Demographic Characteristic	Summary
Learners	Cohort size	107 learners 46 of the 107 (43%) learners responded anonymously to a 1-year Impact Survey
	Survey instrument	Post-teaching micro-credential feedback 1-year Impact Survey
Instructor	Sample size	11 teaching staff
	Survey instruments	Qualitative check-in on instructors' insight and feedback 1-year Impact Survey
Employers	Sample size	6 reporting officers/supervisors
	Survey instrument	1-year Impact Survey

Results

Feedback from Learners

Over the first year since the introduction of the CSM program, 96% of the learners who responded to the surveys agreed that the course content was relevant to their personal and professional goals, and 91% felt they improved their understanding of key concepts and even performed better in their jobs as a result of the CSM courses (see Table 2). Overall program satisfaction averaged 7.3 out of 10 in early feedback and is on an upward trend as improvements are implemented over the three trimesters. This trend suggests that as the CSM program matures, learners are increasingly satisfied with both the content and the delivery of the program.

Table 2
Learners' Evaluation of the CSM Program (N =46)

Feedback Statement	Agreement (%)
The content is relevant to their personal and professional goals	96
They have an improved understanding of the key concepts	91
They have performed better at work	91
They could apply their learning to their work	87
They have increased confidence at work	87
They were able to manage their time effectively while completing micro-credentials	85
It was beneficial to be allowed self-paced learning	93
The CSM program is a good value for the time and resources invested	93

Beyond quantitative scores, qualitative comments from learners have provided rich insights into their experience. An analysis of the open-ended responses identified several recurring themes (see Table 3).

Table 3
A summary of Themes from Learners' Feedback

Theme	Learners' Feedback	Quotes from Learners
Workload and time management	· Many learners initially struggled to balance work, life, and studies, but found ways to cope. · Adopted strategies like dedicating after-work hours and weekends to study, using calendars/to-do lists, and setting aside weekly goals to stay on track. · Realized the importance of time management and self-discipline.	· *"I am still learning to manage my time and workload, but I am discovering more aspects about myself. Hopefully, with time, I will be able to answer this better. My coach also gives great advice, and I do try them out to see if it works for me."* · *"I dedicate at least 1 day on the weekend for at least 8 hours for school. This helps me to catch up on the topics that I could not cover on the weekdays. It also forces me to sit down and finish my work."* · *"Dedicate at least 2 hours daily, either before or after work, to study. Coming up with a schedule of what I want to accomplish for the week helps keep me on track and accountable for the work that I need to do, on top of balancing increasing work responsibilities."*
Course content and relevance	· Learning content was directly applicable to real-world jobs and in keeping with current industry trends. · Occasional issues of overlapping or repetitive content between modules, and some course materials lacking practical examples.	· *"Better understanding of IT at my work in general, was able to apply what I learn in my studies (especially the practical) to real-life work scenarios. Also, the program helps to reinforce my understanding of the IT concepts to work scenarios that I encounter. Always recalling back on the practical and notes that I took."* · *"I have more technical knowledge and understand a little more when the team is sharing about their work. Without the relevant background, it has been difficult integrating into my role. With the CSM program, there is slightly more confidence and understanding into what I wish to achieve in my career."* · *"The exposure to many technical concepts helped me to converse better in technical conversations and consider the solutions available."* · *"I often need to look to external resources to understand the topics completely."*

