Calgary Learning System Audit

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LearningCITY

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EXECUTIVE SUMMARY

Objective

Calgary is a community in transformation: a community facing unprecedented changes to how we live, work, and learn. To thrive in the face of these changes, we must find new ways to recognize, retain, and — most importantly — develop the skills we need to lead us into the future. We must become a city that develops our community's skills better and faster than anywhere else in Canada.

To meet the ever-increasing pace and scope of change, we must establish a *learning system* that is as dynamic as every Calgarian. This learning system must foster Calgarians' specific skills needed to succeed in various professional fields. It must also support the broader skillset that helps us cultivate our adaptive capacity in the face of several demands: shifting societal, technological, economic, and environmental forces. Adaptability is one of the most defining skills needed today.

A community's adaptive capacity is anchored in the ability of its citizens to meet increasingly dynamic demands for new skills.[1] At the root of adaptation is learning. To become a community that adapts, Calgary must become a community that learns faster and better than others.

Over 12 months, *Calgary Economic Development* completed a comprehensive audit of Calgary's learning system. This audit builds on the initial 2020 report entitled, *Calgary on the Precipice* and is a foundational element of Calgary's economic strategy, *Calgary in the New Economy*.

This audit project comprises three separate, but complementary studies:

Study 1 analyzes 12 months of Calgary-based hiring data (N=13,510) to isolate current and emerging priority skills.

Study 2 analyzes the most recent *Statistics Canada* data on Calgary's existing base of skills, including postsecondary completion rates and fields of study.

Study 3 analyzes existing certified and non-certified programming currently offered by Calgary's learning system.

Key Insights

A Community Challenge

Calgary has a vast learning system incorporating 3,063 organizations, delivering 30,870 programs across the for-profit, non-profit, and public sectors. In the system, 75% comprises for-profit and non-profit organizations, and three-quarters are headquartered in Calgary. Only 17% of the system is directly within the provincial domain. The result is a highly fragmented system that lacks both a shared purpose and the underlying mechanisms essential to optimizing these thousands of experiences into a harmonized system. Therefore, local community leaders have the accountability to transform these thousands of isolated experiences into an integrated community system with a shared purpose.

The Legacy Impact

Calgary's learning system has been optimized to support oil & gas and associated sectors. This has several direct and indirect implications on the learning system:

- ***Lags other Cities:*** Largely due to a historically weak relationship between income and education in the oil & gas sector, Calgary's labour force, though highly educated, lags other major Canadian cities in overall postsecondary credentials.
- ***Compensation Premium:*** Calgary has the highest proportion of STEM (science,

technology, engineering, and math) graduates in Canada. However, this is more accurately defined as E-STEM (energy-related STEM). This sectoral expertise can be traced to a premium paid for those in this sector, which then cascades to a premium paid to roles outside of the sector who must compete for this talent. This premium is a structural barrier for individuals to invest in skills required to transition into a new sector.

- ***Adaptive Capacity:*** Our community's strength in E-STEM contributes to a large gap in professional areas related to arts, design, communications, social services, humanities, and social sciences, including psychology, marketing, and economics. These fields provide an essential foundation for developing the enabling skills that anchor adaptive capacity. [2]
- ***Internal Learning Capacity:*** At 25%, Calgary has the lowest proportion of major cities of those attaining their credential in the current province in which they reside. Concurrently, Calgary has the highest proportion of citizens who completed their credential in another province or region. This reflects both the large inward migration of talent over the past two decades and a dependency on other regions to develop the community's skills. With evidence of a decline in inward migration from other Canadian provinces, Calgary faces increasing pressure to adapt the current community-level learning capacity to close the gap between our community's current base of skills and emerging demand outside the oil & gas sector.

The Future is Horizontal

The skills with the highest demand by employers are those that provide the maximum adaptive capacity – enabling and functional skills. Both enabling and functional skills run horizontally across the economy providing the maximum agility to individuals and organizations. In contrast, demand for sectoral expertise is dependent on macro-economic factors which expose individuals (and more broadly the city) to externalities. Moreover, individuals who define their professional identity as anchored to narrow sectoral expertise face the daunting task of redefining themselves in periods of weak demand. However, the audit found a learning system is not optimized to deliver adaptive capacity.

Enabling Skills Gap: These are foundational skills and enable individuals to transition across various contexts (e.g., problem-solving, collaboration, communication). The skills demand audit found that the demand for enabling skills is two times that of job skills. However, it also found that Calgary lags in the explicit development of enabling skills. This includes areas related to listening, numeracy, and adaptability, highlighting an opportunity to increase the explicit development of enabling skills.

Functional Agility: Job skills separate into two sub-groups: sectoral expertise and functional skills. Sectoral expertise is the application of skills that are unique and valued at a sector level. In contrast, functional skills are skills associated with a job-specific task (e.g., accounting, welding) and valued across sectors and organizations. The skills demand audit identifies that the demand for functional skills is between two to seven times that of sectoral expertise.

The Certification Opportunity

This audit found that over 80% of programs do not have a path to certification. Moreover, skills certification in Calgary is limited to educational and professional certifications. This lack of skills certification acts as a systemic barrier to facilitating increased economic mobility in historically marginalized socio-economic groups.[3]

The Incumbent Advantage

Adaptive skills are anchored in highly personalized purpose-based learning. Purpose-based learning puts the individual at the centre. However, this audit highlights structural barriers to adopting purpose-based learning. The vast collection of programming in Calgary is best characterized as the internet before Google. The content individuals are looking for may exist, but it is impossible to locate efficiently. Instead, Calgarians are confronted with infinite programs that may or may not align with their learning goals. No consistent or structured navigation tool exists to efficiently compare learning opportunities relative to goals. Moreover, this audit found that the majority of programs do not articulate a defined audience, making it difficult for individuals to understand how it may align with their needs. In addition, the results suggest

that few new Calgary-based skills developers have launched and been sustained over the past decade. This may result from a structural advantage for incumbents (e.g., colleges) as individuals face a web of thousands of learning opportunities. The result may be that individuals are attracted to an incumbent as a "safe haven," rather than the upstart skills innovator.

Recommendations

System Alignment

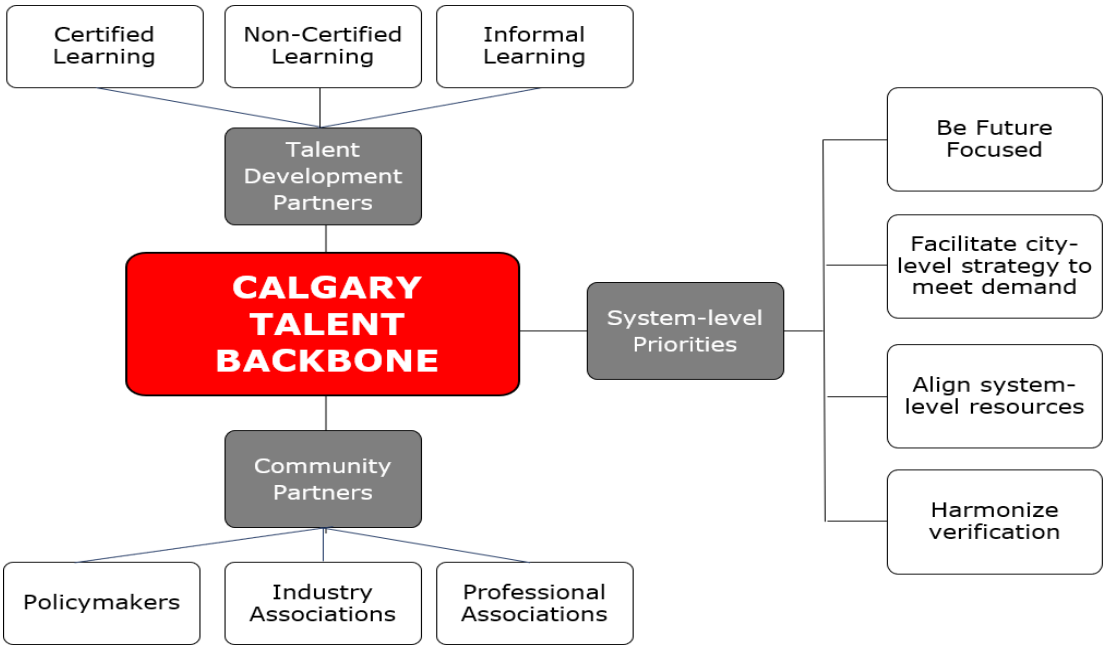
A learning system that is optimized to deliver on community-level priorities requires high-level alignment between diverse stakeholders, including employers, policymakers, and skills developers. This optimization starts with developing and articulating a shared purpose anchored in *Calgary in the New Economy*. As such, there must be intentional processes to advance harmonization, collaboration, innovation, and shared learning across the complete learning system.

To facilitate this, the audit team recommends establishing a community talent backbone organization accountable for developing, acquiring, retaining, and mobilizing talent to deliver on the defined goals of *Calgary in the New Economy*. The project team proposes that this organization be led by the Chief Talent Officer and mandated to optimize the conditions for talent attraction, retention, and development. This includes developing a skills demand forecast to deliver on *Calgary in the New Economy* and a system-level strategy to meet this demand.

Develop and Pilot Mechanism to Certify Priority Skills

To create a more agile and inclusive labour market, the audit team recommends Calgary introduce a consistent skills certification system: *Trusted Skills*. *Trusted Skills* will be decoupled from the learning process and offer the potential to complement certified skills developers while recognizing the potential role that non-certified and informal learning play in the system.

The principle of decoupling learning processes from skills certification is widely recognized today. This includes skills ranging from accounting to skilled trades to motor vehicle licensing. Thus, the legitimacy of the credential granted (e.g., Chartered Professional Accountant designation) is rooted in the quality and rigour of the certification methods and the potential for ubiquity across the community's learning system.[4] A pilot of *Trusted Skills* will be conducted in 2022.



Proposed Calgary Talent Backbone

Prioritize Enabling Skills

To accelerate the adaptive capacity of our labour force, the audit team recommends the prioritization of enabling skills. The system should move to adopt a harmonized enabling skills framework (e.g., Competencies for Life*)* and associated certification.

Facilitate Purpose-Based Learning

The development of an individual's adaptive capacity is accelerated through purpose-based learning. Purpose-based learning prioritizes exploration, experimentation, and values diverse learning experiences across the certified, non-certified, and informal system.

Although our audit identified 30,870 different programs, serious structural barriers remain for individuals to leverage the full system. To overcome these barriers, Calgary must develop open and ubiquitous digital tools (e.g*., My Future YYC*) to facilitate exploration and experimentation. These would include tools to support the development of a personal and professional mission, which embed the capacity to navigate and identify learning paths that align with their mission.

SECTION 1: PROJECT SCOPE

Calgary in the New Economy

The global labour market is undergoing a seismic shift driven by the intersection of two dynamics: a disruption and realignment of traditional sectors and industries and the automation of many roles through artificial intelligence and machine learning. The result is that a modern workplace demands individuals who can live with uncertainty, adapt to new roles, and develop new skills quickly.

In 2018, Calgary city council unanimously approved a new economic strategy for our community (Figure-1).[5] Facilitated by *Calgary Economic Development*, *Calgary in the New Economy* called for an adaptation to the emerging economic landscape by strategically diversifying the economy — this kind of call isn't new. In fact, questions about *what* Calgary should become have been debated for decades. However, the 2020 report *Calgary on the Precipice* by the *Institute for Community Prosperity* and *Calgary Economic Development* raised a more fundamental question: *how* does Calgary adapt?

The accelerating transformation of the global energy market and the structural impact of the pandemic are contributing to seismic economic and social change in Calgary.[6] The historical demand of the oil & gas sector for skilled labour led to Calgary having the highest concentration of high-tech workers in Canada and the second-highest number per capita of small businesses and self-employed individuals in the country.[7] Moreover, Calgary ranks as the third-highest city in Canada for the proportion of university degrees awarded to the population.

Yet, these numbers can be misleading, as Calgary's skills are heavily concentrated in oil & gas. For example, Calgary does possess the highest proportion of Science, Technology, Engineering, and Mathematics (STEM) graduates in Canada.[8] However, as this audit demonstrates, this STEM expertise is heavily concentrated in oil & gas exploration and development, or E-STEM. Since 2014, the demand for oil & gas sectoral expertise has transformed dramatically. For example, the annual employment growth rate in Alberta between 2000 and 2014 at 2.9% is twice the national average but declined between 2015 and 2019 to -1%.[9]

It is forecasted that demand for E-STEM sectoral expertise will be displaced by demand for functional skills in other STEM areas, such as artificial intelligence and data science. Total employment in these two areas is projected to surpass 77,000 in Alberta by 2023, doubling the employment growth rate of all other fields.[10] However, the proportion of Calgarians with functional skills in areas related to software and data science is less than half of other major Canadian cities.[11] Moreover, *Calgary Economic Development* warns that half of the jobs performed by Calgarians today could be at risk of automation over the next 20 years.[12] *Calgary on the Precipice* highlighted this risk, as did the *Business Council of Alberta*, in their report, *Skilled by Design: A Blueprint for Alberta's Future Workforce*. The result is that Calgary paradoxically faces both a skills surplus and skills deficit.[13]

This mismatch of the supply and demand of high-impact skills is not limited to Calgary or Alberta. The *World Economic Forum* reports that 75 million jobs have been displaced across the leading twenty economies, while 133 million new jobs have been created in nascent sectors. Estimates suggest that 1 billion people will need to be reskilled before 2030.[14] Not surprisingly, 91% of human resource decision-makers view an

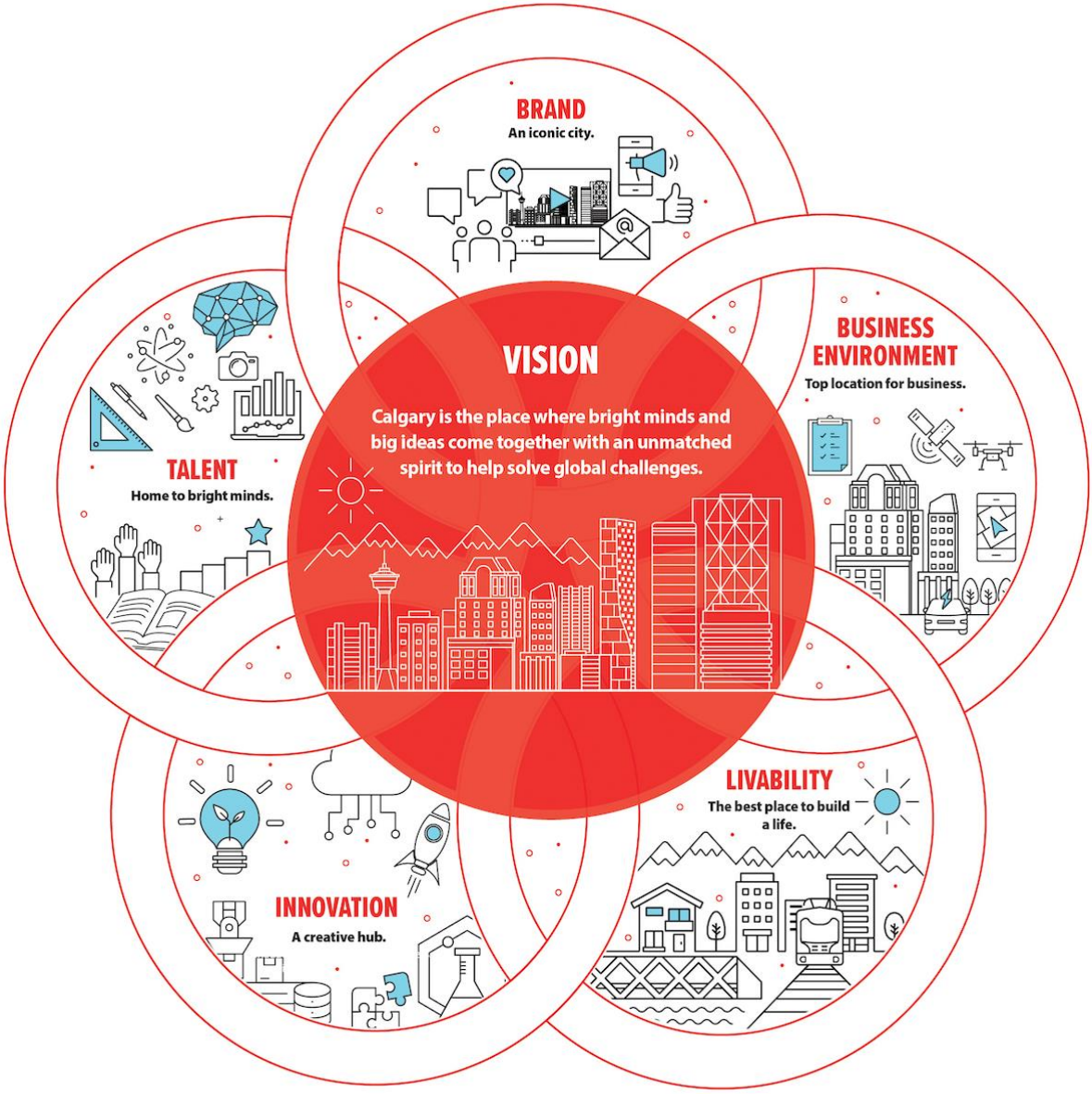


Figure-1: Calgary in the New Economy

employee's ability to adapt as a critical skill.[15] As such, employers are demanding individuals who possess the capacity to live with uncertainty, adapt to new roles, and develop new skills quickly.[16] These skills transcend industries and professions. If there were a defining skill in the next decade, it would be adaptability.

Calgary in the New Economy confronts this question directly by recognizing that Calgary will only adapt when its citizens do. *Adaptive capacity* is the ability to anticipate systematic changes and proactively reconfigure existing resources, or acquire new resources, to maintain a competitive advantage.[17] Whereas *resiliency* presumes dominance of the external environment over the individual or institution, adaptive capacity posits that the individual or institution maintains agency.[18] Adaptable people can adjust to the dynamic context of the world today. This skill can be reactive, like adjusting to working and living during a pandemic. However, adaptability can also be proactive and intentional, characterized by anticipating change and planning our response.

A community's adaptive capacity is anchored in its labour force meeting increasingly dynamic

demands for new skills.[19] Moreover, increasing labour uncertainty forces individuals to rigorously maintain currency within their field or pivot to new fields.[20] Thus, as a community, our challenge is to develop citizens for defined jobs or career paths but also to professionally thrive in a turbulent and dynamic world.[21] To become a community that adapts, Calgary must become a community that develops skills faster and better than others.

From Legacy to Adaptive Learning

Calgary must move past the legacy learning model developed during the industrial era and defined by life stage. This legacy system contributed to the prioritization of job skills. Job skills are the skills an individual needs to complete a specific job and can be broken into two sub-groups: functional skills and sectoral expertise. Historically, employers highly valued job skills as they were essential sectoral expertise. Historically, employers highly valued job skills as they were essential to generating short-term economic value. As a result, the legacy learning system was designed with a primacy on job skills during upper secondary and postsecondary. This job skills-centric model can be seen in the curriculum of certificates, diplomas, and degrees of most Canadian postsecondary institutions (Figure-2).

Job skills incorporate three dimensions: functional skills, sectoral expertise, and organizational context (Figure-3).

Functional Skills

Functional skills are needed to complete a specific role (e.g., accountant, project manager, chef, nurse, software developer). These skills embed the ability to adapt and apply these skills across different sectors. Though functional skills can develop through certified, non-certified, and informal learning experiences, the foundation is often developed through certification. For example, university and college programming is often structured around functional skills (e.g., Bachelor of Nursing, Culinary Arts Diploma).

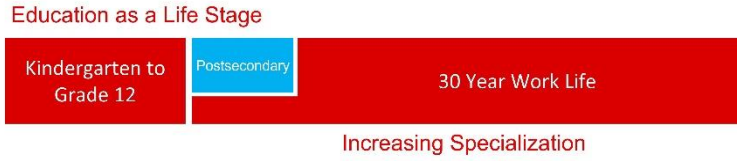


Figure-2: Traditional Learning System (1850-2020)

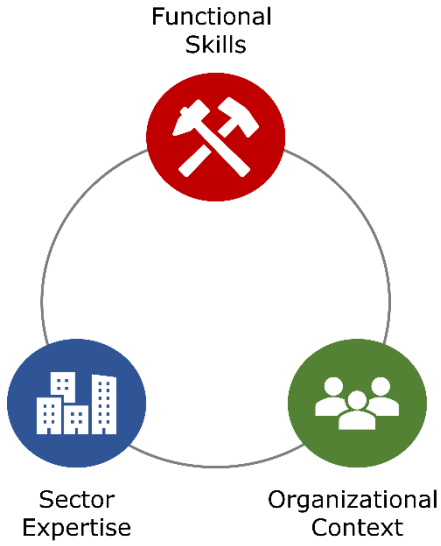


Figure-3: Skills Orbit

Sectoral Expertise

Sectoral expertise is the unique contextual knowledge or skills needed to complete a specific role within a defined sector. For example, a sector may have unique regulatory, legal, or historical contexts that influence a functional role, e.g., an accountant in oil & gas may require specialized knowledge compared to an accountant in the financial services sector. The challenge here is the highly contextual nature of sub-sectors within a sector. For instance, oil & gas comprises dozens of specialized sub-sectors, starting with upstream, midstream, and downstream. Within each of these sub-sectors additional specialization is tied to exploration, drilling, transportation, refining, and distribution.

Unlike functional skills, sectoral expertise is often developed and refined through direct experience in a sector. The immersion in a sector contextualizes functional skills to this sector. For example, an individual who has strong functional skills related to marketing must adapt these skills to shift from consumer-packaged goods to sports.[22]

Organizational Context

Like industry sector context, an organization's context may influence the types of skills required. Organizational context may include size, ownership structure, product and service scope, and geographic reach. For example, the skills needed for a sales manager in a start-up technology company may be very different from a sales manager for a technology company with 50,000 employees operating in 100 countries.

The Changing Role of Job Skills

The sustained value of job skills today is impacted by two factors. First, life expectancy continues to expand, as young people today could live between 80 and 110 years.[23] This effectively doubles an individual's professional life from thirty to sixty years. Secondly, technology has redefined the economic lifespan of job skills. Whereas, in the past, job skills developed as a young adult maintained much of their value for a thirty-year professional line. Today, however, job skills possess an average lifespan of six years.[24] Thus, job skills become dated and demand continual training to maintain relevancy over a sixty-year professional life. Together, these two factors are fundamentally redefining learning.

An individual's adaptive capacity is anchored to *enabling skills* (also known as soft, human, or transferable skills). These include problem-solving, self-reliance, communications, collaboration, core literacies, and core workplace skills. Enabling skills (ES) are foundational as they allow an individual to adapt across diverse personal and professional contexts.[25] The value of enabling skills is related to the capacity they provide an individual to acquire and activate job skills. Therefore, possessing the optimal level of both enabling and job skills allows an individual to adapt to the changing skills demands (Figure-4).

Figure-4: Adaptive Learning System (2020…)

The Learning System

To understand the future of learning, it is important to view it as an integrated system incorporating individual talent, employers, and skills developers (Figure-5):

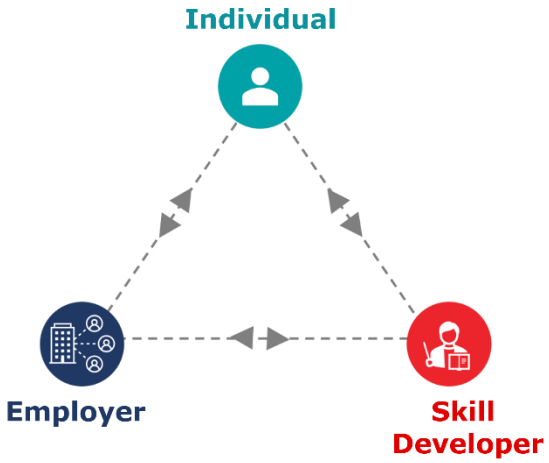


Figure-5: Learning System

Individual Talent. Individuals who currently possess or seek to develop skills.

Skills Developers: Organizations and individuals who facilitate learning through certified, non-certified, and informal methods.

Employers: Organizations who seek to acquire specific skills to achieve a goal.

Adopting a system lens is critical as it recognizes the interdependence of the actors in the system.[26] For example, employers define the skills in demand and seek to acquire these skills. Individuals who possess these skills offer them to organizations for a negotiated price. The value of skills is defined by demand and scarcity. Individuals who do not possess the demanded skills will seek to develop them through certified, non-certified, and informal learning. However, today's learning system is highly inefficient because it lacks both a shared understanding of the currency being exchanged and certification of these skills. Without a common currency, employers have difficulty acquiring the skills they require, while both skills developers and individuals remain uncertain on the skills in demand.

