Back to Basics? Facilitating the Recognition of Micro-Credentials in Ontario PSEs

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Abstract

Support for micro-credentials has grown significantly over the past year within Ontario post-secondary education (PSE). However, significant barriers remain to their widespread recognition both within and outside of PSE. This piece focuses on the indirect benefits associated with maximizing the recognition of micro-credentials within Ontario PSE, including the maximization of student interest, promotion of employer recognition, as well as mitigation of equity-related concerns. It outlines a set of tactics to facilitate the recognition of micro-credentials within the specific context of Ontario PSE, including amendments to the Ontario Qualifications Framework, the establishment of a fully transferable "common core" of micro-credentials, and the need for systematic empirical tracking. These topics are approached from the vantage point of transfer research and policy in Ontario.

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*Original Research Articles are papers that report on original empirical research with a focus on teaching and learning. Papers may be qualitative or quantitative and include an Abstract, Introduction, Method, Results, Discussion, and Reference section, as well as any tables and/or figures.

INTRODUCTION

Interest in micro-credentialling has skyrocketed in Ontario PSE (post-secondary education). The blistering pace of developments in this space make it difficult for even the keenest of specialists to keep up. Over the past few years, not only have we have seen eCampusOntario (2020) develop a framework to guide micro-certification initiatives in the province, but also several other distinct visions for micro-credentialling. These include Colleges Ontario (Davidson & Ruparell, 2020), College and Institutes Canada (2021), the Higher Education Quality Council of Ontario (Deakin et al., 2021) and the Ryerson-based Future Skills Centre (Chaktsiris et al., 2021). Perhaps most importantly, we observed the Ontario government fully embrace micro-credentials as a training solution by:

    i.   rendering micros eligible for funding via the Ontario Student Loans Program (OSAP); and,

    ii.   investing vast sums to improve micro-credential offerings (Government of Ontario, 2020).

These peak levels of interest in micro-credentialling should inspire much excitement in the PSE community, but also deep reflection on the challenges that lay ahead. It is important to remember that PSE is an incredibly obdurate field (Pizarro Milian et al., 2016), one that resists change and innovation despite positive affirmations we hear from college and university presidents, or politicians. Indeed, the widespread adoption and recognition of micro-credentials across Ontario PSE remains far from guaranteed (Pizarro Milian & Davies, 2020).

This piece addresses one critical problem that is frequently sidestepped by supporters of micro-credentialling or addressed only at a highly conceptual level (for an exception, see Gooch, 2020): the within-system recognition or "transferability" of micro-credentials. Here, the term transferability refers broadly to the recognition of micro-credentials awarded by one PSE organization by the rest of its peers within the system. This problem, solutions to it, and the broader arguments presented herein are approached from the vantage point of transfer credit research and policy in Ontario. In this adjacent sphere, policymakers and other stakeholders in Ontario continue to struggle to promote the recognition of courses across colleges

and universities, despite years of effort and strategic financial investments by the provincial government. Given this experience, and the relative novelty of micro-credentials in Ontario PSE, it is argued—as done elsewhere (Peppler-Beechey & Weingarten, 2021)—that micros will similarly struggle to achieve within-system recognition. This challenge is far from unique to Ontario. Indeed, Lockley et al. (2016) have noted within the Australian context that "most institutions do not currently provide credit for the sub-elements of a full subject/unit," and that changing this "would require major policy, system and cultural change" (p. 62). To help mitigate this situation in Ontario PSE, a set of plausible tactics to promote the system-wide recognition of micro-credentials in Ontario PSE are outlined.

The perspective presented in this piece contrasts the focus of contemporary discourse on micro-credentials, which concentrates on their "disruptive" potential and on ensuring maximum alignment with employer demands. Analysts at the Higher Education Quality Council of Ontario (HEQCO), for example, have argued for the primacy of maximizing the independent value of micro-credentials, painting efforts to promote within-system recognition or "stackability" as being of only secondary importance (Deakin et al., 2021; Pichette et al., 2021). Indeed, even one of the anonymous reviewers of this manuscript cautioned that its focus on transferability was out of step with current discourse, and reflective of the authors being in the "wrong ballpark!" However, as outlined through this manuscript, considering these goals as mutually exclusive is short-sighted given that maximizing within-system recognition can enhance the legitimacy of micro-credentials among employers, and facilitate the success of the broader micro-credentialling enterprise in Ontario.