Theme	Learners' Feedback	Quotes from Learners
Blended self-paced learning format	· Blended format (combining asynchronous learning with synchronous sessions) was appreciated for its flexibility. · Learning at one's own pace and convenience is important for working adult learners. · Self-paced learning came with challenges for learning and staying connected.	· *"I am satisfied because: 1) I am able to dictate my own pace of learning; 2) I am able to choose the modules I want to take up based on my interests or work-related."* · *"Found it to be manageable, probably due to the online learning and being able to study at our own pace."* · *"The program is well catered to working professionals, and the flexibility offered trumps other part-time courses with rigid schedules."*
Success coaching and learner support	· Success coaches provided motivational and emotional support. · Worked with learners to develop strategies to navigate the demands of asynchronous learning. · Learners have varying expectations and preferences towards success coaching.	· *"I appreciate the guidance and kind understanding from my coach, which has helped me reflect on ways to improve myself, particularly in managing my time more effectively."* · *"Listening ears. It's hard to talk to colleagues or family who does not know part-time study is living life in a harder mode."* · *"My success coach is great in helping me achieve my goals because I reached out. However, speaking for my peers, the level of engagement can be frustrating as it can feel surface-level, like a broadcast message, especially where the student has not engaged with the success coach and is unaware of how they can help. More of this might even displace the expected relationship between these two parties."* · *"Always keeping me in line of the goals I'm actually working towards."*

Feedback from Instructors

Instructors teaching in the CSM program participated in various surveys (see Table 4), with their feedback analyzed alongside learner survey results. This dual analysis aimed to identify areas of alignment and divergence between the two perspectives, providing insights into instructional challenges and experiences that might not be immediately evident from learner feedback alone.

Feedback from Employers

Although the sample is small to date, responses have been unanimously positive about the program's impact on employees. In our pilot survey, six supervisors agreed that the program equipped their staff with relevant competencies for their job roles. All the supervisors who responded also observed improvements in job performance and considered their staff to have become more valuable assets to the organization after undergoing the CSM program.

To the greatest extent possible, the partnership from the employers' side is crucial in enabling learners to succeed in the program while remaining productive at work. Going forward, the evaluation will continue to gather employer input on metrics like overall program effectiveness in enhancing staff competencies and satisfaction with the employees' growth. The next phase involves conducting more structured interviews across a broader range of industry partners, with a focus on capturing narratives around how employees are applying newly acquired skills on the job, the relevance of taught competencies to business needs, observed improvements in performance and soft skills, and the broader impact of the program on team dynamics and organizational capability.

Discussion

Unpacking Feedback from Learners

Analysis of qualitative comments from learners has provided rich insights into their experience. Thematic analysis of open-ended responses identified several recurring points:

Workload and Time Management

Managing workload and time effectively emerged as a common challenge for many learners trying to balance their studies alongside professional and personal commitments. A significant portion, 85%, reported successfully adapting by employing strategies like reserving evenings and weekends for focused study, utilizing calendars and to-do lists, and setting weekly objectives to stay on track. However, "increased busyness" and difficulties with time management were recurring themes, indicating that while self-discipline plays a crucial role, additional pacing support could prove beneficial. This observation is consistent with findings in existing research, which highlight that while CBE provides greater flexibility, it also demands a higher level of self-regulation and intrinsic motivation, especially in asynchronous and self-paced learning environments (Gervais, 2016; Klein-Collins, 2013).

Table 4

A Summary of Themes from Instructor Feedback

Theme	Instructor's Views and Feedback	Quotes from Instructors
Perceptions of CBE	· Adopting CBE addresses a genuine need for the university in serving working adult learners. · CBE supports lifelong learning and upskilling, especially given Singapore's evolving workforce. · Focusing on competencies makes learning more targeted and relevant to industry needs. · CBE can enhance career readiness by ensuring learners acquire work-ready skills. · CBE is a positive and timely innovation, aligning well with the institution's mission to serve both traditional students and working professionals.	· *"It helps our students stand out in the job market if they have the competencies needed by the industry because it means that they are ready to create value starting from Day 1."* · *"This is certainly a very important item, especially with the dropping SG population and the need for our older workers to upskill. Hence, it is very critical for SIT to be in the space to target older workers."* · *"CBE is targeted towards evaluating specific competencies within a module. This is more robust than evaluating a student's performance as a whole. Therefore, CBE can potentially improve the skills of our learners."*