Calgary on the Precipice proposed establishing a community-level enabling skills framework. In 2021, funded by a *Council Innovation Grant*,

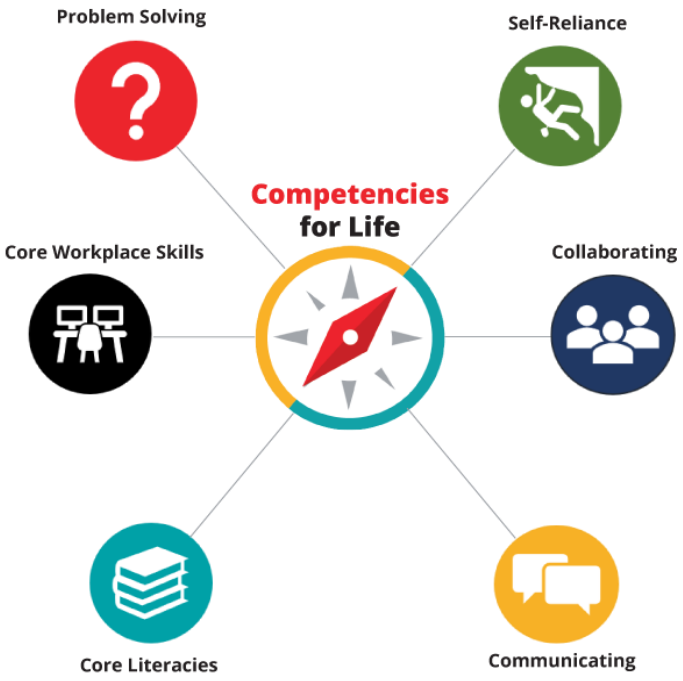


Figure-6: Competencies for Life

Calgary Economic Development and the *Institute for Community Prosperity* developed and piloted an enabling skills framework branded the *Competencies for Life* (Figure-6). The *Competencies for Life* (C4L) are a composite of the leading 25 enabling skills within six skills clusters. Refer to the *Competencies for Life* website for a comprehensive definition of each skill.

From a societal perspective, the C4L communicates the skills demanded. With the skills clearly outlined, individuals can focus on developing these skills. It enables diverse skills developers from across the certified, non-certified, and informal learning system to clearly articulate the skills their programs develop. The implications of a common currency on certified, non-certified, and informal learning partners cannot be overstated. The contribution by the thousands of sports, arts, and community organizations will be integrated and recognized as a critical dimension of the skills market. Moreover, it recognizes the critical contribution of certified learning programs, such as liberal arts, in developing highly valued enabling skills.

A Topology of the Learning System

To become a community that adapts faster and better than others, Calgary must re-envision its learning system. Adaptive skills are not defined by life stage, classroom, or textbook. Rather, adaptive skills are purpose-based, prioritizing personal exploration, experimentation, and enabling skills. This includes viewing the three-major forms of learning — certified, non-certified, and informal — as part of a fully integrated system (Figure-7). Refer to Table-1 for a breakdown of each learning area.

Certified Learning

Certified learning incorporates structured and organized training, education or professional development experiences provided through an educational institution, workplace, or professional accrediting body. It is institution-bound and time-bound and results in formal certification by a formal institution, professional body, or sanctioned certifying agency.[27] This audit clusters certified learning into eight areas:

1. Primary education
2. Lower secondary education
3. Upper secondary education
4. Bachelor or equivalent
5. Master or equivalent
6. Doctorate or equivalent
7. Accredited short-cycle tertiary education (e.g., microcredentials)
8. Professional certification

Non-Certified Learning

Non-certified learning incorporates organized or systematic education, training, or professional development activities delivered by various institutions, community organizations, or training agencies. This method requires registration but does not result in an accredited body. Individual certificates may be awarded by the service provider, independent of a government or a professional body.[28] The audit clusters non-certified learning into three sub-categories:

1. Early childhood education
2. Postsecondary non-tertiary education
3. Non-accredited short-cycle tertiary education (e.g., recreation, arts, religious)

Informal Learning

Informal learning incorporates a diverse array of lived experiences and unstructured learning resources.[29] Herein, informal learning was defined as incorporating six sub-categories:[30]

1. Curriculum-based experiential learning (e.g., co-operative education, live case studies, community-based research)
2. Self-directed paid employment
3. Self-directed volunteering
4. Self-directed learning
5. Self-directed professional development
6. Self-directed learning resources

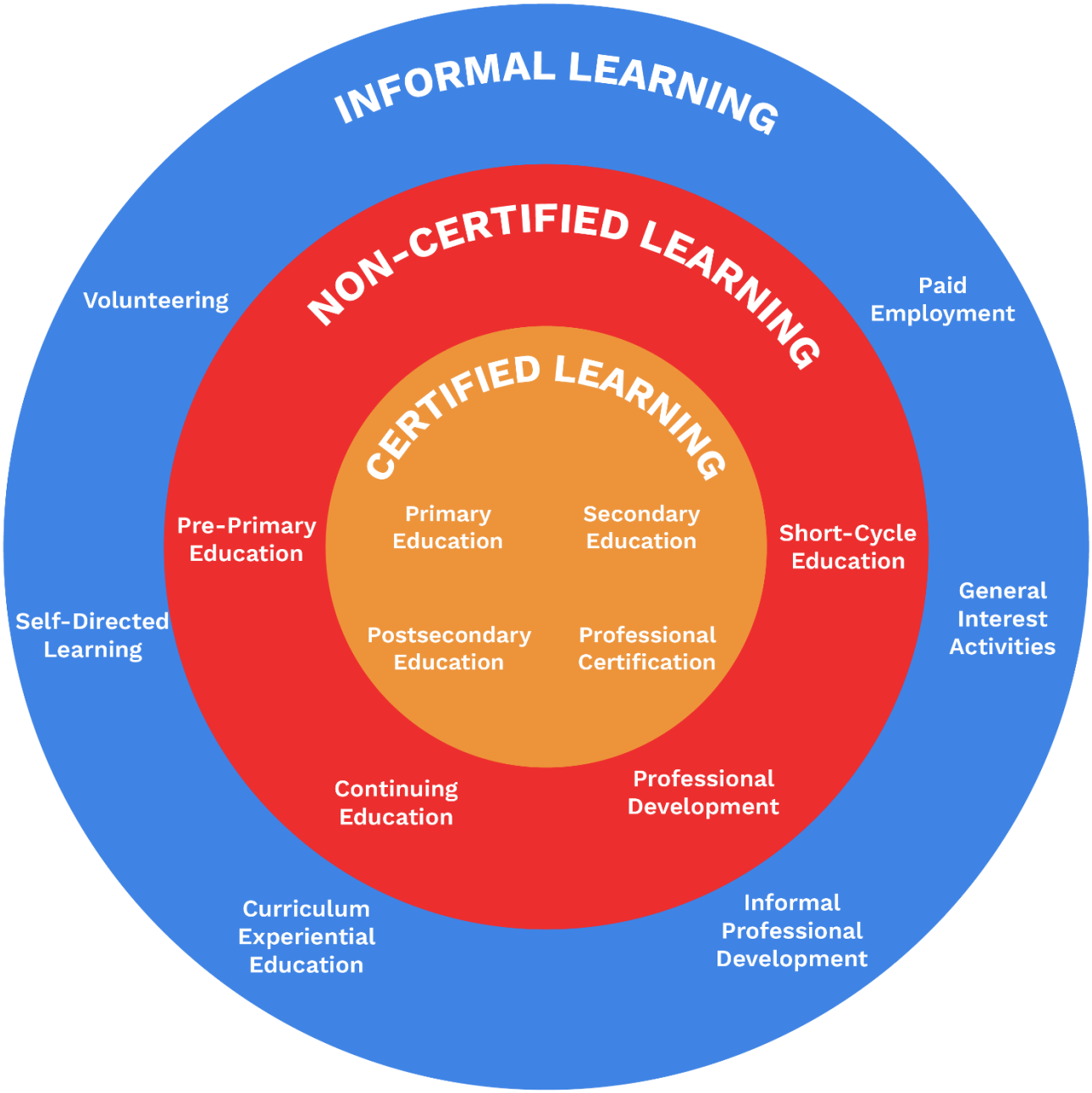


Table-1: The Learning System

Skills Developer Category	Definition	Example	Skills Developer
Certified Structured and organized training, education or professional development experiences provided through an educational institution, in the workplace, or by a professional accrediting body. It is institution-bound and time-bound and results in formal certification by some formal institution, professional body, or sanctioned certifying agency.	Primary education	Elementary school	Calgary Board of Education
	Lower secondary education	Junior high	Calgary Catholic School District
	Upper secondary education	High school	Calgary Board of Education
	Bachelor or equivalent	Bachelor of Business Administration	Mount Royal University
	Master or equivalent	Accelerated MBA for Business Graduates	Queens University (in Calgary)
	Doctorate or equivalent	PhD	University of Calgary
	Accredited short-cycle tertiary education (e.g., microcredentials)	Pivot-Ed	Bow Valley College
	Professional certification	Project Manager Professional	Project Management Institute via U of F
Non-Certified Organized or systematic educational, training, or professional development activities delivered by a variety of institutions, community organizations, or training agencies. This type of learning requires registration but does not result in an accredited certification by a government or professional body. Individual certificates may be provided by the service provider, independent of a government or a professional body.	Pre-primary education. Commonly referred to as pre-school. This form of education is non-certified as no institutional body gives credit for the learnings completed in this stage of education.	Montessori Preschool	Calgary Montessori
	Postsecondary non-tertiary education	Dale Carnegie Sales Training: Winning with Relationship Selling	Dale Carnegie of Southern Alberta and Saskatchewan
	Non-accredited short-cycle tertiary education (e.g., professional development, arts, recreation, religious)	Arts Combo for Adults	Wildflower Arts Centre
Informal The process of acquiring knowledge, skills, and values from daily experiences at home, in the community, or at work. The process may appear unorganized and unsystematic, but it is not necessarily unintentional in that individuals may seek out these experiences to enhance their individual or collective learning.	Curriculum-directed experiential learning. Inclusive of Applied Research Projects; Apprenticeship; Co-operative Education alternating and co-op internship models; Entrepreneurship; Field Placement; Internships; Mandatory Professional Practicum/Clinical Placement; Service; Work Experience	Web development practicum embedded in the web-developer certificate	SAIT
	Self-directed paid employment	Summer job	Self-directed
	Self-directed volunteering	Volunteering	Self-directed
	Self-directed general interest activities. Inclusive of hobbies, household activities, recreational sporting activities, arts, culture, etc.	Go to the Zoo	Calgary Zoo
	Self-directed professional development. Inclusive of communities of practice (e.g., clubs); peer to peer learning; coaching/mentoring; networking events.	Business after-hours	Calgary Chamber of Commerce
	Self-directed learning resources. Inclusive of video, podcast, Internet search, books, social media	"Own the Room" Film	National Geographic

SECTION 2: METHODOLOGY

The first step in optimizing Calgary's learning system requires a comprehensive audit of certified and non-certified skills developers and their programming. Between January and December 2021, a joint research team led by *Calgary Economic Development* and Mount Royal University's *Institute for Community Prosperity*, with the support of students from the University of Calgary, Mount Royal University, and Alberta University for the Arts, conducted a rigorous audit of Calgary's learning system.

This audit involved three studies:

Study 1 incorporates a skills demand audit of Calgary employers.

Study 2 incorporates an audit of Calgary's current base of skills.

Study 3 incorporates an audit of Calgary's certified and non-certified learning system.

Together, these three studies provide a comprehensive snapshot of the community's existing skills base and the strengths, weaknesses, gaps, and opportunities in the current learning system.

Study 1: Calgary Skills Demand Audit

The first study is a skills demand audit, which used data from December 2020 to December 2021. The analysis uses the eight established and emerging sectors identified in *Calgary and the New Economy*. For additional clarity, the energy & environment sector is broken into three sub-sectors, and technology is a unique sector.

1. Financial Services
2. Life Sciences
3. Transportation & Logistics
4. Creative Industries (excluding software)
5. Software Development
6. Agribusiness
7. Tourism
8. Energy & Environment
    a. Oil & Gas
    b. Utilities
    c. Clean Technologies[31]

The scope of each sector is defined by four-digit North American Industry Classifications (NAIC). Refer to Appendix-1 for a breakdown of each sector by NAIC.

The data used for this first study is based on Burning Glass real-time labour market information collected by Burning Glass Inc. Burning Glass collects real-time online employment postings from 40,000 sources globally. This data provides extensive details on occupations, skills, and qualifications that employers seek. This audit includes a total sample of 13,510 employment postings.

The research team translated Burning Glass "baseline" skills into the six enabling skills clusters. The sample identified hundreds of job skills. The 12-month sample includes on average 187 unique job skills per sector. To manage the scope of job skills, the audit divided job skills between functional skills and sectoral expertise. Refer to Appendix-5 for enabling skills coding, Appendix-6 for functional skills coding, and Appendix-7 for sectoral expertise coding.

Table-2: Job Skills Clusters

	Definition	Examples
Functional Skills		
Sales & Marketing	Skills related to the development, marketing, and sales of a product or services	Business Development; Project Management; Digital Marketing; Graphic Design; Technical Writing
Service & Support	Skills related to providing service and support to customers	Customer Service; Technical Assistance; Customer Billing
Finance & Accounting	Skills related to financial management and accounting	Budgeting; Bookkeeping; Financial Analysis; Risk Management; Accounting
Management & Operations	Skills related to the management and operations of an organization	Project Management; Business Planning; Operations Management; Talent Acquisition
Technology	Skills related to the development and application of specialized hardware or software	Software Development; JavaScript; Oracle; SAP
General Labour	Tasks that require limited or no skills	Data entry; Cleaning; Administrative Support
Sectoral Expertise		
Sectoral Expertise	Specialized knowledge and skills related to this sector	Capital Markets; Repair; Mortgage Underwriting; Dental Care; Animal Health; Broadcast Industry Knowledge; Directional Drilling; Telemetry

Study 2: Calgary Skills Audit

The second study incorporates an audit of Calgary's current skills base, including the following.

Educational Attainment

The most recent *Statistics Canada* data associated with *educational attainment* incorporates four dimensions:

1. Percentage of the population (15 and above) with degrees, diplomas, and certificates.[32]
2. Percentage of the population (15 and above) with apprenticeship, trade diploma or certificate.
3. Percentage of the population (15 and above) with a university certificate, diploma, or degree at bachelor level or above.
4. Percentage of the population (15 and above) who completed studies in the province of their current residence.

Classification of Instructional Programs (CIP)

Statistics Canada data associated with the *Classification of Instructional Programs* (CIP). CIP is a hierarchical classification system of all instructional programs, defined as:

> *a combination of courses and experiences that is designed to accomplish a predetermined objective or set of allied objectives such as preparation for advanced study, qualification for an occupation or range of occupations or simply the increase of knowledge and understanding.*[33]

CIP codes scale from two to six digits and become more precise with each level. For this audit, two-digit CIP codes lacked sufficient precision, such as *construction trades* or *engineering,* which incorporate a wide variety of fields. For this reason, the audit further broke each two-digit CIP into four digits. A four-digit CIP provides additional precision for understanding CIP content. For example, a two-digit CIP code of *computer and information sciences and support services* incorporates the eleven four-digit fields of study below:

1. Computer and information sciences and support services, general
2. Computer programming
3. Data processing and data processing technology/technician
4. Information science/studies
5. Computer systems analysis/analyst
6. Data entry/microcomputer applications
7. Computer science
8. Computer software and media applications
9. Computer systems networking and telecommunications

10. Computer/technology administration and management
11. Computer and information sciences and support services, other

For a list of all two-digit CIP codes, refer to Appendix-2. For a full listing of all four- and six-digit CIP codes, visit *Statistics Canada*.

Comparable Data

For this data to provide the necessary context, Calgary's four-digit CIP data was analyzed relative to six Canadian cities (Vancouver, Edmonton, Toronto, Montréal, Ottawa, and Kitchener-Waterloo).

Limitation

The ability to audit Calgary's skills base is limited to the defined CIPs, which are primarily job skills. Thus, no comparable data exists to perform an audit of Calgary's base-level of enabling skills relative to peer cities. The inability to assess and track enabling skills is a critical data gap that requires immediate action.

Study 3: Calgary Learning System Audit

The third study incorporates an audit of Calgary's current learning system, including all certified and non-certified programming. Methodologically, it was imperative to define a consistent and concise coding scheme. After an extensive literature and policy analysis, the audit team concluded there is no recognized framework for coding dimensions associated with certified and non-certified programs. As a result, the team developed a customized codebook that synthesizes various recognized classification systems. The sources ranged from *Statistics Canada* to UNESCO. The audit team consulted the advisory committee on coding options in areas where no existing classification system is available. The codebook was refined over a multi-stage trial. The final codebook incorporates 21 characteristics at three levels: organization, program, and individual. Refer to Appendix-3 for the comprehensive codebook. Below is a summary of the 21 characteristics coded for each program.

Level 1: Organization-Level Coding

This incorporates the characteristics of the organization delivering the specific program. This includes the following six categories:

1. *Organizational Orientation:* Coded organization as for-profit, non-profit, or public.
2. *Learning NAIC*: Coded organization to one of 32 NAICs.
3. *Skills Developer Clusters*: Coded organization to one of the 12 skills developer clusters.
4. *Location:* Coded location where organization is based.
5. *Age:* Coded year organization was founded.
6. *Size:* Coded current number of employees.

Level 2: Program-Level Coding

This incorporates coding for eleven program-specific characteristics:

1. *Program Category:* Coded program as certified, non-certified, or informal.
2. *Learning:* Coded explicit enabling or job skills program assets are developed.
3. *Implicit Learning:* Coded enabling or job skills program that may be developed but are not explicitly identified.
4. *Delivery Orientation:* Coded primary program delivery method (e.g., synchronous).[34]
5. *Program Location:* Coded where location is delivered (e.g., workplace).
6. *Technology Requirements:* Coded the minimum level of technology needed to complete the program.
7. *Certification:* Coded how skills or program completion is certified.
8. *Direct Cost:* Coded the direct cost for the individual to complete this program.
9. *Program Duration:* Coded the estimated time for program completion.
10. *Annual Number of Experiences:* Coded the estimated number of individual experiences in the program.
11. *Primary Cognitive Process:* Coded the cognitive process developed in this program.
12. *Primary Knowledge Orientation:* Coded the knowledge orientation of this program.

Level 3: Individual-Level Coding

This incorporates coding three characteristics of the individual the program is designed for:

1. *Life-stage:* Coded whether the program targets a specific life stage.
2. *Audience:* Coded whether the program targets a specific audience.
3. *Primary Value:* Coded whether the program is oriented towards professional or personal development.

Coding Methodology

Consistency

Consistent data collection is paramount to ensure the data is reliable and comparable. The team of analysts underwent a multi-stage training process and met weekly as a full team to identify areas requiring further clarification.

Specialization

To support consistency, each analyst was assigned specific NAICs. This allowed coders to specialize in specific sectors, such as arts and culture.

Sample

This project incorporated a comprehensive census of all certified programs. For non-certified programming, the research team used structured representative sampling defined by both NAIC and the program. For example, NAIC 611310 (universities) is certified programming, so the audit team conducted a complete census of all organizations in this NAIC, and all the programs offered. In contrast, NAIC 711120 (dance companies) is a non-certified program, and 25% of the organizations and programs were sampled. For each sample sector, the team ensured that the organizations and programs sampled were representative of the sector. For instance, in active programming, the team ensured they coded programs across diverse age groups and gender compositions. Following the completion of all coding, the audit team extrapolated the results of the sampled NAICs to standardize the results, allowing us to estimate the total number of programs and experiences offered annually. Refer to Appendix-4 for the sampling method for each NAIC.

Limitation

This audit of the current learning system is limited to certified and non-certified skills developers with a geographic focus on Calgary. As noted earlier, there are an infinite number of informal learning resources ranging from podcasts to books to volunteering. In fact, studies suggest that over 90% of Canadian adults engage in 10–15 hours of informal learning weekly.[35] As a result, a rigorous audit of these informal resources is not feasible. Similarly, auditing internal proprietary corporate learning initiatives is also not feasible. In both cases, these were excluded from the scope of this audit and are a recognized limitation of the study. As a result, the team recommends that future research explore how both informal learning and proprietary corporate learning contribute to Calgary's learning system.

Community Consultation

The final stage of the audit involved over twenty interviews with community stakeholders in the learning system, including employers, policymakers, scholars, and skills developers. The goal of these interviews was to allow the community an opportunity to provide a fresh perspective on the studies' findings, insights, and recommendations. This consultation will be ongoing to reflect the dynamic nature of learning in our community.

SECTION 3: SUMMARY RESULTS

Section 3 synthesizes the key results for the three studies. **Please refer to Appendix-10 for the full results.**

Study 1: Calgary Skills Demand Audit

The Future is Horizontal: The skills with the highest demand by employers are those that provide the maximum adaptive capacity – enabling and functional skills. Refer to Figure-8 for a breakdown of skills by sector.

On average, ***enabling skills*** are two to three times in greater demand than job skills. In total, 187 unique job skills are identified across the ten sectors. This provides further support for the findings in *Calgary on the Precipice* that enabling skills anchor an individual's adaptive capacity.

The job skills demand audit found that ***functional skills*** were in three-times greater demand than sectoral expertise. It's important to

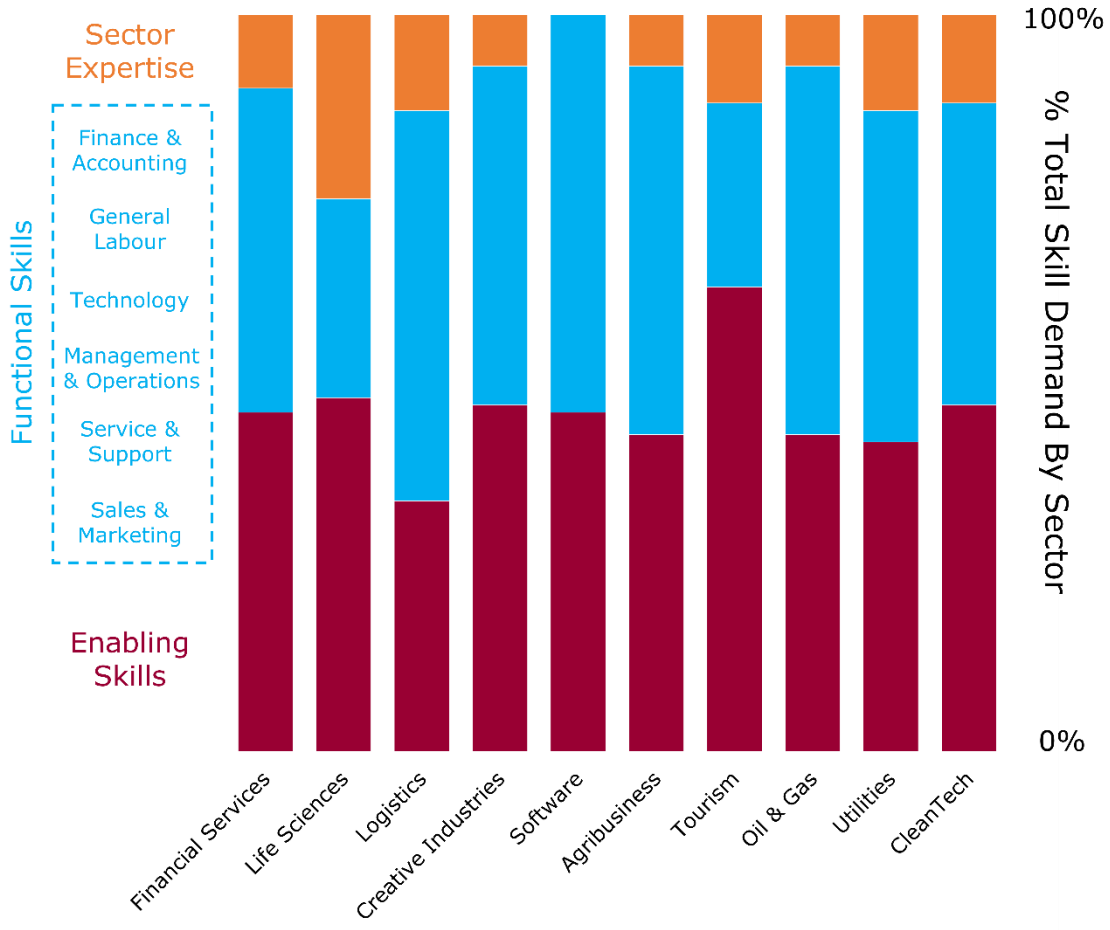


Figure-8: The Future is Horizontal

note that the relation between functional skills and sectoral expertise varies by sector. For example, in Creative Industries, the demand for functional skills is seven times greater than sectoral expertise; however, in Clean Tech, the demand for functional skills remains dominant, but the proportion relative to sectoral expertise is greatly reduced.