ANALYTICAL APPROACH

There has been sustained interest in how the study of policy frameworks across other jurisdictions—such as Australia, the European Union, and New Zealand—could inform the development of micro-credentials in Ontario, and Canada more broadly (e.g., Chaktsiris et al., 2021, p. 14; Duklas, 2020; Presant, 2020). Policy innovations proven effective elsewhere could be emulated or transplanted to our province. However, there has been limited effort to draw on the experiences of adjacent policy spheres within Ontario itself, and in particular, the field of transfer, as a source of insight. It would be naïve to expect that policy borrowing—either across jurisdictions or policy spheres—could be straightforward or seamless. When policies are transplanted, they often mutate into forms that reflect their new environments (Cummings, 2003), and produce unexpected results. Despite

such complexities, Burdett & O'Donnell (2016) suggest that drawing on "lessons learnt from other contexts can, and should, be a powerful tool in the field of comparative education and policy-making" (p. 113). There is much to be gained from studying foreign policies, as long as one carefully considers how local cultures, histories and other factors influence their success in particular scenarios (Lingard, 2010, p. 132).

The piece thus approaches the within-system recognition of micro-credentials from the vantage point of credit transfer in Ontario, with the underlying assumption that the latter's longer history promoting the recognition of formal learning can inform strategies in the micro-credentialling space. Again, the operating assumption is not that a perfect blueprint can be drawn from the Ontario credit transfer experience—as existing structures in this sphere are far from perfect—but rather, that some degree of fruitful cross-pollination can occur between these fields.

A BRIEF OVERVIEW OF MICRO-CREDENTIALS

It is useful at this point to define what we mean by "micro-credentials." As colleagues at HEQCO (Pichette & Rizk, 2020) have recently observed, despite the furor with micro-credentialling, there is considerable ambiguity around the term (also see Academica Group, 2021, p. 11-12; Contact North, 2020). Based on a reading of definitions used across recent academic articles (e.g., Wheelahan & Moodie, 2021) and the "gray" literature, there appears to be an understanding that micro-credentials are signals representing smaller than normal units of learning. As Milligan & Kennedy (2017) outline, "micro-credentials focus on modules of learning much smaller than those covered in conventional academic awards, often allowing learners to complete requisite work in a matter of weeks" (p. 4, emphasis added). Algonquin College (2020) similarly defines micro-credentials as a "granular certification that an individual has mastered certain skills or competencies, earned through the completion of short and purposeful skills-based learning experiences" (emphasis added). The acquisition of the abovementioned knowledge can occur online, in-person, or via blended formats (Kato, Galán-Muros & Weko, 2020). The learning validated by micros can be evaluated through either formal, standardized testing or via the completion of course assignments or projects, and certified either via paper or digital credentials (Kato, Galán-Muros & Weko, 2020). In practice, many configurations exist, and more are likely to emerge as experimentation with micro-credentials continues.

Since their conception, micro-credentials have been heralded as a tool to "unbundle" traditional degrees, rendering the human capital contained within them more accessible to the masses

(Olneck, 2018). The broader vision is one of a shopping mall college or university, where individuals are granted "just-in-time" access (Kohler et al., 2021; Resei et al., 2019) to skills or knowledge without being subject to rigid admissions standards, faculty mandated course requirements, and other bureaucratic hurdles that must be endured in the pursuit of traditional "macro" credentials (e.g., diplomas, degrees). One of the great promises of micro-credentials is that students will be able to "stack" them into something bigger. At Humber College (2020), for example, it is proposed that students "may have the opportunity to combine individual micro-credentials to earn full credentials such as certificates and diplomas." To the south of Ontario, the State University of New York (2018) also accepts as one of its guiding principles that micro-credentials should "stack toward a registered certificate or degree" (p. 5). By serving as a gateway credential to higher learning, it is normally expected that micros could augment access to traditionally exclusionary PSE systems.