Theme	Instructor's Views and Feedback	Quotes from Instructors
Evolving instructor role	· A shift from a traditional instructor role to a more facilitator or mentor role. · A significant investment of effort upfront to design assessments and online lecture materials that meet the CBE model.	· *"In a traditional faculty role, instructors focus on delivering content through lectures and assessing students based on time-bound exams. In a CBE faculty role, educators act more as mentors, guiding students through individualized learning paths, assessing skill mastery, and offering support as students progress at their own pace toward competency."* · *"Traditional faculty role seems more to be on content-delivery and follows a more structured approach that is relatively similar for all the students taking the course. The CBE faculty role is more of a facilitator where we need to guide students to achieve their competency, but at their own pace."* · *"I would need to spend more time creating flexible, practical learning experiences that directly align with real-world competencies."* · *"With the adoption of CBE, my role as a teaching professional will shift from focusing solely on academic content to intentionally connecting knowledge and skills that are directly aligned with industry needs. It's no longer about staying within the confines of academia, but about constantly bridging the gap between education and real-world competencies. This requires a deeper industry connection, ensuring that what I teach is relevant and immediately applicable."*

Theme	Instructor's Views and Feedback	Quotes from Instructors
Challenges to learner engagement	· Much harder to know the learners and to ensure every learner stays engaged. · Learners appear less motivated and self-directed than expected. · Practical application and relevance of learning are essential for working adult learners.	· *"It is much harder to know the students because we see them less."* · *"While the majority of students can keep up with the readings and labs, I was surprised that not many attend the face-to-face consultation sessions, despite some expressing concerns about the lack of interaction. I suspect that many students are balancing their daytime jobs, which limits their availability, and even when we offer online face-to-face sessions concurrently, the turnout remains low."* · *"Setting the student's mindset early on. Many don't have a mindset for learning in a higher education institution, where their knowledge and skills will be challenged."*
A need for a supportive ecosystem	· Need for more manpower (e.g., teaching assistants or co-facilitators) to provide timely support and guidance for learners with diverse abilities and progression levels. · Lacking dedicated time and resources to plan and develop content. · Request support for exploring tools to enhance learner engagement.	· *"From my experience, I've learned that transitioning to competency-based education can be quite intensive, especially in terms of content development. I've struggled at times to contextualize the content to fit a competency-based model, and this challenge extends to assessments as well. Both faculty and students need to adapt to the different kinds of expectations that come with this approach. I've realized that marking rubrics also need to evolve to reflect competency-based learning outcomes more accurately, which requires careful thought and adjustment."* · *"Need to find ways to encourage students to be more active in their learning activities throughout the trimester."* · *"One area that could be improved is having more time and training to fully adjust to the shift toward competency-based education (CBE). It's a significant paradigm shift, and at times, I find it difficult to differentiate between traditional teaching methods and the competency-based approach."*

Course content and relevance

Feedback on course content was mixed but improving. Learners overwhelmingly value the relevance of content and highlighted that materials were directly applicable to real-world jobs and kept up to date with industry trends. However, earlier cohorts pointed out issues like overlapping or repetitive content between modules and some course materials lacking depth or practical examples. Unlike pre-employment learners, these in-employment learners were expecting more depth and practical applications from the start of the program. With the feedback received, the program team addressed these issues, which likely contributed to the improved satisfaction scores in later trimesters.

Blended Self-Paced Learning Format

The CSM program's blended format (combining asynchronous learning with synchronous sessions) was appreciated for its flexibility but also came with engagement challenges. On the positive side, 93% of learners agreed that the self-paced online learning option was beneficial, and many praised the ability to learn at their own pace and convenience. Learners explicitly asked that flexibility be maintained. At the same time, participants highlighted the need for more structured interaction: some suggested including occasional time-tabled in-person sessions or live workshops for complex topics to support learning better.

The learners' request for more time-tabled in-person sessions surprised the program team. Initially, recommendations from the US CBE providers that we consulted suggested avoiding fixed schedules to reduce travel time, allow flexibility, and self-paced learning. However, Singapore's smaller size may make travel easier. In-person classes can help learners manage their study time and connect with peers, boosting motivation and engagement.