Identifying that the demand for functional skills greatly exceeds the demand for sectoral expertise is crucial. Functional skills ranging from management & operations to marketing to accounting may be influenced by sector specific contexts. But this demand suggests most employers believe core functional skills can be efficiently adapted and applied to the unique dynamics of sector, company, product, or service specific context.

Sector and/or company specific experience contextualizes functional skills. For example, a marketing role in financial services may require distinct contextual knowledge. However, contextual knowledge is acquired by being professionally immersed in a sector, and rarely through traditional certified programming. This suggests informal learning mechanisms, such as experiential learning, if designed with intent, provide the potential to accelerate adaptive capacity by developing both functional skills and sectoral expertise.

Study 2: Calgary Skills Audit

Study 2 examines Calgary's current skills capacity relative to five Canadian peer cities.

Postsecondary Credentials: Though 80% of Calgarians possess postsecondary credentials, such as a degree, diploma, or certificate, it is the lowest of all other cities (tied with Edmonton). When considering only a university credential, Calgary ranks third per capita behind Toronto and Montreal.

Current Credentials: Calgary possesses the lowest proportion of those who attained their credential in Alberta and the highest proportion who completed their credential in another province or region. This reflects both the inward migration of talent over the past two decades and a dependency on other regions to develop skills.

Disciplinary Strengths & Weakness: Calgary leads the other cities in engineering and business. For example, as a proportion of the population, Calgary has a 35% greater number of engineering CIPs compared to the peer cities mean.

However, Calgary lags in arts, design, communications, and areas related to the humanities and social sciences, including law, psychology, marketing, and economics. For example, as a proportion of the population, Calgary has 23% fewer CIPs in the social and behavioural sciences, and law, than the peer cities mean. When benchmarking specific functional skills to peer cities, Calgary has a proportionally lower number of skills in sales and marketing relative to peers. Similarly, when benchmarking specific sectoral expertise to peer cities, Calgary has a proportionally lower number of skills in the creative industries relative to peers.

When mapped to the skills demands from Study 1, the concentration of CIPs in business aligns with the cross-sectoral demand for functional skills in areas such as management & operations, finance, accounting, sales & marketing, and cluster services. Similarly, the concentration of CIPs in engineering may align with demand for technology functional skills (e.g., software engineering) or sectoral expertise (e.g., petroleum engineering). However, there is a concerning gap in the low number of CIPs directly linked to enabling skills, such as communication, collaboration, and core literacies. This weakness may be methodological as enabling skills are poorly mapped to CIPs, or it may be a systematic deficiency reflecting the lack of priority for enabling skills development in Calgary compared to its peer cities. This relative deficiency in enabling skills development suggests that Calgarians may lack the foundational skills essential for adaptive capacity.

Study 3: Learning System Audit Results

The third study in this audit reports the results of the quantitative audit of the certified and non-certified learning system. This audit estimates **3,063 organizations** that deliver 30,870 certified and non-certified learning programs. The organizations range from accredited schools to creative arts to religious organizations.

System Capacity by Sector: Figure-9 compares the proportional relationship between organizations, programs, and experience capacity at a skills developer cluster level. It is important to consider the diversity of organizations, programs, and delivered experiences. The ratio of organizations to programs to experiences is influenced by the contextual nature of the learning experience. For example, self-directed learning (e.g., arts) may provide an opportunity to scale the number of programs and experiences that can be delivered. In contrast, the scaling of one-on-one executive coaching faces barriers. For this reason, this figure becomes more meaningful following the analysis of program-level data that considers measures of breadth and depth, such as program duration and certification methods.

Enabling Skills Development: All programs were coded based on their explicit goal of developing the 25 different enabling skills defined in the *Competencies for Life* initiative by the City of Calgary. Enabling skills secure an individual's adaptive capacity. This study found that only nine of the 25 enabling skills are explicitly developed at scale. The remaining 16 enabling skills, including adaptability, active listening, trust, and leadership, are only weakly developed in the system. This lack of explicit development may contribute to a labour force with limited capacity to transition between different roles and fields.

Our results found that few certified and non-certified programs explicitly identify the development enabling skills as a learning outcome. For example, many active programs would embed development of collaboration skills in their team sports, but developing these skills is implicit, not explicit.

This gap between explicit and implicit provides clarity to individuals of the skills being developed. If skills are implicitly developed, this requires an individual to recognize the skills and then identify potential approaches to certification.

Regarding explicit development of enabling skills, universities and colleges are heavily weighted in problem-solving but weak in workplace skills. Whereas elementary and secondary schools are well balanced across all six areas. It is important to consider this chart relative to the overall

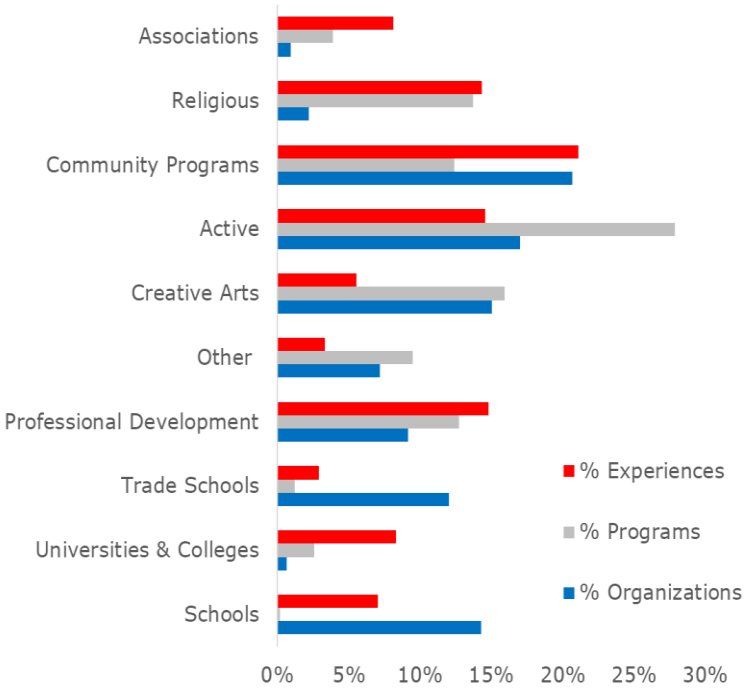


Figure-9: System Capacity by Sector

enabling skills being developed from the previous chart.

Functional Skills: The audit estimates that 18% of learning programming (5,662 programs annually) is associated with functional skills. This translates into over 797,060 annual experiences. The audit also estimates that 68% of functional skills experiences are certified. Non-accredited business schools and professional development programming develop the greatest proportion of functional skills.

Sectoral Expertise: The audit estimates that only 9% of programming (2,842 programs annually) develop sectoral expertise. This translates into 805,697 experiences annually, with the creative industries and life sciences representing over 60% of sectoral expertise programs. The dominant sectoral expertise programs are delivered through colleges and universities (49%), creative arts (24%), and trade schools (18%).

Skills Certification: Only 8% of the estimated 30,870 different programs certify skills outcomes. These are largely provincially accredited elementary, secondary, university, and college systems. In addition, a large proportion are related to trades and technical

certification. In contrast, entire learning clusters, from creative arts to active programs provide no certification.

Research suggests this lack of skills certification reinforces a systematic advantage to specific socio-economic groups.[36] Thus, an opportunity exists to both increase system efficiency and inclusivity by introducing a consistent and structured system of skills certification.

Program Delivery: Before COVID-19, nine of 10 audited programs were delivered synchronously, and 75% of these were delivered at a skills developer location (e.g., classroom, recreation centre). The impact of COVID-19 may radically rebalance this model as both individuals and organizations reframed the approaches to delivering programs in either an asynchronous or blended format.

Experiential Programming: This audit also explores the scope of experiential programming in the current system. Experiential programming bridges conceptual learning with lived experiences through internships, apprenticeships, live case studies, field school's entrepreneurship, and community-engaged research. Experiential programming has been shown to enhance student engagement, increasing situational cognition and the rate of employment pre- and post-graduation. This combination of knowledge acquisition and applied learning experience yields the expertise required for new economy careers (refer to *Calgary on the Precipice* for a full overview of experiential learning).

Only 4% of all learning incorporates embedded experiential learning. Not surprisingly, experiential programming is heavily concentrated in university, college, and trade schools. For example, 39% of university and college programs include forms of experiential learning. Moreover, of the experiential initiatives identified in the sample, 60% are related to applied research projects, followed by 30% being a combination of internships, co-operative education, or mandatory practicums.

Organizational Orientation: Only one in four learning organizations are in the public sector, including provincially accredited school boards, universities, and colleges. When broken down at a sector level, the dominance of for-profit organizations in the trades, human resources, creative arts, and professional development sectors emerge. Non-profits are primarily in the business & labour, religious, and community sectors. Finally, the public sector dominates elementary, secondary, universities, and colleges, and a secondary role in the community sector.

Organization Size: Seven of 10 learning organizations have less than 100 employees. Many of the smaller organizations are clustered in non-certified learning, including creative arts, religious, and active programming. Larger organizations are dominated by universities, colleges, and some larger community organizations. The expansion and alignment of learning capacity demand a systematic harnessing of small-medium enterprise delivery capacity. Options may include increasing system-level alignment of development or consolidating providers to support program scaling.

Organization Age: Almost three-quarters of learning organizations are more than 20 years old. Only 7% were founded in the past decade. This suggests that aligning the capacity in the learning system could incorporate a two-pronged strategy. First, our community must establish the market conditions for existing for-profit and non-profit organizations to adapt to emerging priorities. Simultaneously, Calgary must establish the market conditions to incentivize new skills developers to enter the market in areas where skills demand surpasses system capacity.

Organization Location: Almost three-quarters of learning organizations are Calgary-based. This is consistent with the fact that the majority of 10 learning organizations are smaller enterprises. This reinforces the assertion that the learning system is driven by local market supply and demand conditions. However, the current fragmented system does not possess the underlying structural capital required to optimize system-level capacity. The result is a highly inefficient system with barriers to adapt at scale.

SECTION 4: KEY INSIGHTS

Insight 1: A Community Challenge

In Canada, education is perceived to be the responsibility of provincial governments. This perception reflects the 19th century when education was limited to provincially accredited learning. However, this audit highlights that in the intervening 150 years, Calgary's learning capacity expanded exponentially. Today incorporates 3,063 organizations, delivering 30,870 isolated learning experiences across the for-profit, non-profit, and public sectors. Of this system, 75% comprises for-profit and non-profit organizations, and three-quarters are headquartered in Calgary. Only 17% of the system is directly within the provincial jurisdiction. The result is a highly fragmented system that lacks a shared purpose and the underlying mechanisms needed to optimize these experiences into a harmonized system. Therefore, local community leaders have the accountability to transform these thousands of isolated experiences into an integrated community system with a shared purpose.

Insight 2: The Legacy Impact

The legacy impact of oil & gas legacy manifests itself in three ways in this audit.

Weaker Overall Postsecondary Credentials: Though Calgary's labour force is highly educated, it lags other major Canadian cities in overall postsecondary credentials.

Oil & Gas Orientation: Though Calgary has the highest proportion of STEM graduates in Canada, this skills capacity is best defined as E-STEM (energy related job skills in Science, Technology, Engineering, and Math). Conceptually, STEM is a powerful foundation for growth and diversification; however, oil & gas specialization encourages skills diversification in highly technical areas. For example, many Calgarians have developed expertise in oil & gas, which historically was awarded a large financial premium. For example, *Statistics Canada* reports that compensation for those working in oil & gas extraction in 2021 was over double the national average.[37] As a result, individuals were incentivized to deepen their expertise with a promise of increasing financial reward. The expertise and associated premium extend beyond oil & gas and incorporates compensation in support sectors and those competing for talent. For example, in 2014, incomes in Alberta were 23% higher than the national average, declining to 13% in 2021.[38]

The structural changes facing the oil & gas sector in the last seven years transformed oil & gas expertise from an asset to a barrier for many individuals. The economics of this sector enabled many to live a lifestyle funded by an oil & gas premium. This premium disincentivizes a transition to sectors outside of oil & gas. The result is a natural incentive for many oil & gas professionals to wait out a "bust" while anticipating a future "boom." The premium greatly impacts the efficiency of transitioning our community's labour force because moving sectors is not simply about reskilling — it also demands reframing compensation and lifestyle expectations for many Calgarians.[39]

Learning Capacity: At 25%, Calgary has the lowest proportion of major cities of those attaining their credential in the current province in which they reside. Concurrently, it has the highest number of citizens who completed their credential in another province or region. This reflects both the inward migration of talent over the past two decades and a dependency on other regions to develop skills. This historical capacity to "buy" skills from other jurisdictions is rooted in the income premium of the oil & gas sector

discussed earlier. With evidence of a decline in inward migration from other Canadian provinces over the past several years, Calgary faces increasing pressure to adapt the current community-level learning capacity. It must close the gap between our community's current base of enabling and job skills, and emerging demand from outside of the oil & gas sector.

Insight 3: The Future is Horizontal

The skills with the highest demand by employers are those that provide the maximum adaptive capacity – enabling and functional skills. Both enabling and functional skills run horizontally across the economy providing the maximum agility to individuals and organizations. In contrast, demand for sectoral expertise is dependent on macro-economic factors which expose individuals (and more broadly the city) to externalities. Moreover, individuals who define their professional identity as anchored to narrow sectoral expertise face the daunting task of redefining themselves in periods of weak demand.[40] This challenge was evident over the past eight-years in Calgary.

However, the audit found a learning system is not optimized to deliver adaptive capacity.

The Enabling Skills Gap: The skills demand audit supports previous research that identified the weighting of enabling skills as two times that of job skills. Yet, this audit found a weakness in the explicit development of the 25 enabling skills embedded in the *Competencies for Life*. In fact, 16 of the 25 enabling skills score exceptionally low. These skills include areas related to listening, numeracy, and adaptability. This weakness extends across both certified and non-certified skills developers.

The lack of explicit enabling skills is rooted in a traditional perception that job skills deliver greater short-term economic value than enabling skills. As a result, skills developers may put an explicit emphasis on job skills. For example, research demonstrates that competitive sports contribute to the development of skills related to collaboration and teamwork.[41] However, when analyzing sport & recreation programming, the development of these skills is rarely explicitly identified. Many individuals participating in these programs may not recognize or value the skills being developed. As a result, this experience remains fully detached from an individual's professional narrative.

The C4L pilot further supports this conclusion, which found a lack of explicit recognition of enabling skills development in partner programs. The pilot found that less structured non-certified programming is required to reassess their methods and identify specific enabling skills being developed. In most cases, this did not require a large change to existing programming; rather, the C4L provided a common framework for both skills developers and individuals to reflect on the specific enabling skills developed.

Functional Skills and Adaptive Capacity: The skills demand audit identified that functional skills are in three times greater demand than sectoral expertise. Functional skills enable individuals to adapt functional expertise to different sector contexts. This highlights an opportunity to design certified functional skills programs that intentionally expose individuals to different sector contexts. This may include a variety of pedagogical methods, like work-terms, volunteering, live case studies, and community-based research. Immersing individuals in a diverse sector context can demonstrate how they can adapt functional skills to meet the unique contexts.

Insight 5: The Certification Opportunity

Only 19% of all programs include any form of certification, with these primarily limited to educational and professional certifications. This lack of rigorous and credible skill-based certification amplifies the risk to employers, particularly small–medium enterprises who represent nine of 10 employers in Calgary. Due to a lack of systematic and rigorous skills certification, employers must adopt various informal methods to mitigate risk during hiring. This may include social certification (e.g., references), submission of evidence (e.g., portfolio), or explicit assessment and certification during the hiring process. While important, research suggests these informal processes have an implicit bias that systematically disadvantages certain communities, including females, indigenous Canadians, New Canadians, and those from chronically under-educated or low-income households.[42] As a result, overcoming this certification gap is essential to unlocking the full potential of Calgary's labour market.

Insight 6: The Incumbent Advantage

A foundational principle of a *LearningCITY* (a city-wide learning system) is transitioning to a personalized, purpose-based learning process anchored in empowerment, mission mapping, and experimentation. Purpose-based learning inverts traditional learning by putting the individual at the centre, not the skills developer. A purpose-based model recognizes that an individual's learning combines their certified, non-certified, and informal development experiences. However, this audit highlights structural barriers in transitioning to this purpose-based system.

The current collection of 3,063 certified and non-certified skills developers providing 30,870 isolated programs is akin to the internet before Google. In other words, the content individuals are looking for may exist, but it is impossible to find efficiently. From a citizen's perspective, when they begin exploring potential learning paths, they find infinite programs that may or may not align with their goals, but there is no consistent or structured navigation tool to compare learning opportunities efficiently. Moreover, this audit found that 60% of programs do not define a primary audience, making it difficult for individuals to understand how it may align with their needs. Additionally, our results suggest that few new skills developers have been launched and sustained over the past decade. This lack of new providers may come from a structural advantage for incumbents as individuals face a wall of thousands of learning opportunities. As a result, individuals may be attracted to an incumbent skills developer as a "safe haven," rather than the upstart skills innovator. In many sectors (e.g., telecommunications, financial services), where large incumbents possess a structural competitive advantage, policy approaches have been successfully deployed to stimulate a more open, innovative, and competitive system.

SECTION 5: RECOMMENDATIONS

This audit identified an estimated 3063 skills developers delivering 30,870 programs and 3.5M development experiences annually to Calgarians. A key conclusion finds that Calgary does not possess an integrated learning system. Rather, it has thousands of isolated and fragmented learning experiences. The result is a dilution of the potential impact of each experience in accelerating the transformation of Calgary's skills base to meet priorities defined in *Calgary and the New Economy.*

The 2020 *Calgary on the Precipice* report identified the essential need for our community to invest in structural capital to harness the capacity of all certified, non-certified, and informal skills developers. This empirical audit expands on these initial findings by identifying specific opportunities to invest in the structural capital required to harness the systematic capacity of all skills developers.

Structural capital incorporates the tangible and intangible processes and infrastructure that facilitate the effective collaboration and alignment of individuals and institutions within our community. The findings of this learning system audit identify a lack of the essential structural capital in three critical areas:

1. A lack of clear accountability for facilitating alignment and harmonization across our community's current and future skills market.
2. A lack of shared definition of the essential skills for citizens, organizations, and our community to prosper in the new economy.
3. A lack of a recognized and credible skills certification system that could be leveraged by employers, skills developers, and individuals to consistently certify skills levels.

Below, the audit team proposes four specific recommendations designed to accelerate Calgary's learning capacity.

Recommendation 1: System Alignment

To become a community that develops, attracts, and retains talent better than others, Calgary must make the development, attraction, and retention of talent, as defined in *Calgary in the New Economy,* a community-level priority. Today, there is limited alignment of activities related to developing, attracting, and retaining talent. Rather, current initiatives are largely at an organization or, to a far lesser extent, at a sector level. The result is a fragmented and highly inefficient approach to meeting the broader community-level goals. System-level challenges and opportunities demand system-level solutions.

Building on the principles of open innovation in other sectors, this new lens transforms from a "producer-consumer" learning model, where skills developers produce human capital and employers consume it, to an open co-creation model. Together, they are partners in co-creating an interconnected system of accelerated, agile, and dynamic learning experiences for all Calgarians.[43]

Transitioning from the legacy learning system, which evolved over the past century and delivered world-leading learning outcomes, to an integrated system anchored in adaptive capacity will be difficult. Yet there is short-term urgency facing our community, and widespread awareness of the crises driven by the COVID-19 pandemic. This creates an opportunity for positive change.

This integrated learning system requires a renewed commitment from both employers and skills developers, to look beyond the benefit of their own organizations, and to be partners in

developing the broader adaptive capacity of our community.

A learning system optimized to deliver on community-level priorities requires high-level alignment between diverse stakeholders, including employers, policymakers, and skills developers. This optimization starts with developing and articulating a shared purpose, anchored in *Calgary in the New Economy*. There must be intentional processes to advance harmonization, collaboration, innovation, and shared learning across the full learning system.

System-level innovation is not a top-down initiative; it is triggered by piloting and iterating small-scale experiments. Therefore, progress is defined by harnessing and aligning the diverse learning system, including employers, skills developers, and individuals experimenting and iterating innovative approaches to learning. Moreover, policy approaches must be identified to mitigate the apparent structural advantage of incumbents and stimulate a more open, innovative, and competitive system.

To facilitate this, the audit team recommends establishing a backbone entity accountable for developing, attracting, retaining, and mobilizing talent to deliver on the defined goals of *Calgary in the New Economy* (Figure-10). The team proposes this backbone entity be led by a Chief Talent Officer, and mandated to optimize the conditions for talent attraction, retention, and development. This includes developing a skills demand forecast to deliver on *Calgary in the New Economy*, and a system-level strategy to meet this demand. To expand capacity and efficiency, the team recommends that the *Calgary Talent Backbone* be staffed by secondments from both skills developers and employers.

The audit team proposes that the *Calgary Talent Backbone* focus on four priorities:

1. **Future Focused**
    - Conduct annual learning system supply–demand forecasts. This will provide essential guidance to skills developers on emerging priorities and allow them to maximize their capacity.
    - Facilitate collaboration and harmonization across the learning system to deliver on demand forecast and other market dynamics.
    - Propose strategies to stimulate a more open, innovative, and competitive learning system.

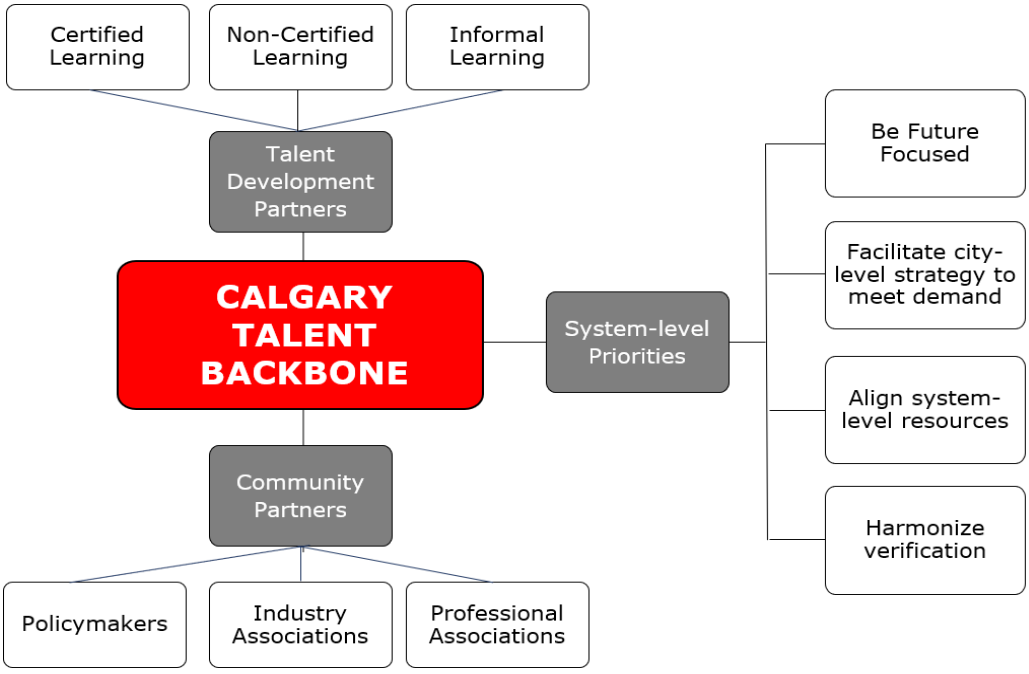


Figure-10: The Proposed Community Talent Backbone

- Introduce structures to accelerate the exponential expansion of experiential learning across the full market.
- Explore the potential opportunities to leverage global learning resources to deliver our community's dynamic skills demands.

2. **Facilitate System-Level Strategy**
   - Facilitate and manage a multi-year strategy to deliver on skills forecasts across all certified, non-certified, and informal skills developers.
3. **Align System-Level Resources**
   - Harmonize the resources of the for-profit, non-profit, and public organizations to deliver on the skills forecast. Scope includes community-level initiatives related to talent attraction, retention, and development.
4. **Harmonize Certification**
   - This audit highlights the essential role of skills certification as part of a broader community-level skills strategy (refer to recommendation 2).

Recommendation 2: Pilot a City-Level Skills Certification Framework

One of the greatest challenges and opportunities for the learning system is developing a consistent and structured skills certification at the community level. The lack of consistent skills certification in critical areas increases hiring risks for employers. In addition, the current informal methods depend primarily on advocacy certification (e.g., references), which systematically disadvantage individuals who may not have robust social networks. This is referred to as the trust gap.

To overcome the trust gap, the team recommends that Calgary pilot a skills certification system — *Trusted Skills* — decoupled from the learning process. *Trusted Skills* fills a significant void identified in the skills audit and could complement current certified learning while also unlocking the value of non-certified and informal learning processes (Figure-11).