A system of more granular signals of skills is depicted by many as facilitating the efficient matching of jobseekers and employers (Hope, 2017). The broader context is that markets are now saturated with PSE graduates, but growing homogeneity in their credentials makes it difficult for employers to screen based on workplace competencies. As Peck et al. (2016) argue, within this scenario, rather than "relying on the sparse information of college transcripts and perhaps inaccurate information from references, a set of digital badges could give an employer a clear idea of what skills and employee brings to the table" (p. 90). Others similarly argue that micro-credentials can paint a "well-rounded picture of knowledge and competencies that resumes and degrees do not reflect" (Alliance for Excellent Education, 2013, p. 8; also see Lockley et al., 2016, p. 59). Barabas & Schmidt (2016) perhaps put it best when they suggested that:

The more fine-grained these signals get, the less they look like "credentials," per se, and the more they look like a corpus of data that can be processed in novel ways to yield insights into workers' abilities and potential. (p. 6)

Some within PSE (e.g., McCowan, 2017; Lewis & Shore, 2019), of course, opine that the "neo-liberal" unbundling of traditional credentials in this manner may be dangerous or problematic for an array of reasons. Two contrasting and prominent arguments have been raised thus far about their impact on social inequality. On the one hand, some fear that already disadvantaged learners may be disproportionately encouraged to forego traditional certifications, and streamed into "untested" micro-credentials (Kift, 2021, p. iii). In this account, micro-credentials may become the new "basement" of PSE and training:

The poor, unemployed, older, disenfranchised, racialized and other marginalized students will get a micro-skill that comes with a built-in glass ceiling, while privileged students get a more thorough, transferable education. (OPSEU, 2020)

At the other end of the spectrum, others worry that, should micro-credentials become a "reliable path" to broader credentials: "they might become 'weaponized,' with a specialized support industry growing to advise well-resourced students about the 'best' badges for college admission" (Fishman, Teasley, & Cederquist, 2018, p. 15). Irrespective of whether micro-credentials become highly valuable symbols or not, alarms have been raised about their ability to feed into social stratification processes.

Though debate ensues about the benefits and drawbacks of micro-credentials, their recent endorsement by the Ontario government as a vehicle through which to provide expedited re-training means that efforts to streamline their development and adoption across the province will be "turbocharged." Nevertheless, there are basic questions about their within-system recognition that remain unsatisfactorily addressed in either policy discourse and, given the recency of these developments, the academic literature.

THE PROBLEM OF RECOGNITION

The way that micro-credentials could interface with, and come to mirror, employer needs has attracted extensive attention within academic and policy documents. Recent micro-credential pilot projects funded by both eCampusOntario and the Future Skills Centre have also been guided by a strong ethos of cross-sector collaboration, including intriguing collaborations between PSE organizations and employers from various industry and community sectors. As such, there is little question about the potential for micros to be synchronized with, or tailored to meet, employers' evolving training needs.

Far less attention has been directed at the mechanisms that could ensure that micro-credentials—and the learning they represent—will be recognized across PSE systems. This remains true even though manufacturing "collective belief" in micro-credentials among consequential stakeholders, including administrative staff, faculty, and students, has been described as a "wicked problem" by experts in the field (Grant, 2016, p. 91-92). At the time of writing, the non-recognition of traditional courses is a well-known problem across many provinces in Canada (Pizarro Milian & Munro, 2020), and a large collection of American states (Giani, 2019; Jenkins & Fink, 2015; Simone, 2014; United States Government Accountability Office, 2017). Research on this topic is quite clear: most students that transfer during their PSE journeys experience some degree of credit loss. Given these priors, there is

no reason to believe that micro-credentials will fare any better in the absence of adequate policy efforts to ensure their recognition. Indeed, scholars have repeatedly observed that more applied, skills-oriented training—such as that typically signaled by micro-credentialling systems—is given "short shrift" during transfer credit assessments, "counting as electives at best or not at all at worst" (Book, 2015, p. 201-202).