Success Coaching and Learner Support

Feedback on success coaching was generally positive, with many learners recognizing the motivational and emotional support provided by their success coaches. Several learners described their coaches as "helpful listening ears" who checked in on their well-being, encouraged perseverance, and provided timely reminders to manage study workload alongside personal and professional commitments. Learners also reported that success coaches worked with them to develop specific strategies to navigate the demands of asynchronous learning, including time management (e.g., creating time-tables), goal setting (e.g., identifying clear steps to meet their goals), and creating actionable plans. However, learner feedback revealed varying expectations and preferences toward success coaching. While some learners highly valued frequent, proactive check-ins, others appeared to prefer a more hands-off approach, engaging with their coaches only when needed.

Improvements made based on Learners' Feedback

To address learners' feedback regarding their challenges with workload, the support team introduced a dedicated session aimed at equipping participants with effective time management techniques and fostering a mindset suited to self-paced

learning.

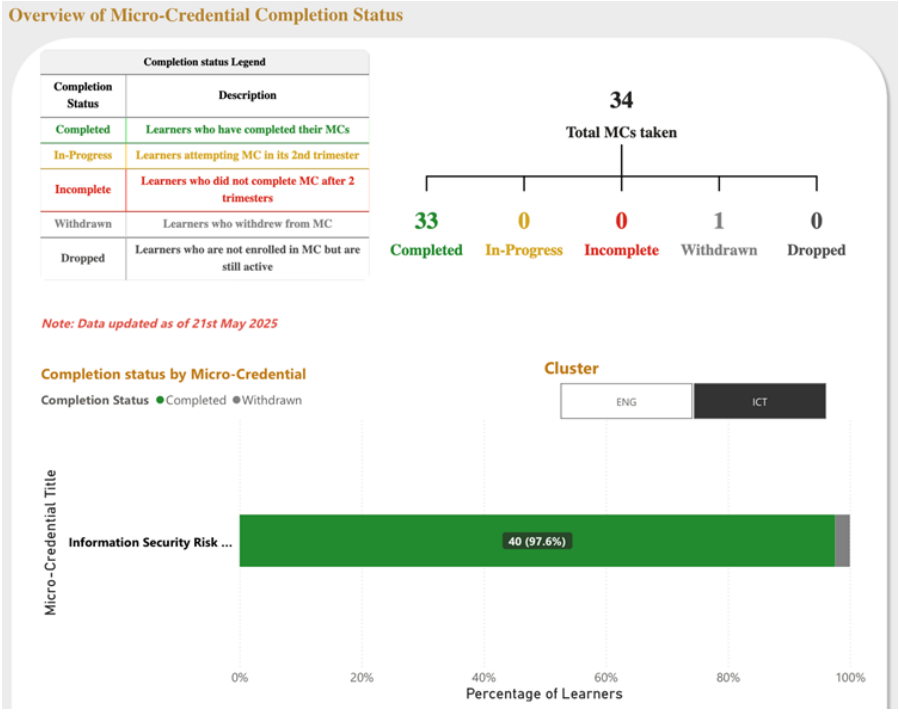
Comments showed that purely self-paced study can leave learners feeling less connected; they craved more opportunities for direct engagement with the instructor and peers. In response, the program introduced additional synchronous consultations and encouraged instructors to maximize the value of face-to-face workshops, which received high praise from students when they occurred.

Differing coaching preferences suggest that learners may require different levels of engagement and support based on their individual learning styles, confidence in adapting to a new environment, and self-management capabilities. As such, a flexible coaching model was adopted that offered both structured, scheduled touchpoints for those who prefer regular interaction and on-demand availability for more independent learners, better accommodating the diverse needs of the CSM learner population.

To make these learner insights actionable, a Program Dashboard has been developed for internal stakeholders. This dashboard visualizes key student metrics such as course completion and satisfaction trends. For example, as shown in Figure 1, it includes a snapshot of the completion status of micro-credentials (MCs), displaying the number of learners who have completed each MC, as well as those in progress and those who have withdrawn.