Decoupling the learning process with skills certification is not a new concept. Today, decoupled skills certification exists in areas like accounting, trades, and being licensed to drive, which award certification despite how the skills developed. Thus, the legitimacy of the credential granted (e.g., a driver's license, certified professional accountant) is rooted in the rigour of the certification and the potential for ubiquity across a community's learning system.[44]

A *Trusted Skills* program will be piloted in 2022, evaluating the following questions.

Question 1: Is there perceived value in* Trusted Skills *by stakeholders in Calgary's learning system?

1. Is there perceived value for participating employers?
2. Is there perceived value for participating skills developers?
3. Is there perceived value for individual talent?
4. Is there perceived value by policymakers?

Question 2: How can* Trusted Skills *be deployed and scaled?

1. How do you define and assess the varying levels of each skill in the pilot?
2. What community institution governs the awarding of *Trusted Skills*?
   a. Who assesses and certifies *Trusted Skills*?
3. How can *Trusted Skills* contribute to diversifying Calgary's learning system?
   a. Diversity of individual talent (e.g., life stage, career goals, developing vs. certifying)
   b. Diversity of employers (e.g., sector, size)
   c. Diversity of skills developers (e.g., certified, non-certified, size)
4. What role do different forms of evidence play in a *Trusted Skills* certification process?
   a. Evidentiary certification
   b. Social certification
   c. Assessment/testing certification
5. How can *Trusted Skills* be integrated into existing learning and skills development programming?

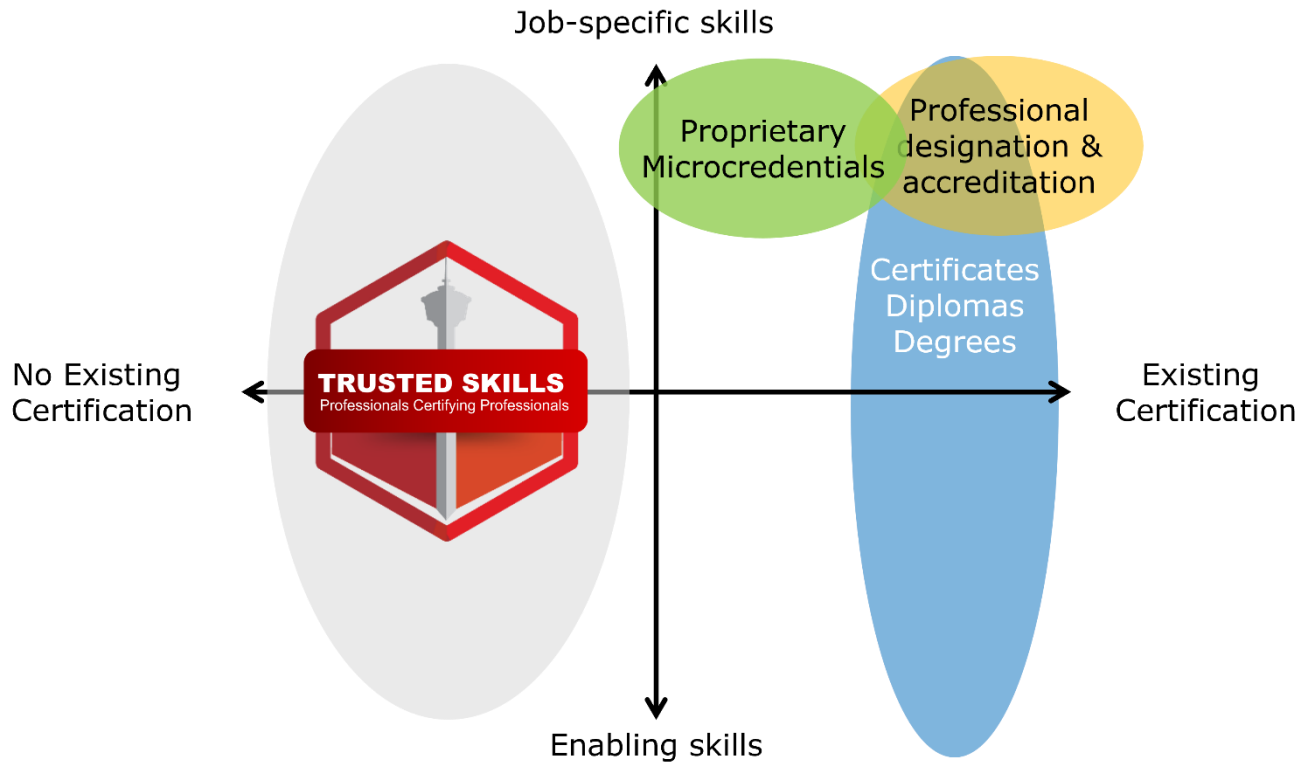


Figure-11: Skill Certification Framework

a. Stacked into summative credentials (e.g., certificate>diploma>degree)

Question 3: How can the pilot guide the scaling of* Trusted Skills*?

1. How do the findings of the pilot guide the scaling and expansion of *Trusted Skills* to other community areas and economic sectors?
   a. Across the *Competencies for Life*
   b. Across priority job skills

Recommendation 3: Prioritize Enabling Skills

Our community's strength in E-STEM has led to a large skills gap in certain fields: arts, design, communications, social services, humanities, and social sciences, including psychology, marketing, and economics. Research shows that many of these fields provide an important foundation for an individual's adaptive capacity.[45] The audit team believes the gap in these fields negatively impacts the development of enabling skills and an individual's adaptive capacity.

For this reason, the team recommends that Calgary prioritize the certification of enabling skills. The C4L pilot project, funded by the *Council Innovation Fund*, confirmed support for a shared enabling skills framework. However, the deployment of this framework depends on a critical mass of Calgary employers who must adopt the C4L model to incentivize both skills developers and individuals to invest in this common enabling skills currency. Thus, the pull of employer demand is critical for the successful expansion of enabling skills. This insight suggests that the future of a shared enabling skills model, such as C4L, is binary. Either a critical mass of the full learning system invests and commits to adopting a C4L type model, or the system proceeds with the fragmented status quo. A marginal commitment to a shared enabling skills model by employers and skills developers will not achieve the minimum threshold required for this model to succeed.

Recommendation 4: Facilitate Purpose-Based Learning

The most serious challenge facing our learning system today is not organizational; it is the role

of each Calgarian. To maximize the full capacity of our learning system and align with regional priorities, individuals must be empowered to define their own futures. Such a system recognizes that skills development — enabling skills, functional skills, sectoral expertise — result from experience and reflection across various learning experiences.

To accelerate this shift and align with regional economic priorities, the team concludes Calgary must become a leader in adopting purpose-based learning at a community level. This model would see digital tools and support developed to help Calgary skills developers and their clients create comprehensive personal "missions" (i.e., learning plans that lead to an intended career outcome), which they will test and refine over time. A mission enables individuals to identify and prioritize the skills required for their personal success. A key component is the development of an individual's "mission map."

The mission map is a person's North Star. It is their hypothesis about where they may want to take their life personally and professionally. Most importantly, a mission map becomes an anchor to support navigating the full learning system, while recognizing important links to regional economic priorities and emerging skills demands. A mission map can be organized around four components: (a) education and learning resources, (b) employment experience (functional skills/sectoral expertise), (c) community/volunteer experience, and (d) contextual experience. This mission map should also incorporate the anticipated relationships an individual will need to achieve their mission (e.g., professional, and personal mentors).

This mission mapping should be a digital tool that Calgarians can use at any life stage, regardless of education or profession. The digital tool may incorporate some of the following features:

- Be an asynchronous online tool that will enable personalized and self-directed learning.
- Provide links to regional economic priorities and emerging skills demands.
- Support digital *Trusted Skills* certification.
- Support any Calgarian. However, to accommodate meaningful integration, the tool can be customized and rebranded by learning partners.
- Must be engaging and interactive for users and recognize the community's diversity.

A Final Word

Calgary's current and future prosperity faces several challenges, including a structural change to the oil & gas sector, and the global pandemic. The audit team contends that the community's future prosperity will be defined by its capacity to attract, retain, and develop talent.

This skills audit was designed to provide community leaders from the for-profit, non-profit, and public sectors with the foundational evidence essential to guide a future integrated skills strategy for the community. A central conclusion of this audit is Calgary today possesses a rich and diverse learning system. However, the current fragmentation of this system limits its potential to accelerate developing the adaptive capacity essential for all Calgarians to prosper.

For this reason, the team envisions an integrated learning system incorporating diverse certified, non-certified, and informal learning pathways. This re-imagined model puts Calgarians at the centre and empowers them to manage their personal and professional development.

For citizens, this means taking increasing ownership of their own learning, regardless of age. For employers, it means investing in learning far earlier and on a sustained basis. This investment may include collaborating with experiential programming in high schools, universities or colleges, or training existing employees. For skills developers, it requires support for the timely development and approval of programs that provide the foundation of a re-envisioned learning system designed to train adaptable citizens. Collaboration, though, can be difficult, especially across such diverse partners as policymakers, educators, and employers. Therefore, the greatest challenge for most of us is not external, but the embedded rules, routines, practices, and cultures that influence our individual mindsets, behaviours, and organizations. Yet the audit team believes that the collaboration, compromise, and consensus required to implement an agile and learning system anchored in adaptive capacity is an essential step forward.

This report represents a comprehensive audit of Calgary's learning system. To our knowledge, this

is the first such audit ever conducted adopting an integrated lens of both certified and non-certified skills developers. However, this audit must be viewed as only a first step to Calgary adopting a more systematic and evidence-based approach to learning. As a first step, this audit stimulated far more questions than answers. These questions should act as an important framework for future evidence-based decision-making.

1. Conduct a qualitative audit of Calgary's informal learning system.
2. Examine the impact of oil & gas compensation on career transitioning.
3. Conduct a comparative audit of Calgary's adaptive capacity relative to other cities.
4. Conduct a study to better understand the lack of clear program audience targeting and its implications.
5. Conduct an audit of implicit enabling skills development.
6. Conduct a study of the barriers to new entry and innovation in learning. This should incorporate exploring a potential structural advantage to incumbent skills developers.
7. Test whether *Trusted Skills* accelerates innovation in Calgary's learning system.
8. Conduct a study of how *Trusted Skills* may be designed to stimulate greater inclusion in Calgary's learning system of traditionally marginalized communities.

SECTION 6: APPENDICES

APPENDIX-1: CALGARY ECONOMIC DEVELOPMENT NAIC CODE SECTOR MAP

NAICS	NAICS Description
Financial Services	
5211	Monetary authorities – central bank
5221	Depository credit intermediation
5222	Non-depository credit intermediation
5223	Activities related to credit intermediation
5231	Securities and commodity contracts intermediation and brokerage
5232	Securities and commodity exchanges
5239	Other financial investment activities
5261	Pension funds
5269	Other funds and financial vehicles
Life Sciences	
3254	Pharmaceutical and medicine manufacturing
333310*	Commercial and service industry machinery manufacturing
334512*	Measuring, medical, and controlling devices manufacturing
3391	Medical equipment and supplies manufacturing
414510*	Pharmaceuticals and pharmacy supplies merchant wholesalers CAN
414520*	Toiletries, cosmetics, and sundries merchant wholesalers
54138*	Testing laboratories
54171*	Research and development in the physical, engineering, and life sciences
6211	Offices of physicians
6212	Offices of dentists
6213	Offices of other health practitioners
6214	Out-patient care centres
6215	Medical and diagnostic laboratories
6216	Home health care services
6219	Other ambulatory health care services
6221	General medical and surgical hospitals
6222	Psychiatric and substance abuse hospitals
6223	Specialty (except psychiatric and substance abuse) hospitals
6231	Nursing care facilities
6232	Residential developmental handicap, mental health, and substance abuse facilities
6233	Community care facilities for the elderly

6239	Other residential care facilities
Transportation & Logistics	
3361	Motor vehicle manufacturing
3362	Motor vehicle body and trailer manufacturing
3363	Motor vehicle parts manufacturing
3364	Aerospace product and parts manufacturing
3365	Railroad rolling stock manufacturing
3366	Ship and boat building
3369	Other transportation equipment manufacturing
4141	Textile, clothing, and footwear merchant wholesalers
4142	Home entertainment equipment and household appliance merchant wholesalers
4143	Home furnishings merchant wholesalers
4144	Personal goods merchant wholesalers
4151	Motor vehicle merchant wholesalers
4152	New motor vehicle parts and accessories merchant wholesalers
4153	Used motor vehicle parts and accessories merchant wholesalers
4161	Electrical, plumbing, heating and air-conditioning equipment, and supplies merchant wholesalers
4162	Metal service centres
4163	Lumber, millwork, hardware, and other building supplies merchant wholesalers
4172	Construction, forestry, mining, and industrial machinery, equipment, and supplies merchant wholesalers
4173	Computer and communications equipment and supplies merchant wholesalers
4179	Other machinery, equipment, and supplies merchant wholesalers
4181	Recyclable material merchant wholesalers
4182	Paper, paper product, and disposable plastic product merchant wholesalers
4184	Chemical (except agricultural) and allied product merchant wholesalers
4189	Other miscellaneous merchant wholesalers
4191	Business-to-business electronic markets, agents, and brokers
4811	Scheduled air transportation
4812	Non-scheduled air transportation
4821	Rail transportation
4831	Deep sea, coastal and Great Lakes water transportation
4832	Inland water transportation
4841	General freight trucking
4842	Specialized freight trucking
4851	Urban transit systems
4852	Interurban and rural bus transportation
4853	Taxi and limousine service
4854	School and employee bus transportation
4855	Charter bus industry
4859	Other transit and ground passenger transportation
4871	Scenic and sightseeing transportation, land
4872	Scenic and sightseeing transportation, water
4879	Scenic and sightseeing transportation, other
4881	Support activities for air transportation
4882	Support activities for rail transportation

4883	Support activities for water transportation
4884	Support activities for road transportation
4885	Freight transportation arrangement
4889	Other support activities for transportation
4911	Postal service
4921	Couriers
4922	Local messengers and local delivery
49311*	General warehousing and storage
49319*	Other warehousing and storage
Creative Industries	
5173	Wired and wireless telecommunications carriers (except satellite)
5174	Satellite telecommunications
5179	Other telecommunications
5182	Data processing, hosting, and related services
3231	Printing and related support activities
5111	Newspaper, periodical, book, and directory publishers
5112	Software publishers
5121	Motion picture and video industries
5122	Sound recording industries
5151	Radio and television broadcasting
5152	Pay and specialty television
5191	Other information services
7111	Performing arts companies
7112	Spectator sports
7113	Promoters (presenters) of performing arts, sports, and similar events
7114	Agents and managers for artists, athletes, entertainers, and other public figures
7115	Independent artists, writers, and performers
7121	Heritage institutions
3346	Manufacturing and reproducing magnetic and optical media
5414	Specialized design services
5415	Computer systems design and related services
5418	Advertising, public relations, and related services
5419	Other professional, scientific, and technical services
Software Development	
5112	Software publishers
5182	Data processing, hosting, and related services
Agribusinesses	
1111	Oilseed and grain farming
1112	Vegetable and melon farming
1113	Fruit and tree nut farming
1114	Greenhouse, nursery, and floriculture production
1119	Other crop farming
1121	Cattle ranching and farming
1122	Hog and pig farming
1123	Poultry and egg production
1124	Sheep and goat farming

1125	Aquaculture
1129	Other animal production
1132	Forest nurseries and gathering of forest products
1141	Fishing
1142	Hunting and trapping
1151	Support activities for crop production
1152	Support activities for animal production
3111	Animal food manufacturing
3112	Grain and oilseed milling
3113	Sugar and confectionery product manufacturing
3114	Fruit and vegetable preserving and specialty food manufacturing
3115	Dairy product manufacturing
3116	Meat product manufacturing
3117	Seafood product preparation and packaging
3118	Bakeries and tortilla manufacturing
3119	Other food manufacturing
3121	Beverage manufacturing
3122	Tobacco manufacturing
3123	Cannabis manufacturing
3253	Pesticide, fertilizer, and other agricultural chemical manufacturing
3331	Agricultural, construction and mining machinery manufacturing
333416*	Heating equipment and commercial refrigeration equipment manufacturing
4111	Farm product merchant wholesalers
4131	Food merchant wholesalers
4132	Beverage merchant wholesalers
4133	Cigarette and tobacco product merchant wholesalers
4134	Cannabis merchant wholesalers
4171	Farm, lawn and garden machinery and equipment merchant wholesalers
4183	Agricultural supplies merchant wholesalers
44422	Nursery, garden center, and farm supply Stores
4451	Grocery stores
4452	Specialty food stores
4453	Beer, wine, and liquor stores
453993*	Cannabis stores
49312*	Refrigerated warehousing and storage
49313*	Farm product warehousing and storage
7223	Special food services
7224	Drinking places (alcoholic beverages)
7225	Full-service restaurants and limited-service eating places

Energy & Environment	
Oil & Gas	
3251	Basic chemical manufacturing
3252	Resin, synthetic rubber, and artificial and synthetic fibres and filaments manufacturing
2111	Oil and gas extraction
2121	Coal mining
2131	Support activities for mining, and oil and gas extraction
3241	Petroleum and coal product manufacturing
23712*	Oil and gas pipeline and related structures construction
4121	Petroleum and petroleum products merchant wholesalers
4861	Pipeline transportation of crude oil
4862	Pipeline transportation of natural gas
4869	Other pipeline transportation
Utilities	
2211	Electric power generation, transmission, and distribution
2212	Natural gas distribution
23713	Utility system construction
3336	Engine, turbine, and power transmission equipment manufacturing
Clean Technologies	
115	Support activities for agriculture and forestry
1153	Support activities for forestry
2131	Support activities for mining
2211	Electric power generation, transmission, and distribution
2213	Water, sewage, and other systems
3211	Sawmills and wood preservation
3241	Petroleum and coal products manufacturing
3251	Basic chemical manufacturing
3254	Pharmaceutical and medicine manufacturing sector
3273	Cement and concrete product manufacturing
3324	Boiler, tank, and shipping container manufacturing
3331	Agriculture, construction, and mining machinery manufacturing
3334	Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing
3359	Other electrical equipment and component manufacturing
3362	Motor vehicle body and trailer manufacturing
5417	Scientific research and development services
562	Waste management and remediation services
Tourism	
485	Bus transportation
481	Air transportation
482	Rail transportation
483	Water transportation
487	Scenic and sightseeing transportation
7211	Traveler accommodations
7212	Other accommodations
7224	Drinking places
7225	Restaurants and other eating places

5121	Motion picture and video industry
7111	Performing arts companies
7112	Spectator sports
7115	Independent artists, writers, and performers
7121	Heritage industries
7131	Amusement parks and arcades
7132	Gambling industry
7139	Other amusement and recreation industries

*Excluded from demand analysis.

APPENDIX-2: TWO-DIGIT CIP CODES

Two-Digit CIP

Below are the 49 two-digit CIP categories:

1. Agriculture, agriculture operations, and related sciences
2. Natural resources and conservation
3. Architecture and related services
4. Area, ethnic, cultural, gender, and group studies
5. Communication, journalism, and related programs
6. Communications technologies/technicians and support services
7. Computer and information sciences and support services
8. Personal and culinary services
9. Education
10. Engineering
11. Engineering technologies and engineering-related fields
12. Aboriginal and foreign languages, literatures, and linguistics
13. Family and consumer sciences/human sciences
14. Pre-technology education/pre-industrial arts programs
15. Legal professions and studies
16. English language and literature/letters
17. Liberal arts and sciences, general studies, and humanities
18. Library science
19. Biological and biomedical sciences
20. Mathematics and statistics
21. Military science, leadership, and operational art
22. Military technologies and applied sciences
23. Multidisciplinary/interdisciplinary studies
24. Parks, recreation, leisure, and fitness studies
25. Basic skills (not for credit)
26. Citizenship activities (not for credit)
27. Health-related knowledge and skills (not for credit)
28. Interpersonal and social skills (not for credit)
29. Leisure and recreational activities (not for credit)
30. Personal awareness and self-improvement (not for credit)
31. Philosophy and religious studies
32. Theology and religious vocations
33. Physical sciences
34. Science technologies/technicians
35. Psychology
36. Security and protective services
37. Public administration and social service professions
38. Social sciences
39. Construction trades
40. Mechanic and repair technologies/technicians
41. Precision production
42. Transportation and materials moving
43. Visual and performing arts
44. Health professions and related programs
45. Business, management, marketing, and related support services
46. High school/secondary diploma and certificate programs
47. History
48. French language and literature/letters
49. Dental, medical, and veterinary residency programs

APPENDIX-3: STUDY 3 CODEBOOK

Importance Scale

1. Marginal importance to achieving project goals
2. Importance to achieving project goals
3. Essential to achieving project goals

Difficulty Scale

1. Easy to find data (1–5 minutes)
2. Medium difficulty to find data (5–10 minutes)
3. Exceedingly difficult to find data (11 minutes to one hour)

Variable	Coding	Importance	Difficulty
Organization Level Coding			
Orientation		**3**	**1**
For-Profit	1. For-profit		
Non-Profit	2. Non-profit		
Public	3. Municipal 4. Provincial 5. Federal 6. Other		
Skills Developer Clusters	**NAICs by Sector**		
Schools	611110 - Elementary and secondary schools	3	1
Universities and Colleges	611210 - Community colleges and C.E.G.E.P.s 611310 - Universities	3	1
Professional Development	611420 - Computer training 611630 - Language schools 611430 - Professional and management development 541612 - Human resources consulting services	3	1
Other Schools	611690 - All other schools and instruction	3	1
Creative Arts	611690 - All other schools and instruction 611610 - Fine arts schools 711120 - Dance companies	3	1
Active Programs	611620 - Athletic instruction 713940 - Fitness and recreational sports centres 713991 - Sports clubs performing before a non-paying audience 713992 - Other sport facilities 721213 - Recreational (except hunting and fishing) and vacation camps	3	1
Community Programs	519121 - Libraries 624310 - Vocational rehabilitation services 623999 - All other residential care facilities 624110 - Child and youth services 624120 - Services for the elderly and persons with disabilities 624190 - Other individual and family services 813310 - Social advocacy organizations 711322 - Festivals without facilities 712110 - Museums 712130 - Zoos and botanical gardens 712190 - Nature parks and other similar institutions	3	1
Religious	813110 - Religious organizations	3	1
Business and Labour Associations	813910 - Business associations 813920 - Professional organizations 813930 - Labour organizations	3	1

Trade Schools	611510 - Technical and trade schools 611410 - Business and secretarial schools	3	1
Other			
Location of organization	1. Calgary-based 2. Alberta-based 3. Canadian-based 4. Other	3	1
Age of organization	1. Under 5 years 2. 5–9 years 3. 10–19 years 4. 20 + years	1	2
Size of organization (employees)	1. Under 10 employees 2. 10–49 employees 3. 50–99 employees 4. 100–249 employees 5. 250–499 employees 6. 500+ employees 7. 1000–9999 employees 8. Greater than 10,000 employees	1	2
Program Level Coding			
Program Name			
Program name	1. Open Text	3	1
Program Category			
Certified Structured and organized training, education or professional development experiences provided through an educational institution, in the workplace, or by a professional accrediting body. It is institution-bound and time-bound and results in formal certification by a formal institution, professional body, or sanctioned certifying agency.	1. Primary education 2. Lower secondary education 3. Upper secondary education 4. Bachelor or equivalent 5. Master or equivalent 6. Doctorate or equivalent 7. Accredited short-cycle tertiary education (e.g., microcredentials) 8. Professional certification	3	1
Non-Certified Organized or systematic educational, training, or professional development activities developed by a variety of structured educational institutions, community organizations, or training agencies, and which is often more flexible in meeting the needs of specific individuals. This type of learning does not result in formal certification	1. Early childhood education 2. Postsecondary non-tertiary education 3. Non-accredited short-cycle tertiary education (e.g., professional development, language training)	3	1
Experiential & Informal The process of acquiring knowledge, skills, and values from daily experiences at home, in the community, or at work. The process may appear unorganized and unsystematic, but it is not necessarily unintentional in that individuals may seek out these experiences to enhance their individual or collective learning.	1. Curriculum-directed experiential learning (e.g., co-operative education, apprenticeship). 2. Self-directed paid employment 3. Self-directed volunteering 4. Self-directed general interest activities (e.g., hobbies, household activities, recreational sporting activities, visiting a museum). 5. Self-directed professional development 6. Self-directed learning resources	3	1