Why is this a problem? There are several reasons why the recognition of micro-credentials across PSE should be of import to those spearheading their development. First, full recognition can help to maximize student interest in micros. If the goal of the micro-credentialling movement is to go "mainstream"—attracting the average college and university student, and not just a segment of mature students needing to quickly up- or re-skill—then work done towards acquiring micro-credentials needs to count towards the total number of credits required for a macro credential. This ensures that micros are perceived not as a detour from the pursuit of macro credentials that currently dominate the market—requiring additional time and tuition—but rather, as a built-in component of existing pathways. This design decision renders micro acquisition as a pathway that produces no additional resistance.

Some have argued that one solution to achieve this outcome would be to build groups of domain-specific micro-credentials into degrees, such as an assortment of "badges" for programming languages (e.g., Java, Python) into computer science programs (LaMagna, 2017). This is something that colleges and universities have experimented with (Zanville, Porter, & Ganzglass, 2017; Prebil & McCarty, 2018). However, such strategy will not be maximally effective if students know that the work done towards acquiring those credentials will not be recognized at other organizations. To have "currency", micros "must be recognised and accepted beyond the issuing institution" (Lockley et al., 2016, p. 62). Data from the U.S. tells us that roughly a third of students transfer to a second organization within six years of enrolled in PSE (Shapiro & Dundar, 2015). In Ontario, recent reports suggest that roughly 8% of students transfer within the first two years of study alone (Zarifa et al., 2020). If students who intend to transfer—be it from college to university, or in another direction—fear that credits earned through micro-credentials will not carry over, this will serve as a very strong disincentive to their uptake. The same is true if micro-credentials will not be formally recognized by graduate, law, and other professional schools during admission decisions.

Second, ensuring the recognition of micro-credentials across PSE also serves to maximize their legitimacy in the eyes of prospective employers. An intriguing feature of credentials as labor market signaling devices is that their value is determined not just by the utility of the human capital they represent, but by the institutions that endorse them (Craig, 2015; Willis III et al., 2016). Even then, establishing trust in a new credential category is a difficult exercise (Barabas & Schmidt, 2016). Increasing the number of educational organizations that formally recognize a micro serves as useful strategy to signal to employers that it is indeed trustworthy. Indeed, if there is no mutual recognition of micro-credentials among colleges and universities within the same province, what does this implicitly signal to employers about their quality? As an example of the strength of mutual recognition, consider this hypothetical: a small northern Ontario college could certainly develop a micro-credential in an area of expertise (e.g., mining, forestry) that becomes widely recognized by regional employers. With some time, if they excel in such training, the recognition of this hypothetical micro-credential could spread even further. Now, consider an alternative scenario, where a network of colleges across northern and rural Canada collaborated to develop a state-of-the-art micro-credential in the same area, developing a consistent and expedient training program that is fully transferable, and carrying the endorsement of each of their institutional brands. Which of the abovementioned micro-credentials is most likely to carry greater currency among employers?

Equity is the third reason why the within-system recognition of micro-credentials across PSE should be pursued vigorously. It is unlikely that, if micro-credentials become widely offered across our PSE system, they will be perceived as equivalent to traditional credentials by either students or employers. History shows us that whenever a new organizational type, credential or other innovation has been introduced to PSE, as a rule, it has been subordinating to pre-existing alternatives. This was true for American community colleges (Brint & Karabel, 1991), for-profit colleges (McMillan-Cottom, 2017), online universities (Davies & Zarifa, 2012), and other notable upstarts. In each of the abovementioned cases, we saw that it was primarily students from traditionally marginalized groups that flocked to the new seats created by these less lucrative options, at times with less than desirable academic and labor market outcomes. Obviously micro-credentials in Ontario are a qualitatively distinct case, as they will be offered by reputable actors. But, at the same time, there is no evidence even mature students will pursue untested micros as opposed to enrolling part-time in a post-graduate certificate or master's degree offered by the same organization.