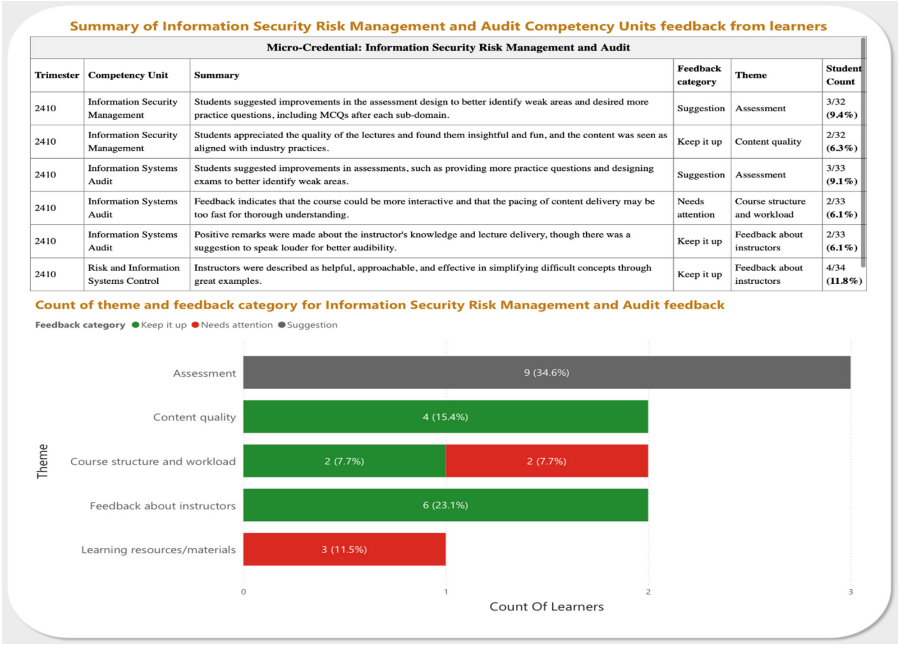
Figure 1

Program Dashboard showing Student Metrics



The dashboard also features charts of learner satisfaction scores over time and by micro-credential and competency unit, allowing the program team to quickly identify where improvements have had an effect or where further attention is needed. Qualitative feedback themes, as shown in Figure 2, are also summarized in the dashboard, giving instructors and program leaders a quick view of common learner concerns.

Figure 2
Dashboard showing Students' Thematic Feedback



By aggregating survey data in this way, the dashboard supports user-centric decision-making. For instance, success coaches can identify which students might need extra support (if their course progress is lagging), and instructors can pinpoint specific aspects of a module to refine based on student sentiment.

Triangulating Learner and Instructor Perspectives on CBE

Instructors generally affirmed the value and timeliness of adopting CBE, particularly for upskilling working adults. Their perspectives aligned with learners' appreciation for the practical relevance and flexibility of the CSM program. Instructors recognized that CBE supports industry-aligned learning by shifting the focus from traditional time-based progression to competency achievement, reinforcing what learners themselves cited as valuable: learning that is immediately applicable at work.

However, the triangulation of data between instructors and learners highlighted some challenges in effectively implementing CBE. While learners appreciated the flexibility of self-paced learning, both groups pointed to difficulties in maintaining engagement. Learners noted that fully self-paced study often left them feeling disconnected, expressing a desire for more direct interaction with instructors and peers. At the same time, scheduling regular synchronous classes proved problematic due to the competing demands of work and other commitments. Instructors also observed that many learners struggled with motivation and time management, echoing feedback about the pressures of balancing workload and study schedules.

Triangulated insights also revealed necessary and challenging shifts in instructor roles. This role evolution, from content deliverers to facilitators and mentors, was necessary to meet CBE's demands but introduced a significant workload in content development, assessment design, and learner support. These demands mirror learners' requests for more applied, engaging, and responsive learning experiences.