Primary Skills Orientation			
Enabling Skills Ability to incorporate the knowledge, skills, attitudes, values, and behaviours needed to deliver analytical thinking, interpersonal, foundational skills; and professional enabling skills.	1. Problem-solving 2. Self-reliance 3. Collaboration 4. Communications 5. Foundational literacies 6. Core workplace skills		
Development of Skills Explicitly Identified in Program Materials			
	Wave 1: Code as high or low potential. *Wave 2:* Define sample of programs to explore deeper learning outcomes.		
Problem-Solving	1. Analytical thinking 2. Curiosity 3. Creativity 4. System thinking	3	3
Self-Reliance	1. Adaptable 2. Takes initiative 3. Determination	3	3
Collaboration	1. Emotional intelligence 2. Conflict management 3. Inspire and lead others 4. Trusted 5. Value relationships	3	3
Communications	1. Active listening 2. Effective verbal communications 3. Effective writer	3	3
Core Literacies	1. Reading literacy 2. Good with numbers 3. Financial literacy 4. Civic literacy 5. Technology literacy	3	3
Core Workplace Skills	1. Define workplace goals 2. Management, money, and people 3. Professional identity 4. Time management 5. Continuous learning	3	3
Potential for Developing Skills (but not explicit)			
Analytic Skills	1. Low Potential 2. High Potential	3	3
Interpersonal Skills	1. Low Potential 2. High Potential	3	3
Foundational skills	1. Low Potential 2. High Potential	3	3
Professional Skills	1. Low Potential 2. High Potential	3	3

Job Skills Potential			
Job Skills Incorporate the knowledge, skills, attitudes, values, and behaviours needed to complete specific tasks associated with a role (e.g., accounting, welding) and/or a sector (e.g., energy, sport).	○ *Wave 1:* Open Text comments. ○ *Wave 2:* Code to two-level CIP. ○ *Wave 3:* Code targeted programs to four-level CIP.	3	2
Classification of Instructional Programs (CIP) CIP is a hierarchical classification system of all instructional programs, a combination of courses and experiences that is designed to carry out a predetermined objective.	○ Refer to full two-digit CIP code list ○ Refer to full four-digit CIP code list	1	2
Functional Skills Composed of six major sub-sectors that appeared from the demand study (Study 1) based on 13,000 employment postings for Calgary in 2021.	1. Sales & Marketing 2. Service & Support 3. Finance & Accounting 4. General Labour 5. Technology 6. Management & Operations	1	1
Calgary Economic Development Sector Composed of eight key sectors. Energy & environment is further broken into three separate sub-sectors (oil & gas, clean technology, and utilities). For the Creative Industries, the study isolated software related NAICs as a sub-sector. (Mapped to Calgary Economic Development defined NAICs for each sector.)	1. Financial Services 2. Life Sciences 3. Transportation & Logistics 4. Creative Industries (excluding software) 5. Software development 6. Agribusiness 7. Tourism 8. Energy & Environment a. Oil & Gas b. Utilities c. Clean Technologies	1	1
Delivery Orientation			
Primary method	1. Primarily synchronous (e.g., real-time consumption) 2. Primarily asynchronous (e.g., non-real time) 3. Blended (incorporates both synchronous and asynchronous delivery) 4. Individual preferred (e.g., leader may choose)	2	1
Location preferred	1. Workplace 2. Home 3. Location agnostic 4. Individual decided	2	1
Technology requirements (cost to individual)	1. Basic technology needs (e.g., PC, MS Office) 2. Enhanced technology needs (<$500 investment) 3. Extensive technology needs (>$500 investment)	1	1
Skills Certification Process			
Institutional certification Is rooted in the embedded regulatory, structural, and procedural legitimacy of the certifying institution.	1. License (e.g., medical) 2. Educational (e.g., degree) 3. Certification (e.g., CMA) 4. Stacked Credential (e.g., Coursera) 5. Experience (e.g., co-op)	3	1

Social certification Are framed by judging the above-mentioned personal legitimacy of the certifying individual or evidence.	1. Evidentiary (e.g., portfolio) 2. Advocacy (e.g., reference)	3	1
Program has no certification of learning	1. None	3	1
Prerequisite			
Prerequisite	1. Yes (Open-Text) 2. No	1	2
Direct cost to individual (CDN $)			
No cost	1. $0	3	2
Low cost	2. $1–$99		
Medium cost	3. $100–$9999		
High cost	4. $10,000 or greater		
Duration			
The program has no defined time.	1. Not defined	2	1
The program has a defined time.	2. Less than one day 3. One day to one week 4. One week to one month 5. One month to one year 6. Over one year 7. Ongoing		
Annual number of experiences offered			
Estimated number of experiences delivered annually.	*Wave 1:* Identify if obvious. *Wave 2:* Project individual experiences based on category specific methodology.	3	3
Primary Cognitive Process			
	Wave 1: Identify if obvious. *Wave 2:* Define sample of programs to explore deeper learning outcomes**.**		
Remember Retrieving relevant knowledge from long-term memory	**1. Remember** ○ Recognize ○ Recall	1	2
Understand Determining the meaning of instructional messages, including oral, written, and graphic communication.	**2. Understand** ○ Interpreting ○ Exemplifying ○ Classifying ○ Summarizing ○ Inferring ○ Comparing ○ Explaining		
Apply Carrying out or using a procedure in each situation.	**3. Apply** ○ Executing ○ Implementing		
Analyze Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose.	**4. Analyze** ○ Differentiating ○ Organizing ○ Attributing		
Evaluate Making judgments based on criteria and standards.	**5. Evaluate** ○ Checking ○ Critiquing		
Create Putting elements together to form a novel, coherent whole or make an original product.	**6. Create** ○ Generating ○ Planning ○ Producing		

Primary Knowledge Orientation			
	Wave 1: Identify if obvious. *Wave 2:* Define sample of programs to explore deeper learning outcomes.		
Factual knowledge The basic elements that students must know to be acquainted with a discipline or solve problems in it.	**1. Factual knowledge** ○ Terminology ○ Specific details and elements	1	3
Conceptual knowledge The interrelationships among the basic elements within a larger structure that enable them to function together	**2. Conceptual knowledge** ○ Classification and categories ○ Principles and generalizations ○ Theories, models, and structures		
Procedural knowledge How to do something; methods of inquiry, and criteria for using skills, algorithms, techniques, and methods.	**3. Procedural knowledge** ○ Subject specific skills and algorithms ○ Subject specific techniques and revisions ○ Criteria for determining when to use appropriate procedure		
Meta-cognitive knowledge Knowledge of cognition in general as well as awareness and knowledge of one's own cognition.	**4. Meta-cognitive knowledge** ○ Strategic knowledge ○ Knowledge about cognitive tasks, including appropriate contextual and conditions knowledge. ○ Self-knowledge		
Individual Level Coding			
Is the program designed for a specific life-stage preference	1. Pre-teen (0–12) 2. Teen (13–17) 3. Young adult (18–29) 4. Adult (30–64) 5. Seniors (65 and over) 6. No life stage orientation	3	1
Audience	1. Non-Targeted 2. Targeted (Open-Text)	3	2
Primary Value	*Wave 1:* Identify if obvious. *Wave 2:* Define sample of programs to explore deeper learning outcomes. 1. Professional development 2. Personal development 3. Blended/not obvious	3	2

APPENDIX-4: STUDY 3 NAIC SAMPLING ALLOCATION

Certified and Non-certified NAIC	% Orgs Samples	% Programs Sampled
519121 - Libraries	100	100
611110 - Elementary and secondary schools	100	100
611210 - Community colleges and C.E.G.E.P.s	100	100
611310 - Universities	100	100
611410 - Business and secretarial schools	100	100
611420 - Computer training	100	100
611430 - Professional and management development	100	100
611510 - Technical and trade schools	100	100
611630 - Language schools	100	100
624310 - Vocational rehabilitation services	100	100
711322 - Festivals without facilities	100	50
712110 - Museums	100	50
712130 - Zoos and botanical gardens	100	50
712190 - Nature parks and other similar institutions	100	50
611610 - Fine arts schools	25	25
611620 - Athletic instruction	25	25
611690 - All other schools and instruction	25	25
623999 - All other residential care facilities	25	25
624110 - Child and youth services	25	25
624120 - Services for the elderly and persons with disabilities	25	25
624190 - Other individual and family services	25	25
711120 - Dance companies	25	25
713940 - Fitness and recreational sports centres	25	25
713991 - Sports clubs performing before a non-paying audience	25	25
713992 - Other sport facilities	25	25
721213 - Recreational (except hunting and fishing) and vacation camps	25	25
813310 - Social advocacy organizations	25	25
813910 - Business associations	25	25
813920 - Professional organizations	25	25
813930 - Labour organizations	25	25
541612 - Human resources consulting services	15	15
813110 - Religious organizations	15	15

APPENDIX-5: ENABLING SKILLS CODING

Coding Synonyms: *Problem-Solving*

Analytical Thinking	Creativity	Curiosity	Systems Thinking
• Critical thinking • Cost-benefit analysis • Identify • Recognize • Judgement • Evaluate • Analyze • Assess • Reasoning • Rationalization • Decipher • Investigation • Inspect • Concrete thinker • Theory • Analytical • Pathology • Managing uncertainty • Troubleshooting • Decision making • Decide and initiate action • Solution • Sort out • Diagnostic • Techniques • Overcomes challenges • Tips • Tricks • Test • Solve • Diagnose • Tactical • Dissect • Examine	• Innovative • Out-of-the-box thinking • Original thinking • Inventive • Imagination • Artistry • Ingenuity • Sketch • Draw • Visual arts • Paint • Dance • Theater • Create • Music • Cook • Crafts • Abstract • Design • Creative • Art • Drama • Culinary • Masterpiece	• Humility • Inquisitive • Outward-looking nature • Openness to learn • Explore • Curious • Thirst for knowledge • Ask questions • Inquire • Discover • Interest • Fascinating • Learn everything • See for yourself • Play • "Did you know..." • Adventure	• Complex systems • Strategy mapping • Mind mapping • Interdependency • Seek root cause • Insight • Considers the larger picture • System management • System leadership • Seeing the big picture • Research • Strategy • Knowledge of systems • Intersectional • Historical context

Coding Synonyms: *Self-Reliance*

Adaptable	Determination	Takes Initiative
• Accepting • Open-minded • Diversity • Openness to experience • Flexible thinking • Cultural competence • Adaptable • Bridging gaps • Industry crossover • Handles unexpected situations • Branch out • Physical literacy • Different scopes of work • wide range • Breadth • Variety of environments • Etiquette • Real-world situations • Diverse settings • Pivot • Well-rounded • Hands-on • Respond to emergencies • Coping skills • Interfaith dialogue	• Drive results • Resilience • Cope with pressure • Dedicated • Remain calm in stressful situations • Committed • Overcome barriers • Accountability • Deliver • Work to completion • Achievement focus • Tenacity • Diligence • Determined • Stick-to-itiveness • Perseverance • Stamina • Reach full potential • Hard work • Hope • Handle life-threatening situations • Ambitious • Goal oriented • Approach obstacles with confidence • Personal best • Become a stronger version of self • Challenge your body • Work ethic • Competition	• Self-starter • Self-management • Self-motivated • Independence • Responsive • Achieve results • Detail-oriented • Take acti • Proactive • Personal initiative • Independent individuals • Eagerness • Discipline • Wants the challenge • Serve • Self-directed

Coding Synonyms: *Collaboration*

Emotional Intelligence	Conflict Management	Inspire & Lead Others	Trusted	Value Relationships
• Empathy • Self-awareness • Self-esteem • Others' needs • Managing stress • Sensitivity • Understanding emotions • Control emotions • Express emotions • Identify emotions • Emotional regulation • Stress • Support • Mental health • Special needs • Understand needs • Mental strength • Mental challenge • Center your mind • Mentally tough • Calming the mind • Confidence • Mental preparedness • Self control • Anxiety • Spiritual consciousness	• Negotiation • Understand new perspectives • Resolve • Conflict management • Settlement • Reconciliation • Mediation • Arbitrate • Avoid power struggles • Intervention • Behavioural management • Remediate	• Lead organization • Guide • Leadership • Take ownership • Supervise • Coach • Mentor • Motivate • Encourage • Provide direction • Guidance • Excite • Energize • Teach • Influence • Persuasion • Advocate • Sway • Win over • Stage presence • Charisma • Sales • Role model • Minister • Train others • Parenting • Encourage positive personality traits	• Ethical behaviour • Commitment to personal integrity • Fairness • Ethics • Integrity • Transparency • Honesty • Impartiality • Truthfulness • Respect for regulations • Rules • Policies • Upstanding • Moral • Decency • Trust • Responsibility • Sportsmanship • Confidentiality	• Collaborative • Teamwork • Work with people • Relationship management • Work with all levels • Interact with others • Cooperate • Join together • Group dynamic • Participation • Partnership • Clubs • Establish rapport • Networking • Relationships • Make friends • Bring together • Alliance • Liaison • Build bridges • Interpersonal skills • Client building • Customer service • Meet others • Social exchange • Socialize • Connecting • Share • Close-knit group • Family • Work with peers • Working in a pair • Friendship • Group learning • Camaraderie • Work alongside • Worship • Fellowship

Coding Synonyms: *Communications*

Active Listening	Effective Verbal Communicator	Effective Writer
• Listening • Attentive • Pay attention • Respond • Story-time • Panel discussion	• Verbal • Oral • Cold calling • Presentation • Answer effectively • Spoken • Vocal • Sing • Speech • Rap • Phonetic • Dialect • Read aloud • Linguistic (when mentioned regarding verbal communication) • Language (when mentioned about verbal communication) • Articulate (when mentioned about verbal communication) • Phonological • Communication • Poetic (when mentioned about verbal communication) • Pronunciation • Express (when mentioned about verbal communication) • Relay • Any specific language (when mentioned about verbal communication) • Jargon • Greetings • Phrases • Discuss • Conversation • Debate • Interview • Describe (when mentioned about verbal communication) • Hand signals • Storytelling (when mentioned about verbal communication) • Lead prayers • Glossary of terms	• Writing • Song writing • Spelling • Script • Grammar • Compose • Text • Type • Calligraphy • Draft • Essay • Literacy (when mentioned about writing) • Email • Author • Lyrically • Transcribe • Resume • Cover letter • Documentation • Correspondence • Typography • Record keeping • Any specific language (when mentioned about writing) • Describe (when mentioned about written communication) • Journaling • Storytelling (when mentioned about written communication)

Coding Synonyms: *Core Literacies*

Reading Literacy	Good with Numbers	Financial Literacy	Civic Literacy	Technology Literacy
• Reading • Comprehension of written text • Books • Terminology • Vocabulary • Any specific language (when mentioned about reading) • Literacy (when mentioned about reading) • Phonics • Bible study • Quran study	• Math • Numeracy • Quantitative • Calculations • Arithmetic • Compute • Specific mathematical disciplines • Fractions • Learn to count	• Finance • Accounting • Fiscal • Bank • Money • Budget • Invest • Capital • Pay • Bills • Subsidize • Grant • Loan • Wealth accumulation • Salary • Dollar amounts	• Knowledge of government • Political • Economies • Social literacy • Political savvy • Culturally relevant • Citizenship • Multicultural • Learn about community • Learn about culture • Insight into culture • Environmental sustainability • Gender equality • Work in the community • Underrepresented • Encourage positive social change • Cultural awareness • Legal • Community-building • Government • Governance • Participate in society • Humanities • Practice own culture • Uniting community • Protect environment • Cultural history • Religious knowledge • Socio-economic conditions • Cultivate community • Community inclusion • Bylaws	• Computer literacy • Recording • Technology • Digital • Device • Automated • Robotics • Electronic • Operator • Any reference to a specific software • Database • Apps • Coding • IT • Software • Online

Coding Synonyms: *Core Workplace Literacies*

Define Workplace Goals	Manage Money & People	Professional Identity	Time Management	Continuous
• Support team • Sets objective • Goal setting • Mission • Vision • Set targets • Preparation for professional career • Safety • OH&S regulations • Understanding workplace • Ergonomics • Executive • Work settings • Marketing • Employment goals	• Manage budget • Resource management • Manage people • Management experience • Administrative • Clerical • Inventory maintenance • Information management • Program resource materials • Employment support • Organizational behaviour	• Self-identity • Core values • Personality • Self-concept • Individuality • Personal attributes • Professional interests • Occupational profile • Professionalism • Career plan/ goals • Passion career • Build professional capacity • Postsecondary preparation • Future career • Employment training • Career-readiness • Professional ability • Professional development • Career development • Portfolio	• Organize • Planning • Scheduling • Follow timelines • Productivity • Meets deadlines • Orderliness • Efficiency • Prioritizing • Optimize • Deadline management	• Independent thinking • Actively engaged • Introspection • Contemplation • Memories • Mindfulness • Consideration • Grow • Personal goals • Continuous improvement • Personal development • Continuous review • Lifelong learning • Independent thinking • Active learning • Improve • Personalized individual • Learn by choice • Upgrading skills • Enhance skills • Learning goals • Reflect • Meditation

APPENDIX-6: FUNCTIONAL SKILLS CODING

Functional Skills	Scope	Four-Digit CIP
Sales & Marketing	Skills related to the development, marketing and sales of a product or services. E.g., Business Development; Project Management; Digital Marketing; Graphic Design	01.08 Agricultural public services 09.01 Communication and media studies 09.04 Journalism 09.07 Radio, television, and digital communication 09.09 Public relations, advertising, and applied communication 09.10 Publishing 09.99 Communication, journalism, and related programs, other 10.03 Graphic communications 13.05 Educational/instructional media design 50.01 Visual, digital, and performing arts, general 50.04 Design and applied arts 50.06 Film/video and photographic arts 52.05 Business/corporate communications 52.14 Marketing 52.18 General sales, merchandising and related marketing operations 52.19 Specialized sales, merchandising and marketing operations
Service & Support	Skills related to providing service and support to individuals. E.g., Customer Service; Technical Assistance; Customer Billing; Patient Care	12.03 Funeral service and mortuary science 12.04 Cosmetology and related personal grooming service 12.05 Culinary arts and related services 12.99 Personal and culinary services, other 13.10 Special education and teaching 13.11 Student counselling and personnel services 13.15 Teaching assistants/aides 19.00 Work and family studies 19.01 Family and consumer sciences/human sciences, general 19.02 Family and consumer sciences/human sciences business services 19.07 Human development, family studies and related services 19.99 Family and consumer sciences/human sciences, other 39.03 Missions/missionary studies and missiology 39.07 Pastoral counselling and specialized ministries 42.28 Clinical, counselling, and applied psychology 44.00 Human services, general 44.02 Community organization and advocacy 44.07 Social work 44.99 Public administration and social service professions, other 46.05 Plumbing and related water supply services 47.00 Mechanics and repairers, general 47.02 Heating, air conditioning, ventilation, and refrigeration maintenance technology/technician 47.06 Vehicle maintenance and repair technologies 51.01 Chiropractic (JS) 51.02 Communication disorders sciences and services 51.04 Dentistry (DJS, DMD) 51.05 Advanced/graduate dentistry and oral sciences (Cert., MS, MSc, PhD) 51.06 Dental support services and allied professions 51.07 Health and medical administrative services 51.08 Allied health and medical assisting services 51.09 Allied health diagnostic, intervention, and treatment professions

		51.10 Clinical/medical laboratory science/research and allied professions 51.11 Health/medical preparatory programs 51.15 Mental and social health services and allied professions 51.17 Optometry (OD) 51.18 Ophthalmic and optometric support services and allied professions 51.19 Osteopathic medicine/osteopathy (DO) 51.22 Public health 51.23 Rehabilitation and therapeutic professions 51.24 Veterinary medicine (DVM) 51.26 Health aides/attendants/orderlies 51.31 Dietetics and clinical nutrition services 51.34 Alternative and complementary medical support services 51.36 Movement and mind-body therapies 51.37 Energy-based and biologically based therapies 51.38 Registered nursing, nursing administration, nursing research and clinical nursing 51.39 Practical nursing, vocational nursing, and nursing assistants 52.12 Real estate
Finance & Accounting	Skills related to financial management and accounting. E.g., Bookkeeping; Financial Analysis; Risk Management; Accounting	30.16 Accounting and computer science 52.03 Accounting and related services 52.06 Business/managerial economics 52.08 Finance and financial management services 52.16 Taxation 52.17 Insurance
Management & Operations	Skills related to the management and operations of an organization. E.g., Human Resources; Project Management; Business Planning; Operations	01.01 Agricultural business and management 01.03 Agricultural production operations 01.99 Agriculture, agriculture operations and related sciences, other 03.06 Wildlife and wildlands science and management 04.03 City/urban, community and regional planning 22.02 Legal research and advanced professional studies (post-LLB/JD) 22.03 Legal support services 31.03 Parks, recreation, and leisure facilities management 50.10 Arts, entertainment, and media management 51.32 Bioethics/medical ethics 51.99 Health professions and related clinical sciences, other 52.01 Business/commerce, general 52.02 Business administration, management, and operations 52.04 Business operations support and assistant services 52.07 Entrepreneurial and small business operations 52.09 Hospitality administration/management 52.10 Human resources management and services 52.11 International business/trade/commerce 52.12 Management information systems and services 52.20 Construction management 52.21 Telecommunications management 52.99 Business, management, marketing, and related support services, other

Technology	Skills related to the development and application of specialized hardware or software. E.g., JavaScript; Oracle; SAP	01.10 Food science and technology 04.09 Architectural sciences and technology 10.01 Communications technology/technician 10.02 Audiovisual communications technologies/technicians 10.99 Communications technologies/technicians and support services, other 11.01 Computer and information sciences and support services, general 11.02 Computer programming 11.03 Data processing and data processing technology/technician 11.04 Information science/studies 11.05 Computer systems analysis/analyst 11.06 Data entry/microcomputer applications 11.07 Computer science 11.08 Computer software and media applications 11.09 Computer systems networking and telecommunications 11.10 Computer/information technology administration and management 11.99 Computer and information sciences and support services, other 14.01 Engineering, general 14.02 Aerospace, aeronautical and astronautical/space engineering 14.03 Agricultural engineering 14.04 Architectural engineering 14.05 Bioengineering and biomedical engineering 14.06 Ceramic sciences and engineering 14.07 Chemical engineering 14.08 Civil engineering 14.09 Computer engineering 14.10 Electrical, electronics and communications engineering 14.11 Engineering mechanics 14.12 Engineering physics/applied physics 14.13 Engineering science 14.14 Environmental/environmental health engineering 14.18 Materials engineering 14.19 Mechanical engineering 14.20 Metallurgical engineering 14.21 Mining and mineral engineering 14.22 Naval architecture and marine engineering 14.23 Nuclear engineering 14.24 Ocean engineering 14.25 Petroleum engineering 14.27 Systems engineering 14.28 Textile sciences and engineering 14.32 Polymer/plastics engineering 14.33 Construction engineering 14.34 Forest engineering 14.35 Industrial engineering 14.36 Manufacturing engineering 14.37 Operations research 14.38 Surveying engineering 14.39 Geological/geophysical engineering 14.40 Paper science and engineering 14.41 Electromechanical engineering 14.42 Mechatronics, robotics, and automation engineering 14.43 Biochemical engineering 14.44 Engineering chemistry 14.45 Biological/biosystems engineering

		14.99 Engineering, other 15.00 Engineering technology, general 15.01 Architectural engineering technology/technician 15.02 Civil engineering technology/technician 15.03 Electrical and electronic engineering technologies/technicians 15.04 Electromechanical and instrumentation and maintenance technologies/technicians 15.05 Environmental control technologies/technicians 15.06 Industrial production technologies/technicians 15.07 Quality control and safety technologies/technicians 15.08 Mechanical engineering related technologies/technicians 15.09 Mining and petroleum technologies/technicians 15.10 Construction engineering technology/technician 15.11 Engineering-related technologies 15.12 Computer engineering technologies/technicians 15.13 Drafting/design engineering technologies/technicians 15.14 Nuclear engineering technology/technician 15.15 Engineering-related fields 15.16 Nanotechnology 15.99 Engineering technologies and engineering-related fields, other 30.08 Mathematics and computer science 30.15 Science, technology, and society 30.30 Computational science 30.31 Human computer interaction 41.00 Science technologies/technicians, general 41.01 Biology technician/biotechnology laboratory technician 41.02 Nuclear and industrial radiologic technologies/technicians 41.03 Physical science technologies/technicians 41.99 Science technologies/technicians, other 47.01 Electrical/electronics maintenance and repair technology 47.02 Heating, air conditioning, ventilation, and refrigeration maintenance technology/technician 52.13 Management sciences and quantitative methods
General Labour	Skills that do not require a specific educational background or training. Most involve skills that can be developed through experience. E.g., Dishwashing; Housekeeping	

*CIP code may develop both functional skills and sectoral expertise.