In the event that micros eventually become a second-tier track within our system, it is of the utmost importance that students who take them have the ability to apply the learning

and academic credit accumulated through them to conventional macro-credentials. This will ensure that these students do not face unnecessary barriers to advancing their education. Such rationale has long been used within the field of transfer research and policy to justify the construction of pathways between the community college and university sector.

SOME STRATEGIES TO PROMOTE RECOGNITION

If the within-system recognition of micros can maximize student interest, legitimacy, and equity, then it is incumbent on developers of micro-credentialling programs within PSE organizations and other stakeholders to do the work required to render micros as widely recognizable as possible. To this end, the next sections of this manuscript outline a series of tactics constituting part of a broader policy strategy to maximize the recognition of micro-credentials in Ontario PSE. This strategy is grounded in part in knowledge of policy innovations and practices that have worked (and failed) in achieving the transferability of course-based credits and programs in Ontario and other jurisdictions (Missaghian, 2020). We hope that raising these strategies kick-starts more inclusive discussions of this topic within the Ontario PSE community.

RECONFIGURING THE OQF

Qualification frameworks typically outline the knowledge or competencies that PSE programs at various credential tiers are designed to provide learners. The Ontario Qualifications Framework outlines this information for a range of credentials offered across all sectors of the provincial system, including public colleges and universities, private career colleges and Indigenous institutes. A key function of the OQF is that it provides the foundation for quality assurance, ensuring that credentials adhere to the same standards regardless of where they are offered (Ontario Ministry of Colleges & Universities, 2020). Inclusion in the OQF facilitates an objective comparison and mapping of credentials, and thus, the fair evaluation of equivalencies between units of learning during transfer credit decisions.

At the time of writing, micro-credentials are not included in the OQF (Gooch, 2020), nor does there appear to be a concerted effort to push for their inclusion (Usher, 2021). This produces considerable ambiguity as to what type or amount of learning they actually represent and will arguably serve as a significant barrier to their formal recognition across PSE organizations. This could lead to unpredictable results during routine processes, such as transfer credit assessments and other evaluations of transcripts for various organizational purposes (e.g., graduate admissions).

Inclusion in the OQF would clear up a lot of this haziness about what micros are, as it would provide evaluators with a basic understanding of how they relate to existing and recognized credential categories.

Using the most basic and objective criteria available—instructional hours—it is possible to assess whether any existing categories in the OQF could incorporate micro-credentials. Let us first recall that micros are intended to be completed expeditiously, in a matter of a few weeks (see Milligan & Kennedy, 2017). While the Commonwealth of Learning suggests micro-credentials can be anywhere from one to 100 hours in length (COL, 2019), other sources highlight that they tend to be much shorter. McMaster University's (2020) Faculty of Engineering recently defined micros as encompassing nine to 12 hours of learning. This was rationalized as the equivalent of taking 3 hours of learning every week, over a three-to-four-week period. Looking at the OQF, there is only one credential category below the 100 instructional hours mark: The Certificate 1, which requires at least 40 instructional hours. The next longest credential, Certificate 2, requires at 240-500 instructional hours, and would exceed the definition of what most would deem as "micro". The province could move to formally designate Certificate 1 as the category that micro-credentials fit under within the OQF. Further amendment would also be required to allow all institutional types in Ontario to offer the credential, as it is currently set aside for private career colleges and Indigenous institutes. That, or there could be an introduction of a shorter micro-credential category into the OQF, consisting of less than 40 instructional hours. Either move would facilitate the comparison and recognition of micro-credentials, via the standardization of the credential.

This focus on formal categorization may appear superficial, bureaucracy-driven, or even pedantic to some. However, decades of sociological and organizational theorizing demonstrate that social categories are essential to how individuals make sense of their surroundings (Lamont & Molnar, 2002). And, in particular, how they make status distinctions (Delmestri & Greenwood, 2016). The latter are particularly important within PSE, where meaning and value are often attributed to credentials based on their associated organizational brand, and quite independent of any objective criteria (Brankovic, 2018; Pizarro Milian, 2017). Such status distinctions also eventually bleed into the labor market, with perceptions of credentials and their cultural significance fundamentally shaping employer recruitment and hiring practices (Rivera, 2015). All this to say: micro-credentials cannot be left in the ether and should be formally included in the OQF if they are to achieve wide recognition within the PSE system.