Instructors also flagged gaps in teaching resources and support structures. For example, requesting more support to manage project supervision or additional time for creating CBE-aligned materials. These operational realities triangulate with learner feedback that sometimes notes delays in content delivery or a lack of real-time support.

Unpacking Feedback from Employers

Skill Development and Relevance

Supervisors highlighted both technical and soft skill improvements of their staff. They provided concrete examples of how the learners applied new skills to their jobs. For instance, one supervisor described how an employee was instrumental in executing a complex data center migration project, leveraging the technical skills gained from a cloud computing micro-credential. Another common theme was increased independence and initiative, as managers observed that the employees were more proactive in tackling tasks without needing as much guidance. These qualitative observations align with the learners' self-reported gains in confidence and performance. It is promising that, from the employer's viewpoint, the CSM curriculum is indeed cultivating competencies that are relevant and immediately applicable at work.

Organizational Impact and Support

Importantly, supervisors are not just passive observers; many took active steps to facilitate their employees' learning. Common supportive actions included providing flexibility in work schedules (e.g., adjusting deadlines or allowing time off for study), granting access to company resources such as laboratory environments or data sets for practice, and assigning work tasks that align with the micro-credential content so that employees can apply new knowledge directly. This partnership from the employers' side has been crucial in enabling learners to succeed in the program while remaining productive at work.

Moving forward, the evaluation plan will gather further feedback from employers, focusing on aspects such as the program's overall effectiveness in enhancing em-

ployee skills and their satisfaction with observed professional growth. The next steps will involve conducting structured interviews with a wider range of industry partners to gather detailed insights. For example, how newly acquired skills are being applied in the workplace, the alignment of taught competencies with business requirements, improvements in both performance and soft skills, and the broader influence of the program on team dynamics and organizational capabilities.

Consolidating for Next Steps

The learners' journey has revealed the transformative power of micro-credentials within the CSM model. By equipping them with skills that are immediately applicable, the model has not only enhanced learners' confidence but also bolstered their role as proactive contributors within their organizations, as O´Tuama (2022) advocates, taking a broader view of learning capital in the frame of the lifeworld, that lifelong learning not only builds 'human capital' in terms of skills and capabilities but also 'seed' and 'identity' capitals as learners boost self-confidence and gain a positive view of their professional identity. As the university scales the CBE model to more programs, it is worth reflecting on the importance of lifelong learning and tailoring educational experiences to suit diverse learner personas, such as school leavers who may benefit from holistic development and a more structured learning environment. The question of whether stackable micro-credentials could effectively serve these full-time students remains a pivotal area for exploration. Understanding how best to meet the varied needs of different groups will ensure that the model remains relevant and impactful for all.

Instructors have played a fundamental role in the success of the CBE-driven micro-credentials, embracing innovative teaching methods and championing authentic assessments that align with industry requirements. Their willingness to adapt and reframe their approaches to education has laid a strong foundation for this transformative model. However, as the program scales, a larger change management effort will be required to inspire more educators to shift their teaching mindsets. Drawing on the experiences of pioneering instructors, those who took the courageous leap to adopt new practices could serve to motivate others within the faculty. As suggested by Prokes (2021), faculty must work together to improve their practice in teaching CBE. This collaborative environment should include mentorship and peer support to promote improvement. By fostering a culture of collaboration and continuous growth among instructors, the program could further strengthen its ability to deliver meaningful and industry-aligned education.

Employers have been pivotal partners in enabling the success of learners by supporting their professional and academic growth. Actions such as granting flexible schedules, providing access to resources, and aligning work tasks with educational content demonstrate a shared commitment to cultivating workforce-ready competencies. Moving forward, there is an opportunity to deepen collaboration with industry by incorporating their insights directly into curriculum design and competency articulation. As emphasized by works such as the Institute for Competency-Based

Education and the Lumina Foundation's studies on credential transparency (Institute for Competency-Based Education, 2023; Lumina Foundation, 2022), tools like comprehensive learner records and skills transcripts could help communicate learners' achievements more effectively. By refining how competencies are presented, these efforts can better connect learning outcomes to career advancement opportunities, strengthening the program's long-term impact.