APPENDIX-7: SECTORAL EXPERTISE CODING

Sectoral Expertise		Four-Digit CIP
Financial Services	Expertise uniquely associated with the financial services sector. E.g., Actuarial Sciences	30.16 Accounting and computer science 52.03 Accounting and related services 52.08 Finance and financial management services 52.16 Taxation 52.17 Insurance
Software Development	Expertise uniquely associated with software development. E.g., Software as a Service (SaaS)	11.01 Computer and information sciences and support services, general 11.02 Computer programming 11.03 Data processing and data processing technology/technician 11.04 Information science/studies 11.05 Computer systems analysis/analyst 11.06 Data entry/microcomputer applications 11.07 Computer science 11.08 Computer software and media applications 11.09 Computer systems networking and telecommunications 11.10 Computer/information technology administration and management 11.99 Computer and information sciences and support services, other 14.04 Architecture engineering 14.09 Computer engineering 15.12 Computer engineering technologies/technicians 30.30 Computational science 30.31 Human computer interaction
Life Sciences	Expertise uniquely associated with the life sciences services sector. E.g., Pharmaceutical Sciences	19.05 Foods, nutrition, and related services 26.01 Biology, general 26.02 Biochemistry/biophysics and molecular biology 26.03 Botany/plant biology 26.04 Cell/cellular biology and anatomical sciences 26.05 Microbiological sciences and immunology 26.07 Zoology/animal biology 26.08 Genetics 26.09 Physiology, pathology, and related sciences 26.10 Pharmacology and toxicology 26.11 Biomathematics, bioinformatics, and computational biology 26.12 Biotechnology 26.13 Ecology, evolution, systematics, and population biology 26.14 Molecular medicine 26.15 Neurobiology and neurosciences 26.99 Biological and biomedical sciences, other 30.01 Biological and physical sciences 30.10 Biopsychology 30.11 Gerontology 30.19 Nutrition sciences 30.25 Cognitive science 30.27 Human biology 31.05 Health and physical education/fitness 41.01 Biology technician/biotechnology laboratory technician 42.01 Psychology, general 42.27 Research and experimental psychology 42.28 Clinical, counselling, and applied psychology 42.99 Psychology, other

		51.00 Health services/allied health/health sciences, general 51.01 Chiropractic (JS) 51.02 Communication disorders sciences and services 51.04 Dentistry (DJS, DMD) 51.05 Advanced/graduate dentistry and oral sciences (Cert., MS, MSc, PhD) 51.06 Dental support services and allied professions 51.07 Health and medical administrative services 51.08 Allied health and medical assisting services 51.09 Allied health diagnostic, intervention, and treatment professions 51.10 Clinical/medical laboratory science/research and allied professions 51.11 Health/medical preparatory programs 51.12 Medicine (MD) 51.14 Medical scientist (MS, MSc, PhD) 51.15 Mental and social health services and allied professions 51.17 Optometry (OD) 51.18 Ophthalmic and optometric support services and allied professions 51.19 Osteopathic medicine/osteopathy (DO) 51.20 Pharmacy, pharmaceutical sciences, and administration 51.21 Podiatric medicine/podiatry (DPM) 51.22 Public health 51.23 Rehabilitation and therapeutic professions 51.24 Veterinary medicine (DVM) 51.25 Veterinary biomedical and clinical sciences (Cert., MS, MSc, PhD) 51.26 Health aides/attendants/orderlies 51.27 Medical illustration and informatics 51.31 Dietetics and clinical nutrition services 51.32 Bioethics/medical ethics 51.33 Alternative and complementary medicine and medical systems 51.34 Alternative and complementary medical support services 51.35 Somatic bodywork and related therapeutic services 51.36 Movement and mind-body therapies 51.37 Energy-based and biologically based therapies 51.38 Registered nursing, nursing administration, nursing research and clinical nursing 51.39 Practical nursing, vocational nursing, and nursing assistants 51.99 Health professions and related clinical sciences, other 60.01 Dental residency programs 60.04 Medical residency programs - general certificates 60.05 Medical residency programs - subspecialty certificates 60.06 Podiatric medicine residency programs 60.99 Dental, medical, and veterinary residency programs, other
Transportation & Logistics	Expertise uniquely associated with the transportation & logistics sector. E.g., Pilot	14.02 Aerospace, aeronautical and astronautical/space engineering 14.36 Manufacturing engineering 14.37 Operations research 49.01 Air transportation 49.02 Ground transportation 49.03 Marine transportation 49.99 Transportation and materials moving, other
Creative Industries (Excluding software).	Expertise uniquely associated with the creative industries sector. E.g., Film	04.02 Architecture (BArch, BA, BS, BSc, MArch, MA, MS, MSc, PhD) 04.03 City/urban, community and regional planning

		04.04 Environmental design/architecture 04.05 Interior architecture 04.06 Landscape architecture (BS, BSc, BSLA, BLA, MSLA, MLA, PhD) 04.08 Architectural history and criticism 04.09 Architectural sciences and technology 04.99 Architecture and related services, other 09.01 Communication and media studies 09.04 Journalism 09.07 Radio, television, and digital communication 09.09 Public relations, advertising, and applied communication 09.10 Publishing 09.99 Communication, journalism, and related programs, other 10.01 Communications technology/technician 10.02 Audiovisual communications technologies/technicians 10.03 Graphic communications 10.99 Communications technologies/technicians and support services, other 14.10 Electrical, electronics and communications engineering 15.13 Drafting/design engineering technologies/technicians 19.09 Apparel and textiles 31.01 Parks, recreation, and leisure studies 31.03 Parks, recreation, and leisure facilities management 31.06 Outdoor education 31.99 Parks, recreation, leisure, and fitness studies, other 50.01 Visual, digital, and performing arts, general 50.02 Crafts/craft design, folk art and artisanry 50.03 Dance 50.04 Design and applied arts 50.05 Drama/theatre arts and stagecraft 50.06 Film/video and photographic arts 50.07 Fine arts and art studies 50.09 Music 50.10 Arts, entertainment, and media management 50.99 Visual and performing arts, other 52.05 Business/corporate communications 52.14 Marketing 52.18 General sales, merchandising and related marketing operations 52.19 Specialized sales, merchandising and marketing operations 52.21 Telecommunications management 52.99 Business, management, marketing, and related support services, other
Agribusiness	Expertise uniquely associated with the agribusiness sector. E.g., Horticulturist	01.00 Agriculture, general 01.01 Agricultural business and management 01.02 Agricultural mechanization 01.03 Agricultural production operations 01.04 Agricultural and food products processing 01.05 Agricultural and domestic animal services 01.06 Applied horticulture/horticultural business services 01.07 International agriculture 01.08 Agricultural public services 01.09 Animal sciences 01.10 Food science and technology 01.11 Plant sciences 01.12 Soil sciences 01.99 Agriculture, agriculture operations and related sciences, other

		03.01 Natural resources conservation and research 03.02 Natural resources management and policy 03.03 Fishing and fisheries sciences and management 03.05 Forestry 03.06 Wildlife and wildlands science and management 03.99 Natural resources and conservation, other 14.03 Agricultural engineering
Oil & Gas	Expertise uniquely associated with the agribusiness services sector. E.g., Application of geographic information systems in oil & gas	14.07 Chemical engineering 14.20 Metallurgical engineering 14.21 Mining and mineral engineering 14.25 Petroleum engineering 14.39 Geological/geophysical engineering 15.09 Mining and petroleum technologies/technicians 40.01 Physical sciences, general 41.03 Physical science technologies/technicians
Utilities	Expertise uniquely associated with the agribusiness services sector. E.g., Powerplant engineering	15.03 Electrical and electronic engineering technologies/technicians 15.04 Electromechanical and instrumentation and maintenance technologies/technicians 15.05 Environmental control technologies/technicians 47.01 Electrical/electronic maintenance and repair technology 47.02 Heating, air conditioning, ventilation, and refrigeration maintenance technology/technician 48.08 Boilermaking/boilermaker
Clean Technologies	Expertise uniquely associated with the agribusiness services sector. E.g., Environmental system monitoring	14.05 Bioengineering and biomedical engineering 14.14 Environmental/environmental health engineering 14.34 Forest engineering 14.41 Electromechanical engineering 14.43 Biochemical engineering 14.44 Engineering chemistry 14.45 Biological/biosystems engineering 15.14 Nuclear engineering technology/technician 30.33 Sustainability studies 40.04 Atmospheric sciences and meteorology 40.05 Chemistry 40.06 Geological and Earth sciences/geosciences
Tourism	Expertise uniquely associated with the tourism sector. E.g., Hotel Management	12.05 Culinary arts and related services 12.99 Personal and culinary services, other 52.09 Hospitality administration/management

*CIP code may develop both functional skills and sectoral expertise.

APPENDIX-8: FUNCTIONAL SKILLS PROGRAMS EXAMPLES

Functional Skills	Synonyms	Program Examples
Sales & Marketing	Business Development	Graphic Designer Certificate Program at Academy of Learning
	Project Management	Bachelor of Communications, Public Relations Program at Mount Royal University
	Digital Marketing	Adobe Software Certificate Program at Mount Royal University
	Graphic Design	Communications and Media Studies Masters Program at University of Calgary
	Technical Writing	Online Digital Marketing (Gr. 7–9) Introductory Program at SAIT Polytechnic
		Professional Certification Marketing Program at Stafford House International
Service & Support	Customer Service	Advanced Care Paramedic Diploma Program at SAIT Polytechnic
	Technical Assistance	Addictions and Community Services Worker Diploma Program at CDI College
	Customer Billing	Help Desk Support Analyst Certification Program at Academy of Learning
	Relationship	Nail Technician Program at Delmar College of Hair Design
	Patient	Child Safety – Babysitter Program at West Hillhurst Community Association
	Consultant	Bachelor of Nursing (BN) Program at the University of Calgary
Finance & Accounting	Budgeting	Personal Finance: How to Financially Survive a Layoff Program at the Calgary Public Library
	Bookkeeping	Risk Management: Insurance and Finance (BCom) Program at the University of Calgary
	Financial Analysis	Post-Bachelor Certificate in Accounting Program at the University of Lethbridge
	Risk Management	Accounting Software Certification Program at Mount Royal University
	Accounting	Payroll Professional Certification Program at Bow Valley College
		Financial Coaching Program at Carya
Management & Operations	Human Resources	Oil and Gas Administration Diploma Program at CDI College
	Project Management	Hospitality and Tourism Management Diploma Program at ERP Technical
	Business Planning	Business Administration Diploma, Human Resources Major Program at Bow Valley College
	Operations	Supply Chain Training and Employment Program offered by Life Mark Health, supported by the Government of Canada.
	Talent Acquisition	Bachelor of Applied Business Administration Program at SAIT Polytechnic
	Management	Project Management Basics Program at Lemmex Williams Training

Technology	Engineering	Computer Literacy Program at the Centre for Newcomers
	Software Development	Online Coding Explorers Gr. 7–9 Program at SAIT Polytechnic
	JavaScript	Network Administrator Certification Program at Academy of Learning
	Oracle	DevOps for Architects Training Program at Web Age Solutions Inc
	SAP	Electrical & Computer Engineering Master of Engineering Program at the University of Calgary
	Cyber Security	Cybersecurity Specialist Diploma Program at CDI College
General Labour	Unskilled Labour	Not Applicable

APPENDIX-9: SECTORAL EXPERTISE PROGRAMS EXAMPLES

Sectors	Synonyms	Program Examples
Financial Services	○ Credit ○ Securities ○ Commodity ○ Brokerage ○ Investment ○ Funds ○ Monetary ○ Stock ○ Contract ○ Asset ○ Portfolio	○ Investment Management Program at Macro Consulting Group ○ Risk Management: Insurance & Finance (BCom) Program at the University of Calgary ○ Bachelor of Business Administration, Finance Program at Mount Royal University ○ Qualified Associate Financial Planner Program at Business Career College ○ SAP Finance Diploma Program at ERP Technical ○ Personal Financial Planning (BCom) Program at the University of Calgary
Creative Industries (excluding software)	○ Telecommunication ○ Print ○ Publish ○ Motion picture ○ Video ○ Sound ○ Recording ○ Television ○ Broadcast ○ Perform ○ Arts ○ Sports ○ Promoter ○ Agent ○ Media ○ Design ○ Advertising ○ Public Relations ○ Marketing ○ Software ○ Coding ○ Programming ○ Data ○ Hosting ○ Software as a Service (SaaS)	○ Theatrics/Stage Presence Program at En L'air Academy of Dance and Aerial ○ Film and Video Production Diploma at SAIT Polytechnic ○ Graphic Communications and Print Technology Degree Program at SAIT Polytechnic ○ Software Development Diploma Program at Bow Valley College ○ Bachelor of Communications, Broadcast Media Studies Program at Mount Royal University ○ Bachelor of Communications, Information Design Program at Mount Royal University
Software Development	○ Software ○ Coding ○ Programming ○ Data ○ Hosting ○ Software as a Service (SaaS)	○ Coding Bootcamp at Lighthouse Labs ○ Full Stack Developer program at InceptionU ○ Mega Coding class at Coding School for Kids ○ Applied User Experience Design Bootcamp at SAIT's School for Advance Digital Technology
Life Sciences	○ Medical Equipment ○ Medical Supplies ○ Lab ○ Research ○ Office ○ Physician ○ Dentist ○ Dental	○ Advanced Care Paramedic Certification Program at PMA Calgary Inc ○ Community Service Worker with Addictions Specialty Certification Program at Academy of Learning ○ Integrated Services for Children with Motor Disabilities (ISMD) Program at Renfrew Educational Service ○ Bachelor of Health Sciences (BHSc) Program at the University of Calgary ○ Biomedical Engineering Master of Science (MSc) Program at the University of Calgary

	○ Diagnostic ○ Service ○ Paramedic ○ Chiropractic ○ Optometrist ○ Therapist ○ Counselling ○ Nutritionist ○ Substance Abuse ○ Psych ○ Developmental ○ Community Care ○ Foster	○ Neuroscience (BSc) Program at the University of Calgary
Transportation & Logistics	○ Manufacturing ○ Motor Vehicle ○ Aerospace ○ Railroad ○ Ship ○ Boat ○ Transportation ○ Wholesaler ○ Equipment ○ Supplies ○ Air ○ Rail ○ Water ○ Truck ○ Transit ○ Bus ○ Passenger ○ Storage ○ Warehouse	○ Aviation Certification Programs at Mount Royal University ○ Commercial Pilot License Program at Calgary Flying Club ○ Electric Motor System Technician Certification Program at SAIT Polytechnic ○ Aircraft Maintenance Engineers Technology Diploma Program at SAIT Polytechnic ○ Railway Conductor Diploma Program at SAIT Polytechnic ○ Transportation of Dangerous Goods (TDG) Certification Program at Black Gold Emergency Planners
Agribusiness	○ Farm ○ Greenhouse ○ Nursery ○ Animal ○ Production ○ Manufacturing ○ Product ○ Bake ○ Chemical ○ Wholesale ○ Equipment ○ Store ○ Restaurant	○ Agricultural Equipment Technician Certificate Program at SAIT Polytechnic ○ Baker Certification Program at SAIT Polytechnic
Tourism	○ Bus ○ Air ○ Rail ○ Water ○ Transportation ○ Travel ○ Accommodation ○ Restaurant ○ Motion Picture ○ Video ○ Perform	○ Hospitality Management Diploma at SAIT Polytechnic ○ Travel and Tourism Diploma at SAIT Polytechnic ○ Butchery and Charcuterie Management Diploma Program at SAIT Polytechnic ○ Bachelor of Music Program at Ambrose University ○ BFA in Drama Program at the University of Calgary

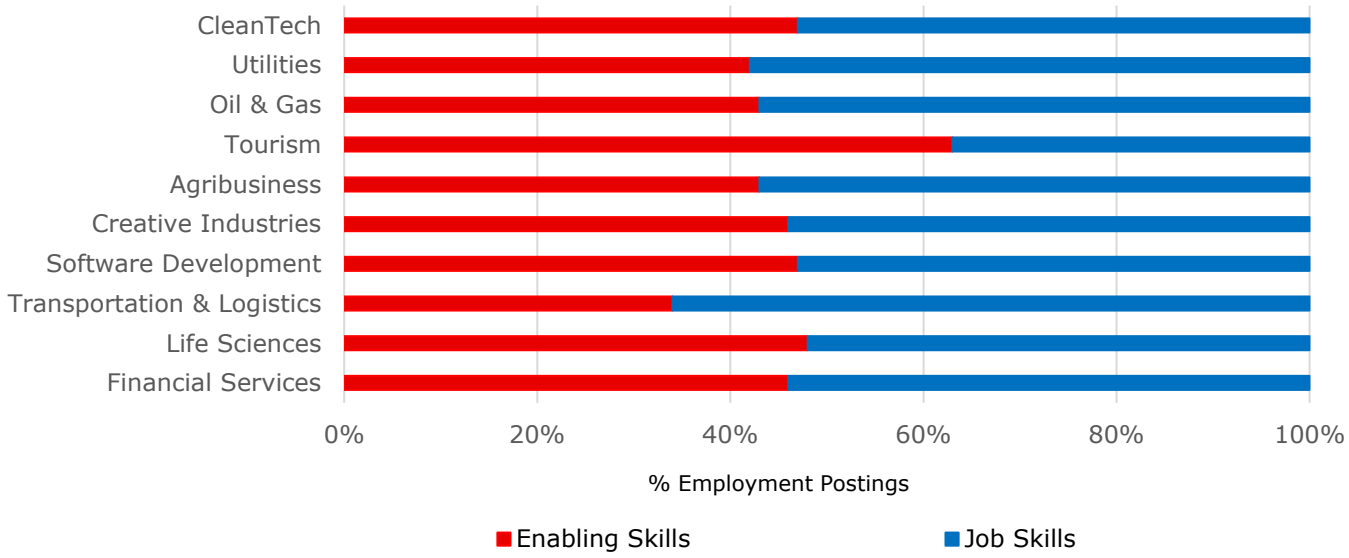
	○ Sport ○ Arts ○ Heritage	
Oil & Gas	○ Chemical ○ Manufacturing ○ Oil ○ Gas ○ Coal ○ Mining ○ Petroleum ○ Pipeline	○ Gas Production Operator Certification Program at Enform ○ Energy Engineering (BSc in Engineering) Program at the University of Calgary ○ Master of Engineering, Chemical and Petroleum Program at the University of Calgary ○ Pipeline Engineering Certificate Program at University of Calgary ○ Oil and Gas Administration Diploma at CDI College
Utilities	○ Electric ○ Power ○ Gas ○ Utility ○ Engine ○ Turbine	○ Electrical Engineering (BSc in Engineering) Program at the University of Calgary ○ Water and Wastewater Treatment Operations Certification Program at SAIT Polytechnic ○ Gas Process Operations Certificate Program at SAIT Polytechnic
Clean Technologies	○ Agriculture ○ Forestry ○ Mining ○ Electric ○ Power ○ Water ○ Sewage ○ Preservation ○ Petroleum ○ Coal ○ Pharma ○ Cement ○ Concrete ○ Manufacturing ○ Commercial ○ Motor Vehicle ○ Research ○ Science ○ Waste ○ Energy ○ Environmental	○ BSc in Earth Science Program at the University of Calgary ○ Civil Engineering (BSc) Program at the University of Calgary ○ Energy Engineering (BSc) Program at the University of Calgary ○ Environmental Science (BSc) Program at the University of Calgary ○ Energy Asset Management Diploma at SAIT Polytechnic

APPENDIX-10 FULL RESULTS

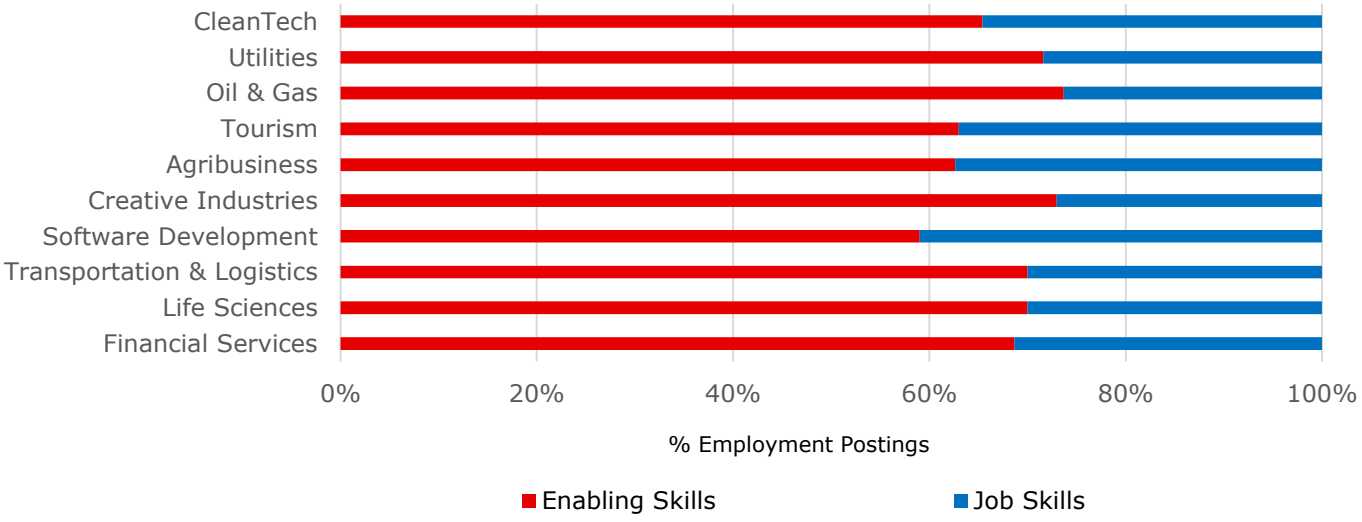
Study 1: Calgary Skill Demand Audit

The following two charts provide a lens on the proportion of enabling skills and job skills for each sector (N=13,510). 55% of requested skills are job skills. However, isolated to the top 10, 65% of the skills are enabling skills. This is because enabling skills are highly concentrated, whereas job skills are fragmented across an average of 187 different specific areas.