Ontario would not be innovating in following this course of action. Indeed, New Zealand has already introduced micro-credentials into their qualification framework, and similar discussions have taken place in other jurisdictions (Selvaratnam & Sankey, 2020; Wheelahan & Moodie, 2021).

ESTABLISHING A "COMMON CORE"

Having established general parameters around what micros should look like, via formal inclusion in OQF, groups of system stakeholders could then work towards the development of a "common core," meaning an agreed-upon batch of micro-credentials that transfer seamlessly across segments of the PSE system. This is a strategy that has worked in numerous American state systems to ensure full recognition of course-based credits (Logue, 2017), and typically relies on strong government leadership, endorsement, and enforcement. However, in the absence of a central entity that could legally mandate a common core in Ontario, this work would require an extensive amount of collaboration and consensus-building across our system. There is no precedent for this level of collaboration in the Ontario transfer system, where articulation agreements are typically bilateral, and when multi-lateral, tend to include only a subset of the system's colleges or universities.

One potential avenue through which to push this work forward would be for the provincial government tap existing hubs, such as the Council of Ontario Universities (COU) or Colleges Ontario (CO), to facilitate discussions for the development of an initial set of university or college sector specific micros. Breaking discussions down further, and starting even "smaller", could entail focusing on specific program areas within sectors, such as business or nursing. Within the college system, the Heads of Business group has been successful in establishing one of Ontario's most wide-reaching articulation agreements, ensuring the transferability of business courses across the province's colleges (see ONCAT, 2020). This agreement could provide a template for the development of a set of fully transferable, business-related micro-credentials in the college sector. Another avenue at the discipline level could entail using professional bodies or accreditors, such as the Chartered Professional Accountants (CPA) or other groups, to design and endorse the adoption of a particular set of professionally oriented micro-credentials.

An important consideration, given the collaborative and labor-intensive nature of the approach proposed above, is how to prioritize the development of micros across areas. Rather than letting all interested stakeholders run off to develop their own set of micro-credentials, it may be prudent for the provincial government to prioritize areas with demonstrated industry demand. Research on the demand for industry certifications—arguably the closest conventional certification to micro-credentials—suggests that their demand is far from even. As a Burning Glass (2017) analysis of 700 million job advertisements found, the top 50 industry certifications accounted for roughly two-thirds of all those requested on job advertisements. Moreover, the demand for certifications varied significantly across job categories, from 2% of job ads related to sales positions to 18% in business and financial operations. The same could be true for the distribution of demand for micro-certifications, though more research is needed in this space. Once high demand is identified, government support for micro-certification development, including both financial support and formal endorsement, should be highly targeted.

EMPIRICAL TRACKING

In a scenario where micro-credentialling enjoys the sustained support of the provincial government and other system stakeholders, and where they eventually proliferate across our system, empirically tracking their evolution would afford multiple benefits—which we highlight below. These benefits would be amplified if micro-credential development remains a decentralized process—spearheaded by colleges and universities—rather than centrally orchestrated effort, by either the provincial government or one of its agencies.

From a purely administrative standpoint, formalizing the within-system recognition of a micro-credential requires an articulation agreement identifying its equivalency with another micro, or between the focal micro and other units of learning (e.g., course credits). Establishing this equivalency requires a formal evaluation of curriculum documents (e.g., course outlines) by faculty members at each of the institutions covered by the agreement (Missaghian, 2021). At the moment, a key barrier to articulation involving micros is there is limited public information about them. Indeed, the recently created database of Ontario micro-credentials setup by the provincial government offers no details beyond a short title and duration. Nor does it link to any website containing said details or provide contact information for individuals associated with these micros. Given this paucity of information, it would prove very difficult for faculty member tasked with evaluating a micro for transfer credit to make an informed decision. This sets the table for significant credit loss, with work done towards the achievement of micro-credentials likely not counted towards the completion of macro-credentials. One way to overcome this information problem would be for all micro-credentials (and associated information) to be included in the

provincial government's database. This is a solution which should have been implemented long ago in Ontario for course outlines, to support transfer credit assessment.