Insights for Other Institutions to Consider

This pilot study offers valuable insights for institutions beyond SIT that are considering the implementation of CBE through micro-credentials. Although grounded in the SIT context, the findings carry broader implications for higher education providers aiming to deliver flexible and industry-relevant learning experiences. One key takeaway is the critical importance of robust learner support structures. While micro-credentials offer flexibility, this alone is not sufficient for learner success. The presence of success coaches, who provided motivation, timely guidance, and emotional support, proved essential in helping learners manage the competing demands of work, study, and personal commitments. Importantly, learners displayed differing needs in terms of the intensity and style of support they valued, suggesting that institutions should avoid a one-size-fits-all approach and instead design coaching and support systems that are adaptive and learner-centered.

The study also highlights the value of combining flexible delivery with structured engagement. Although self-paced learning was widely appreciated for its convenience, many learners expressed a strong desire for occasional synchronous face-to-face interactions. Scheduled live tutorials, in-person sessions, or collaborative workshops helped learners feel connected and supported, particularly when facing more complex topics. For other institutions, this suggests that effective CBE design requires more than just flexibility in pacing. It must also include deliberate structures that foster synchronous interactions between learners and instructors, promoting accountability and a clear sense of progress.

Employer engagement also emerged as a critical factor in program success. In this study, the most positive employer responses came from supervisors who had been actively involved in sponsoring learners, aligning job tasks with taught competencies, and supporting learning within the organization, highlighting the importance of initiating and maintaining ongoing dialogue with industry partners to ensure the relevance and applicability of micro-credentials. Institutions should not assume that employer endorsement will automatically follow. Credibility must be continually earned through clear communication of learner outcomes and consistent quality assurance.

The use of a data dashboard to monitor program quality and learner progress proved to be a powerful tool for continuous improvement. Other institutions may wish to adopt similar approaches to visualize learner feedback, course completion patterns, and satisfaction trends. These dashboards allow program teams and support

staff to make informed decisions, identify learners who may require additional support, and review instructional practices in a timely manner.

Limitations

One drawback of the study is the uneven response rate across various micro-credentials, which may have influenced the results and limited the ability to make broad conclusions. Furthermore, the number of employers who provided feedback was relatively low, which restricted the reliability of insights into employer views and the broader organizational effects of the CBE program. Some employers with neutral or less favorable opinions might not have shared their feedback. The same concern applies to learners and faculty (albeit to a lesser degree) because although response rates were higher in these groups, it is plausible that those who chose to respond were more engaged or positively inclined toward the program. This occurrence across stakeholder groups suggests a potential self-selection bias, where the findings may disproportionately reflect the perspectives of more motivated respondents rather than portray the full spectrum of experiences. These issues highlight the necessity for more extensive data collection in future evaluations to ensure a well-rounded representation of all micro-credential programs and a larger, more diverse pool of stakeholder input.

Conclusion

This pilot study highlighted CBE integrated with micro-credentials as a model for workforce-aligned higher education. Our evaluation of SIT's CSM program contributes to filling this gap by offering early insights into how learners, instructors, and employers experience such offerings. Micro-credentials within the CBE framework, especially when designed with stackability, robust support structures, and quality assurance, can enhance the reliability, validation, transparency, and recognition of learners' competencies (Ahsan et al., 2023; ENQA, 2023; eucen, 2024). As SIT's offering illustrates, they can serve both as standalone upskilling tools and as building blocks toward accredited degrees, meeting the demand for flexible, modular, and job-relevant education.

Going forward, broader and longitudinal studies are needed to assess long-term learning and employment outcomes. Importantly, such research should continue to triangulate perspectives across learners, educators, and industry, ensuring that CBE programs not only meet pedagogical standards but also deliver on their promise to transform learning into demonstrable and valued workplace competence.

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