Enabling – Job Skills by Sector (all)

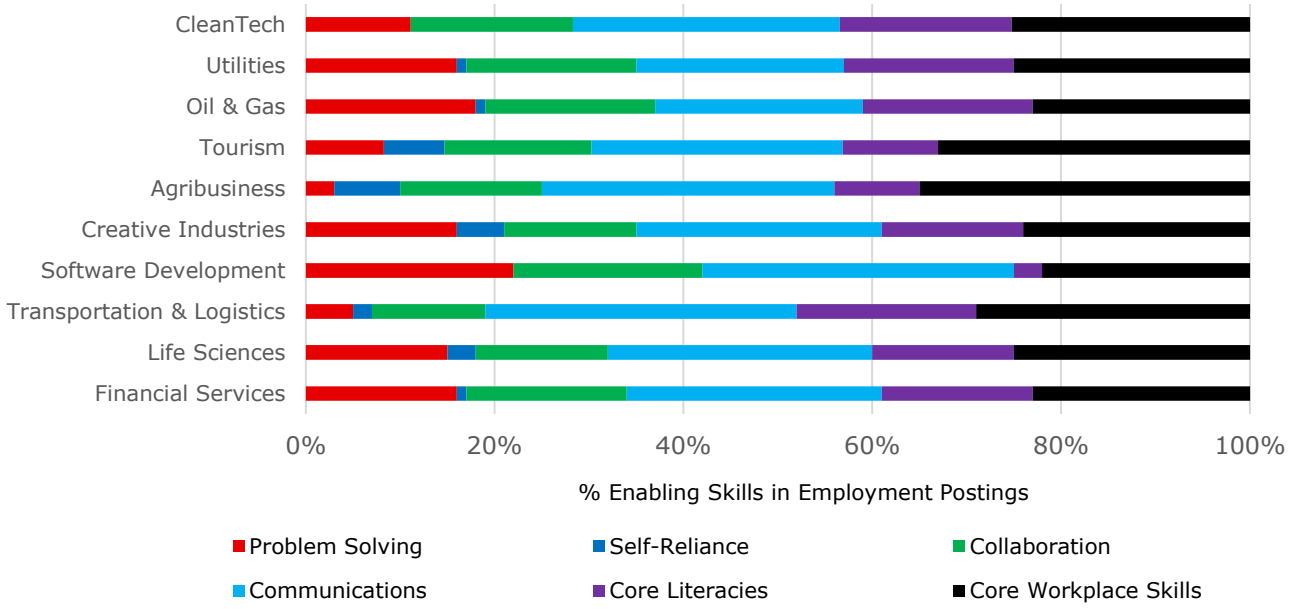


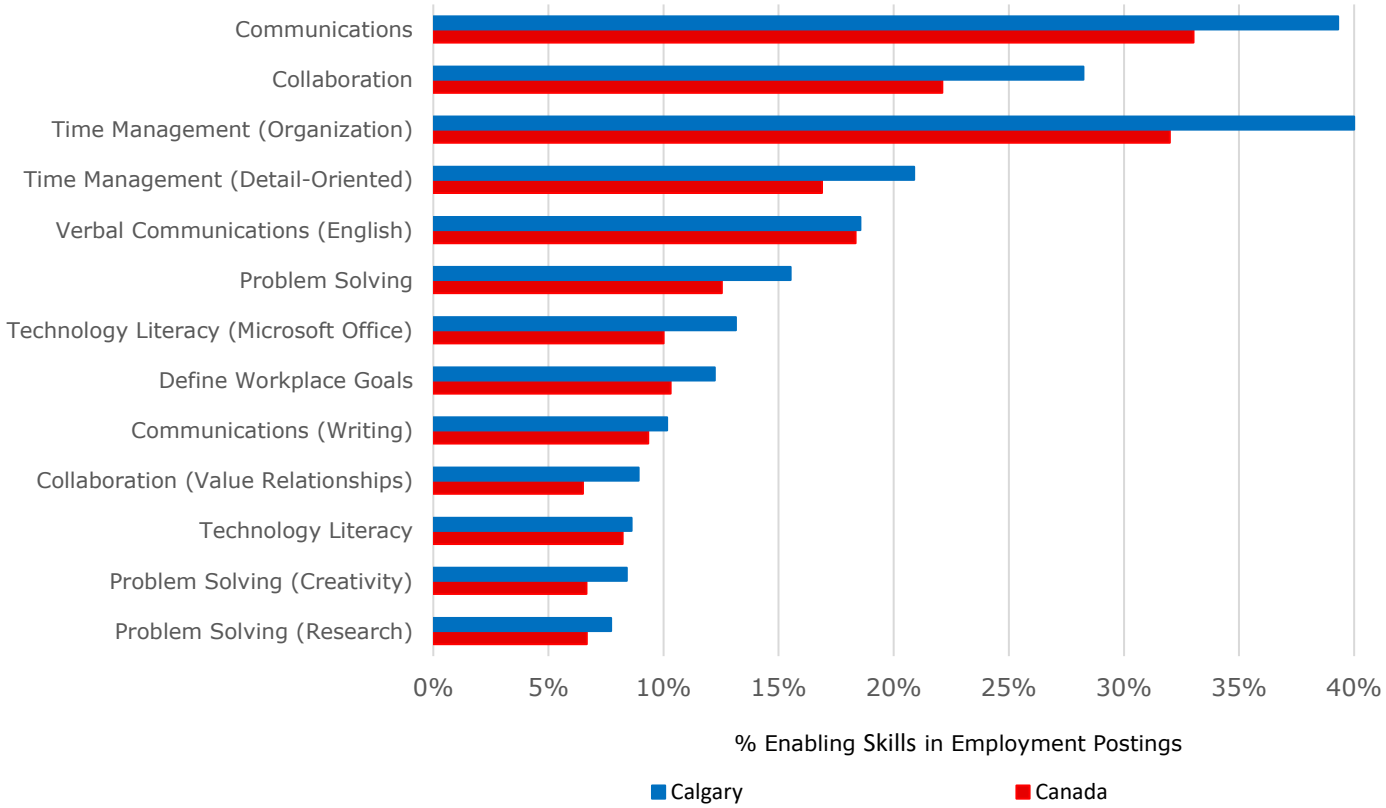
Enabling – Job Skills by Sector (Top-10)



Enabling Skills by Sector

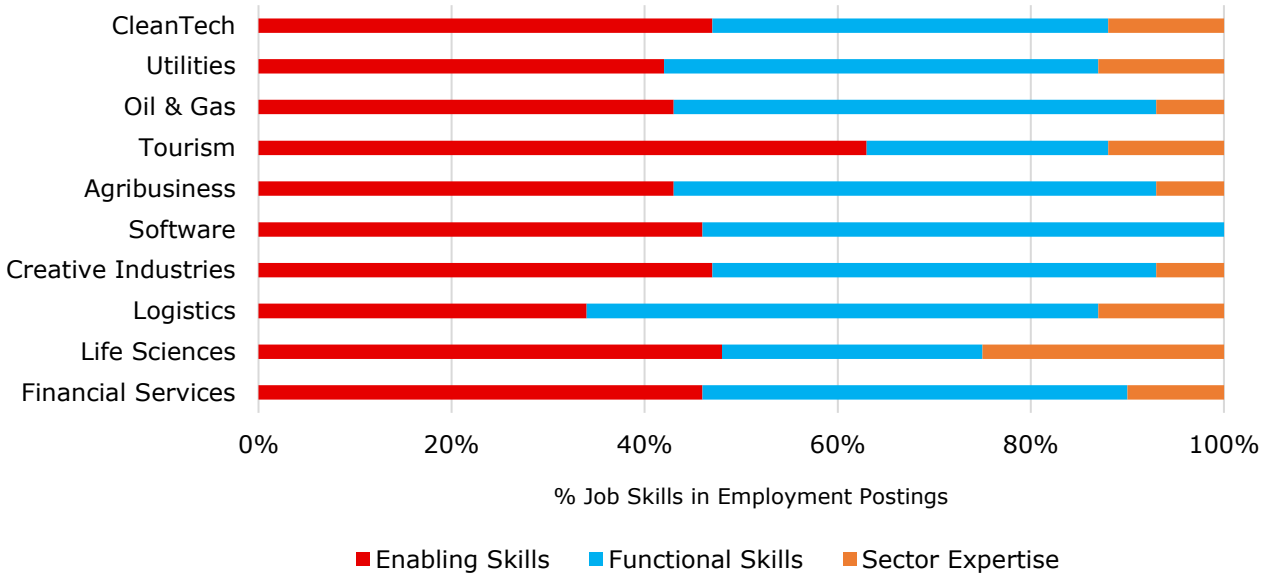
The first chart provides a lens on the specific enabling skills by sector. Communication and core workplace skills are the leading enabling skills across most sectors. Core workplace skills have a heavier concentration in areas related to organization and time management. Self-reliance is rarely explicitly included in employment postings. The second chart compares the leading 15 individual enabling skills for Calgary and Canada. enabling skills related to communications, collaboration, and organization dominate employment demand in both Calgary and Canada.



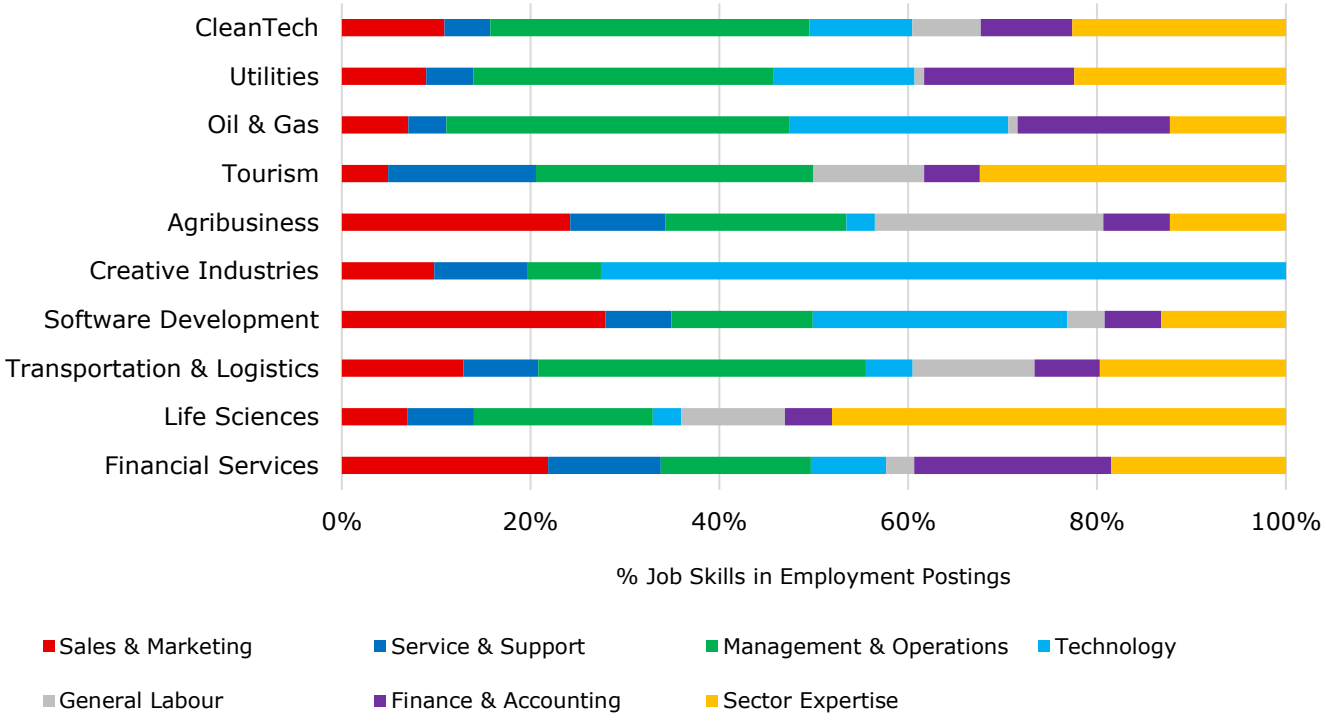


Job Skills by Sector

The following chart breaks down job skills by functional skills and sectoral expertise. On average, the demand for functional skills is three times that of sectoral expertise. The exception is life sciences where it is closer to one to one. This is important as functional skills provide an adaptive capacity to move between sectors.



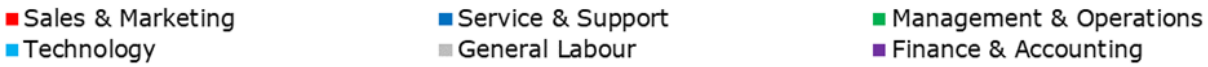
Below further breaks down each of the ten sectors by the seven job skills clusters. This chart demonstrates the fluctuating demand for functional skills by sector. For example, transportation & logistics, utilities, oil & gas have a high demand for management & operations skills, whereas agribusinesses and creative industries have a higher demand for sales & marketing skills. Technology skills are in demand from six of the 10 sectors but dominate the software development sector.



Job Skill Demand by Sector

Below are the top 10 individual job skills for each of the 10 sectors colour coded by job skills cluster. job skills related to service & support, sales, and project management are dominant. Of the 80 job skills, there are very few that are explicitly linked specifically to sectoral expertise. Rather, most job skills are primarily linked to functional skills (e.g., service & support, marketing, finance) rather than deep sector-specific expertise. Like enabling skills, functional skills transcend sectors and context. Functional skills ranging from project management to marketing to accounting will be influenced by sector specific contexts, but the base functional skills can be efficiently adapted and applied to the unique dynamics of sector, company, product, or service specific context.

Sector or company specific experience may contextualize functional skills. For example, a marketing role in financial services may require distinct contextual knowledge associated with financial services. However, contextual knowledge is acquired through by being professional immersed in the sector (informal learning), and only rarely through traditional certified programming. This suggests informal learning mechanisms linked to experiential programming has the potential to play a large role in accelerating the adaptive capacity of Calgarians.



Financial Services	%	Life Sciences	%	Logistics	%	Creative– All	%
Customer Service	25%	Customer Service	16%	Customer Service	20%	Customer Service	17%
Customer Contact	18%	Scheduling	14%	Scheduling	12%	Sales	12%
Securities	15%	Administrative Support	14%	Logistics	11%	Project Management	11%
Business Development	15%	Patient Care	12%	Lifting Ability	10%	Scheduling	11%
Financial Analysis	14%	Cleaning	10%	Repair	9%	Budgeting	10%
Wealth Management	13%	Mental Health	8%	Sales	8%	Social Media	9%
Sales	12%	Budgeting	8%	Sorting	8%	Software Development	9%
Risk Management	10%	Quality Assurance and Control	7%	Project Management	7%	SQL	7%
Onboarding	10%	Project Management	7%	Budgeting	7%	Marketing	7%
Budgeting	10%	Appointment Setting	7%	Customer Contact	6%	Business Development	6%
Creative – Software	**%**	**Agribusiness**	**%**	**Tourism**		**Oil & Gas**	**%**
Software as a Service (SaaS)	10%	Customer Service	21%	Scheduling	16%	Project Management	16%
Customer Service	10%	Scheduling	17%	Cleaning	16%	SAP	15%
Software Development	9%	Cleaning	16%	Customer Service	13%	Scheduling	15%
Hootsuite	7%	Retail Industry Knowledge	15%	Cooking	12%	Budgeting	15%
Project Management	7%	Cooking	11%	Repair	10%	Accounting	9%
SQL	6%	Food Safety	10%	Staff Management	8%	Business Process	8%
Sales	6%	Staff Management	9%	Budgeting	8%	Customer Service	8%
Yoga	6%	Repair	9%	Guest Services	8%	Microsoft Power Bi	8%
Salesforce	4%	Merchandising	9%	Sales	7%	Energy Services	8%
Customer Contact	4%	Food Service Experience	8%	Bartending	6%	Economics	7%

Utilities	%	Cleantech	%
Project Management	26%	Project Management	15%
Onboarding	22%	Customer Service	14%
Budgeting	22%	Scheduling	13%
Natural Gas	19%	Quality Assurance and Control	9%
SAP	15%	Onboarding	7%
Scheduling	15%	Business Development	7%
Accounting	14%	Key Performance Indicators (KPIs)	6%
Economics	14%	Change Management	5%
SQL	12%	Procurement	5%
Key Performance Indicators	12%	Customer Contact	4%

Job Skill Demand by Sector – Growth Job Skills

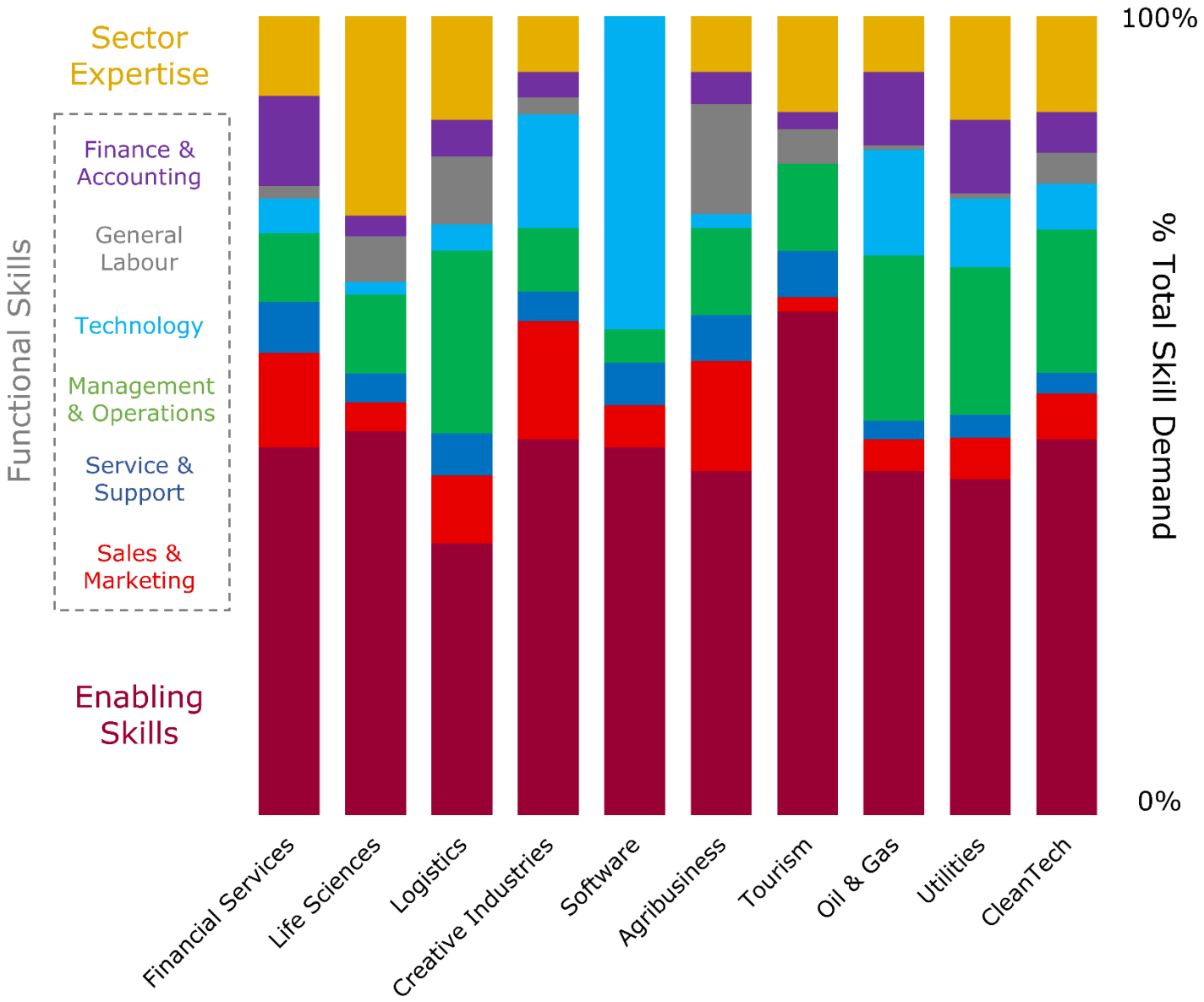
The table below profiles the top five growth job skills per sector based on national data by skill cluster. Consistent with the previous findings, most high growth job skills are oriented to functional skills, with a focus on technology and sales & marketing. Life Sciences is the only sector where there is growth in sectoral expertise.

Sales & Marketing
Service & Support
Management & Operations
Technology
General Labour
Finance & Accounting

Financial Services	Life Sciences	Transportation & Logistics	Creative Industries
Technology: Software Development Principles	Health Care: Medical Support	Technology: Web Development	Sales & Marketing: Social Media
Sales & Marketing: Social Media	Health Care: Basic Living Activities Support	Technology: Software Development Methodologies	Information Technology: Software Development Principles
Technology: SQL Databases and Programming	Health Care: Advanced Patient Care	Analysis: Business Intelligence	Information Technology: Cloud Solutions
Technology: Java	Health Care: Dental Care	Technology: Scripting Languages	Sales & Marketing: Market Analysis
Technology: Cloud Solutions	Health Care: Mental Health Diseases and Disorders	Sales & Marketing: General Marketing	Sales & Marketing: General Marketing
Software Development	**Agribusiness**	**Tourism**	**Oil & Gas**
Technology: Python	Sales & Marketing: Brand Management	Service & Support: Front Office	Technology: Software Development Principles
Technology: Software as a Service	Sales & Marketing: Social Media	Management & Operations: Occupational Health & Safety	Technology: Cloud Solutions
Technology: Kubernetes	Sales & Marketing: Market Analysis	Management & Operations: Onboarding	Technology: SQL Databases and Programming
Management & Operations: Development Operations	Health Care: Patient Education and Support	Management & Operations: Key Performance Indicators	Technology: Software Development Methodologies
Technology: Data Science	General Labour: Housekeeping	Sales & Marketing: Digital Marketing	Technology: Scripting Languages
Utilities	**Cleantech**		
Technology: SQL Databases and Programming	Technology: Software Development Principles		
Technology: Software Development Principles	Sales & Marketing: Market Analysis		
Sales & Marketing: Market Analysis	Technology: SQL Databases and Programming		
Technology: Software Development Methodologies	Sales & Marketing: Social Media		
Technology: Web Development	Technology: Scripting Languages		

Aggregated Skill Demand by Sector

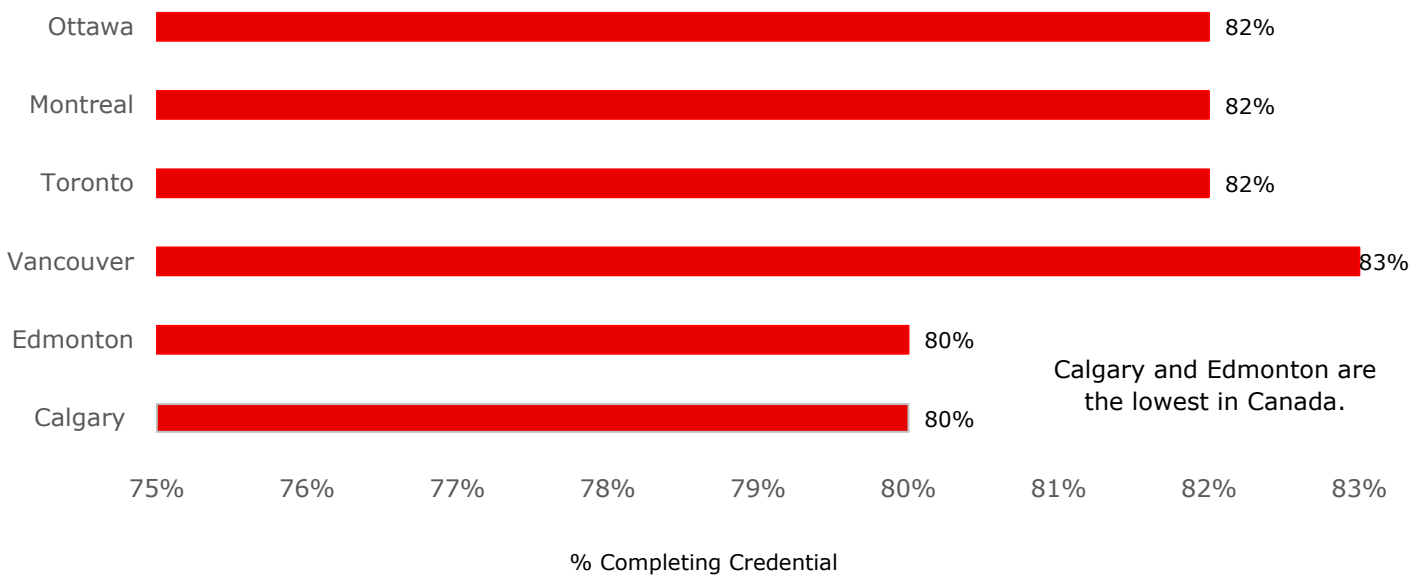
Below is an aggregation of the enabling skills and job skills. This demonstrates the central role of enabling and functional skills horizontally across sectors. Accelerating the adaptive skills of our community must focus on expanding both enabling and functional skills.



Study 2: Calgary Skills Audit

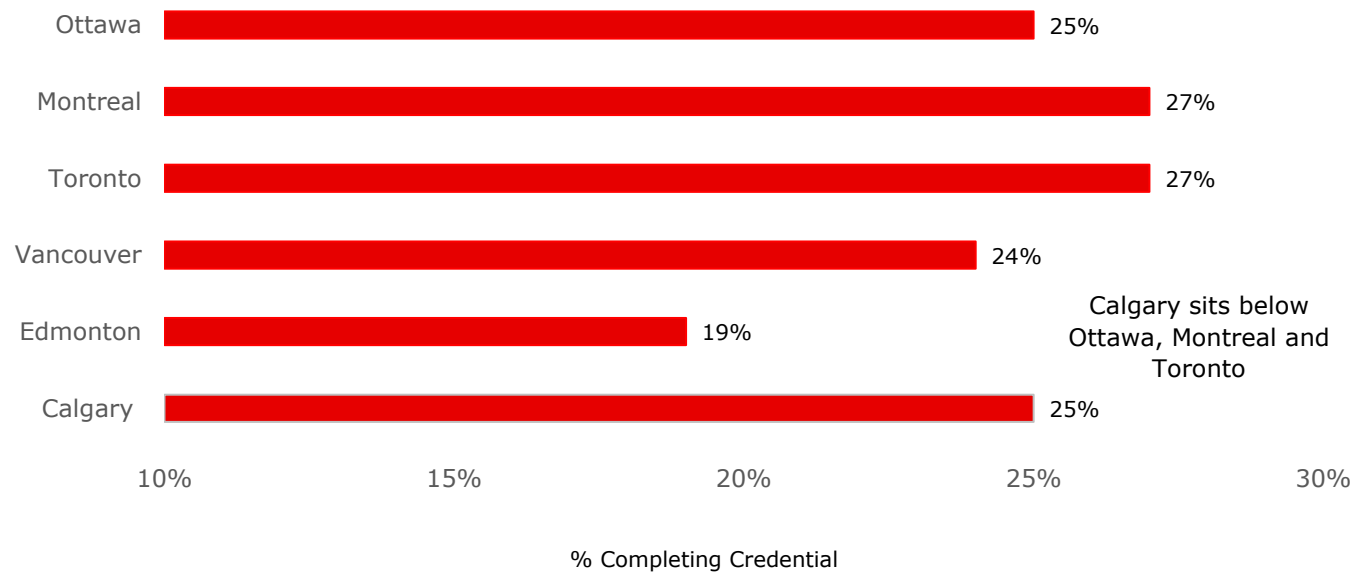
Postsecondary Credential (% population 15 and above)

At 80%, Calgary and Edmonton ranks lowest amongst the six cities in the proportion of population who have completed a degree, diploma, or certificate.