Beyond a central database for administrative purposes, it would also be important to develop the adequate data infrastructure to track what students are completing micro-credentials. This information would be useful for two primary reasons. First, to track student demand for, and satisfaction with, micro-credentials, intelligence which could in turn inform augmented offerings across topic areas. Second, data identifying completion of micros could be incorporated by colleges and universities into cyclical reporting for Statistics Canada's Postsecondary Student Information System (PSIS), which is tied to tax records and an assortment of other administrative datasets. At this point, there is no solid research which ties micro-credentials to improved labor market performance (Boud & St Jorre, 2021). And the little research that does exist suggests that their perceived value is lacking (Grant, 2016, p. 99). As such, it is unclear what labor market value they provide. Systematically tracking and quantifying the returns to micro-credentials could go a long way towards legitimizing micro-credentials as an essential component of the credential ecosystem (Gander, 2016, p. 81-82).

A NOTE ON INDUSTRY-BASED MICRO-CREDENTIALS

Up to this point, we have focused on the recognition of micro-credentials across colleges and university. This discussion has generally excluded the large swath of micro-credentials that have been developed and offered for some time by corporations, such as Microsoft, LinkedIn, and IBM. There are many challenges to the full-scale recognition of industry-based micro-credentials in PSE, given the sheer diversity that exists across the former (Kato & Weko, 2020). Existing models for establishing equivalencies between industry-based micro-credentials and the course content offered by PSE organizations require extremely labor intensive, bi-lateral articulation. For example, Leaser et al. (2020) discuss a collaboration between Northeastern University and IBM, whereby these two entities established an articulation agreement between a set IBM's digital badges and a Northeastern professional M.A. program. This arrangement allowed individuals with IBM digital badges to receive credit if they enrolled in the Northeastern program. There have also been suggestions that institutions like Elon University are developing the registrarial architecture to establish equivalencies between micro-credentials and

conventional courses (see Parks, 2019). As these efforts move forward, one expedient way to proceed in establishing more equivalencies between industry-based micro-credentials and PSE programming may be for colleges and universities to rely heavily on plausible or indirect equivalencies. For example, peers of Northeastern could work backwards from the courses that institution determined were equivalent with IBM's badges, and assess whether they currently recognize such courses as equivalent to their own. This could expedite their own articulation efforts with IBM, as it would eliminate ambiguity about the prospective equivalencies. The approach would ensure that the energy expended by first-movers like Northeastern can inform future articulation between its interested peers and entities like IBM. However, even such efficiency-minded efforts to establish equivalencies between PSE and industry training may prove too slow and cumbersome over the long term. It is questionable whether articulation could keep pace with rapid micro-credential development within industry. At a system level, it may prove most efficient for colleges and universities to simply embed popular industry-based micro-credentials into their programs, rather than attempting to articulate existing courses to micro-credentials.

CONCLUSION

Micro-credentials offer an exciting solution to many pressing societal problems, expanding access to PSE training, providing signals for more efficient labor markets, and expedited training in high-demand areas. Given the momentum that micro-credentials have built over the last year, it appears that they may be well-positioned to disrupt Ontario PSE in the coming decade. In doing so, they may succeed where other technologies like online learning, MOOCs and others have failed. Nevertheless, there are many challenges on the path to their widespread adoption. This piece has emphasized that their recognition and transferability across PSE is not guaranteed, and that a lack of within-system recognition threatens the emergence of micro-credentials as a legitimate option in the eyes of students, employers at large, and has strong equity implications. In turn, a set of innovative tactics and policy reforms that could be employed to facilitate their recognition across Ontario PSE have been outlined. This includes the amendment of the OQF, and the development of a fully transferable "common core" of micro-credentials. Alone, such developments will not entirely solve the recognition problem for micro-credentials. However, they constitute initial steps that could dismantle key barriers as the province attempts to introduce micro-credentialling into the PSE system.

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