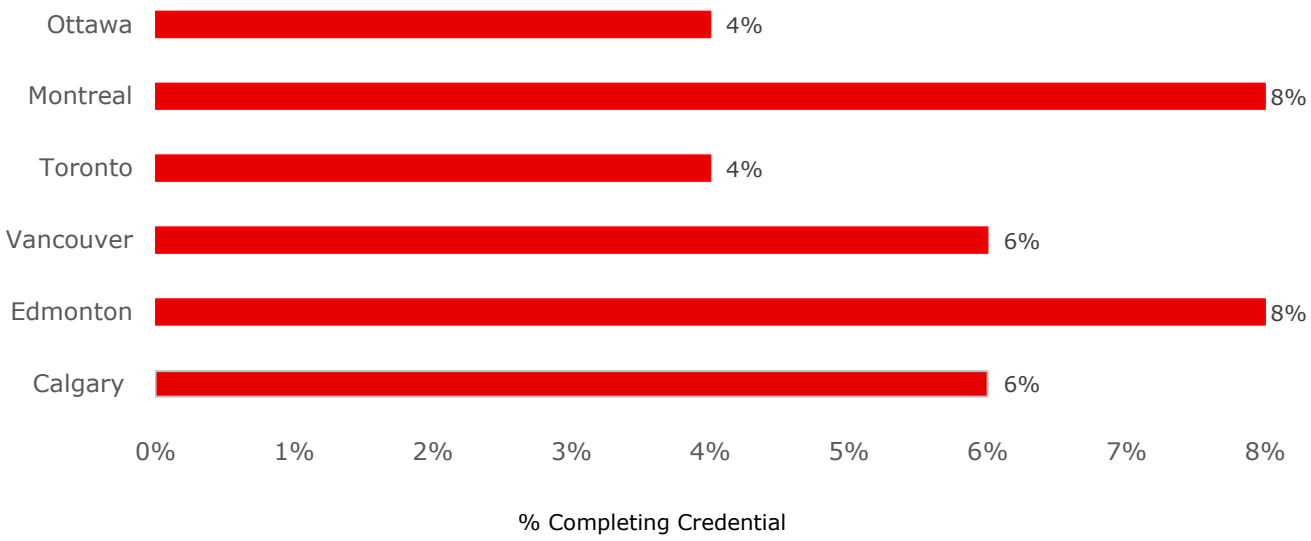
University Certificate; Diploma or Degree (% population 15 and above)

At 25%, Calgary ranks third in the completion of a university credential. Montréal and Toronto lead with 27%.



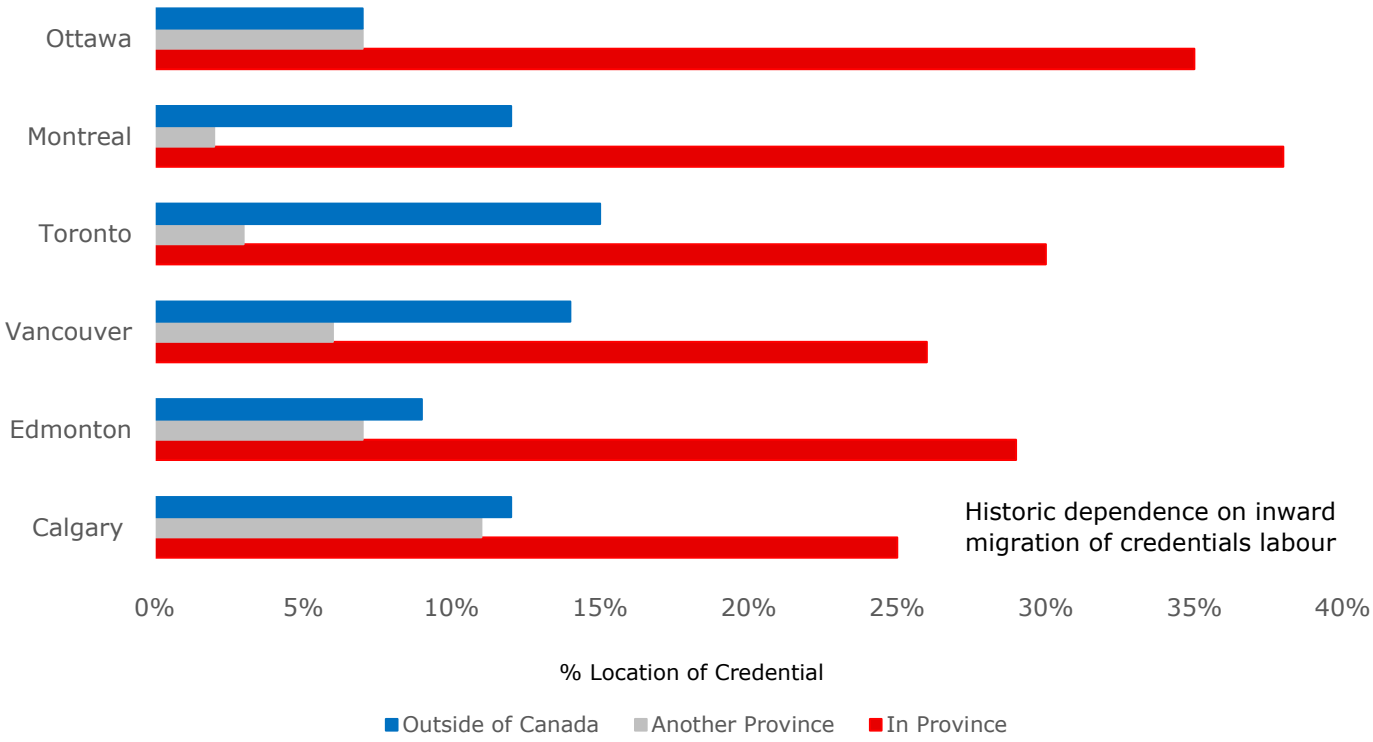
Apprenticeship or Trades Certificate or Diploma (% population 15 and above)

Calgary ranks second, tied with Vancouver, with 6% completing an apprenticeship or trades certificate.



Studied in Province/Territory of Current Residence (% population 15 and above)

At 25%, Calgary has lowest proportion who attained their credential in Alberta, while concurrently, the highest who completed their credential in another province or region. This reflects both the inward migration of talent over the past two decades and a dependency on other regions to develop talent.



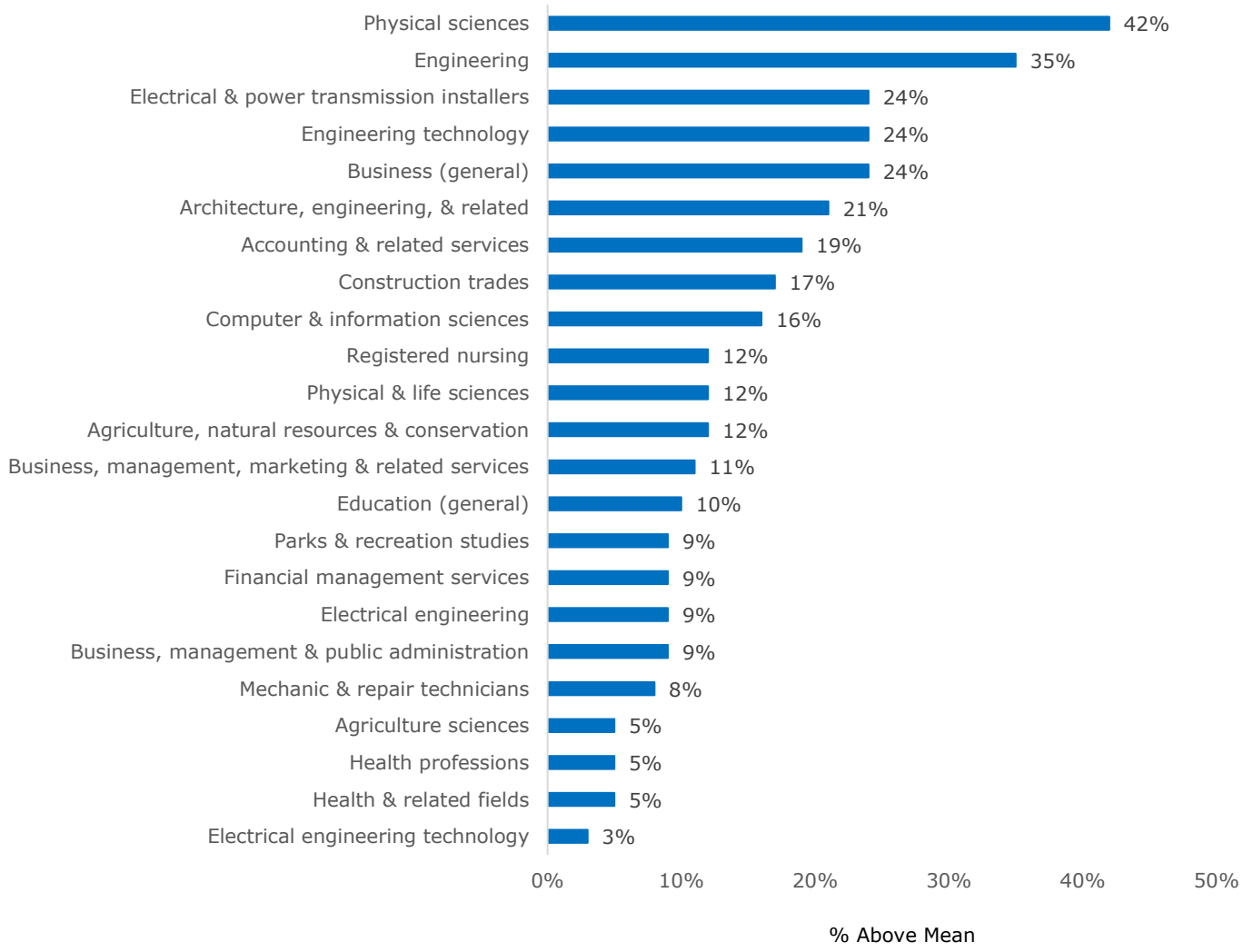
Classification of Instructional Programs Benchmarking

The following two charts compare the proportion of two- and four-digit CIPs between Calgary and the per capita mean of six Canadian cities (Vancouver, Edmonton, Kitchener-Waterloo, Toronto, Ottawa, Montréal). For simplicity, this analysis includes only CIPs representing 0.5% or more of the population (refer to the appendix for the benchmarking of Calgary and each city).

The first chart reflects the CIPs where Calgary is **above** the peer cities' mean score. For example, 4.3% of Calgary's population completed instructional programs in engineering. The peer cities mean is 2.8%. Calgary therefore has 35% more engineering CIPs compared to the peer cities mean. As this chart shows, Calgary's strengths are in programs related to engineering and business.

Calgary – Peer Cities Benchmarking (% Calgary above mean)

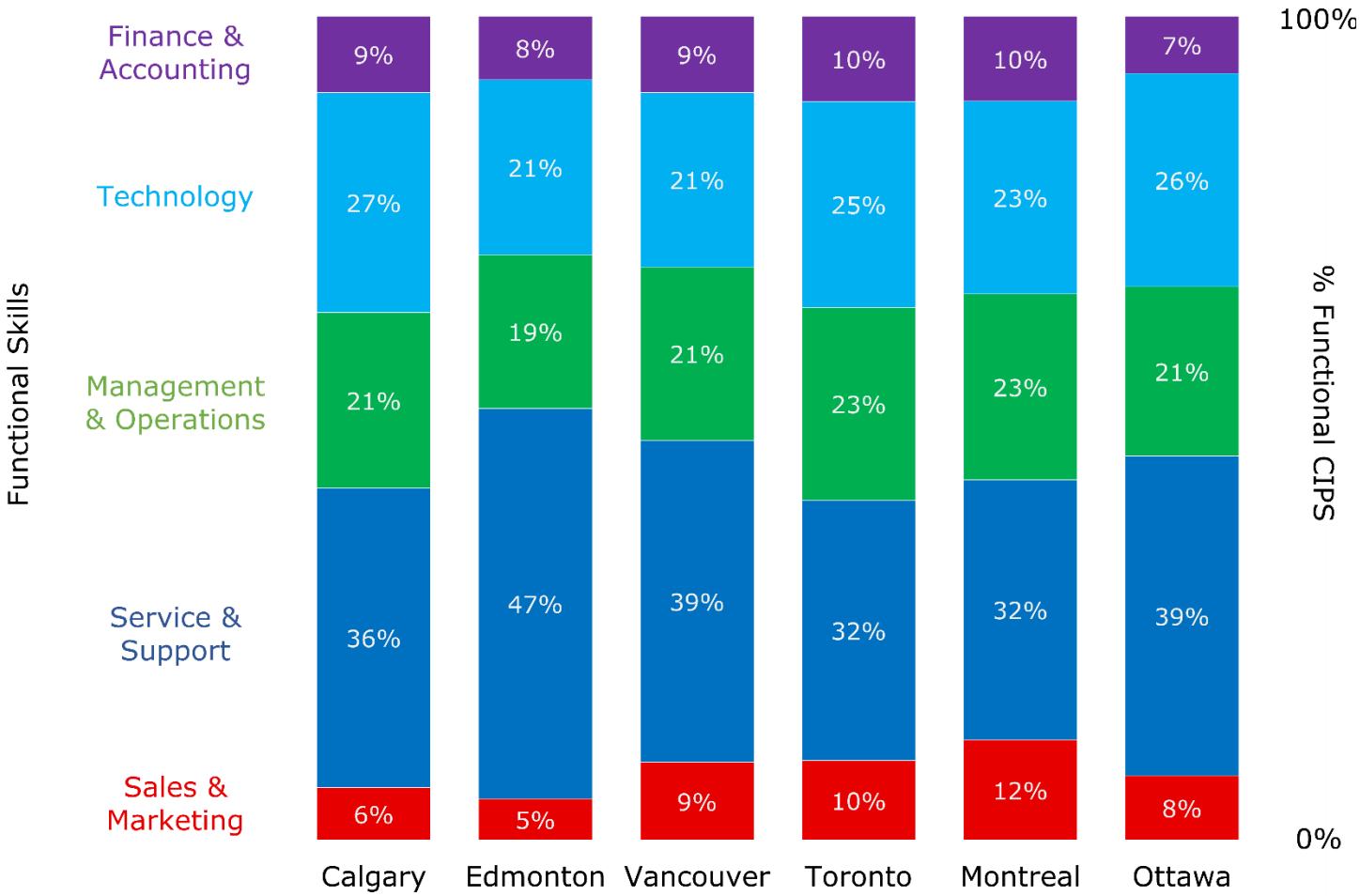
This second chart reflects the CIPs where Calgary is **below** the peer cities' mean. For example, 5% of Calgary's population completed instructional programs in social, behavioural science, and law. The peer cities' mean for this CIP is 6.2%. The result is Calgary has 23% fewer CIPs related to social, behavioural sciences, and law relative to the peer cities' mean. As this chart shows, Calgary's weakness is in arts, design, communications, and humanities and social sciences, including psychology, marketing, and economics.



Calgary – Peer Cities Benchmarking (% Calgary below mean)

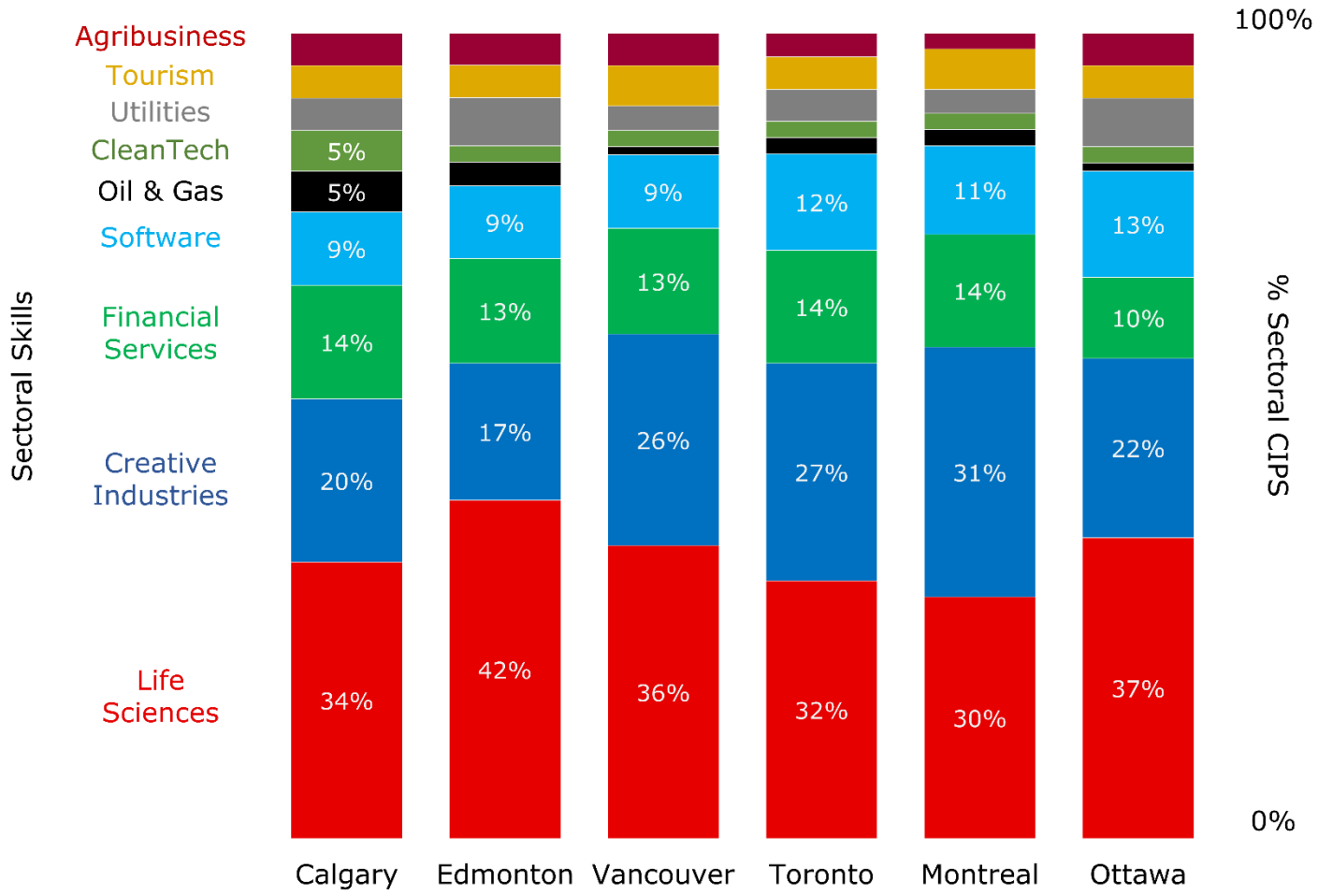
Calgary – Peer Cities Functional Skills Benchmarking

This chart compares Calgary's functional skills baseline relative to the five peer cities. This chart reflects the proportion of the functional skills CIPs by the five major categories. Refer to the appendix for a breakdown of the associated CIP assigned to each functional category. These five functional skills categories represent 31 percent of total CIPs across the five peer cities. In Calgary, they represent 33 percent. This benchmarking highlights weaker supply of skills associated with sales and marketing relative to the five peer cities.



Calgary – Peer Cities Sectoral Expertise Benchmarking

This chart examines Calgary's sectoral expertise, based on the eight priority sectors defined by Calgary Economic Development. This chart reflects the proportion of the sectoral expertise CIPs compared to the five peer cities. Refer to the appendix for a breakdown of the associated CIP assigned to each sector. These sectors represent 23 percent of total CIPs across the five peer cities. In Calgary, they represent 21 percent. This benchmarking highlights weaker supply of skills associated with the creative industries and software development relative to the five peer cities.



Full CIP City Benchmarking

In the following tables, the audit team compares the top 20, four-digit CIP codes for Edmonton, Vancouver, Toronto, Montréal, and Ottawa to Calgary. The four-digit codes are further colour coded by broader themes. **Blue** are business related fields, **red** is engineering and computer science, **green** is healthcare, **orange** is education, **purple** are skilled trades, **yellow** is creative arts, and **black** are other fields. There are a total of 43 unique four-digit CIP codes included in the top 20 across the five peer cities. The economic orientation of each city also emerges through this analysis as the skills that emerge through the CIPs, reflect the economic priorities of a city.

Four-Digit CIP Ranking by City - Calgary and Edmonton (% total population)

The CIP variance between Calgary and Edmonton reflects the historical economic priorities of each city. Of the top 20 four-digit CIPs for each city, 14 are common and six are unique to each city. Calgary has a higher proportion of computer and information sciences, computer science, economic, electrical engineering, mechanical engineering, and geological sciences. In contrast, Edmonton has a higher proportion of carpentry, plumbing, culinary arts, health administration, nursing, and industrial equipment maintenance. Calgary, Edmonton, and Ottawa are the only cities without creative arts in the top 20.

Calgary	%	Edmonton	%
Business administration, management, and operations	2.31%	Education, general	2.14%
Business/commerce, general	2.28%	Registered nursing, nursing administration, nursing research and clinical nursing	2.05%
Accounting and related services	2.22%	Business/commerce, general	1.77%
Education, general	1.87%	Accounting and related services	1.76%
Registered nursing, nursing administration, nursing research and clinical nursing	1.85%	Business administration, management, and operations	1.74%
Engineering, general	1.02%	Precision metal working	1.42%
Business operations support and assistant services	0.82%	Electrical and power transmission installers	0.92%
Cosmetology and related personal grooming services	0.78%	Business operations support and assistant services	0.89%
Precision metal working	0.74%	Cosmetology and related personal grooming services	0.86%
Vehicle maintenance and repair technologies	0.73%	Plumbing and related water supply services	0.76%
Computer science	0.73%	Vehicle maintenance and repair technologies	0.73%
Electrical and power transmission installers	0.70%	Heavy/industrial equipment maintenance technologies	0.66%
Electrical, electronics and communications engineering	0.67%	Psychology, general	0.62%
Geological and Earth sciences/geosciences	0.67%	Liberal arts and sciences, general studies, and humanities	0.55%
Economics	0.66%	Engineering, general	0.52%
Finance and financial management services	0.66%	Carpentry/carpenter	0.52%
Mechanical engineering	0.66%	Practical nursing, vocational nursing, and nursing assistants	0.50%
Liberal arts and sciences, general studies, and humanities	0.65%	Finance and financial management services	0.50%
Psychology, general	0.65%	Culinary arts and related services	0.50%
Computer and information sciences and support services, general	0.53%	Health and medical administrative services	0.48%

Four-Digit CIP Ranking by City – Calgary and Vancouver (% total population)

Of the top 20 four-digit CIPs for each of Calgary and Vancouver, 12 are common and eight are unique to each city. Calgary has a higher proportion of computer and information sciences, mechanical engineering, and geological sciences, whereas Vancouver has a proportion of fine arts, design, culinary arts, and health aides.

Calgary	%	Vancouver	%
Business administration, management, and operations	2.31%	Business administration, management, and operations	2.04%
Business/commerce, general	2.28%	Business/commerce, general	1.96%
Accounting and related services	2.22%	Accounting and related services	1.95%
Education, general	1.87%	Registered nursing, nursing administration, nursing research and clinical nursing	1.76%
Registered nursing, nursing administration, nursing research and clinical nursing	1.85%	Education, general	1.71%
Engineering, general	1.02%	Liberal arts and sciences, general studies, and humanities	0.98%
Business operations support and assistant services	0.82%	Cosmetology and related personal grooming services	0.89%
Cosmetology and related personal grooming services	0.78%	Economics	0.86%
Precision metal working	0.74%	Psychology, general	0.82%
Vehicle maintenance and repair technologies	0.73%	Vehicle maintenance and repair technologies	0.81%
Computer science	0.73%	Computer science	0.80%
Electrical and power transmission installers	0.70%	Design and applied arts	0.70%
Electrical, electronics and communications engineering	0.67%	Business operations support and assistant services	0.65%
Geological and Earth sciences/geosciences	0.67%	Precision metal working	0.65%
Economics	0.66%	Culinary arts and related services	0.63%
Finance and financial management services	0.66%	Finance and financial management services	0.63%
Mechanical engineering	0.66%	Electrical, electronics and communications engineering	0.57%
Liberal arts and sciences, general studies, and humanities	0.65%	Fine arts and art studies	0.56%
Psychology, general	0.65%	Engineering, general	0.56%
Computer and information sciences and support services, general	0.53%	Health aides/attendants/orderlies	0.53%

Four-Digit CIP Ranking by City – Calgary and Toronto (% total population)

Of the top 20 four-digit CIPs for each of Calgary and Toronto, 15 are common and five are unique to each city. Calgary has a higher proportion of business operations, mechanical engineering, electrical and power transmission, and geological sciences, whereas Toronto has a higher proportion of design, English language and literature, human development, marketing, and political science.

Calgary	%	Toronto	%
Business administration, management, and operations	2.31%	Business/commerce, general	2.50%
Business/commerce, general	2.28%	Business administration, management, and operations	2.21%
Accounting and related services	2.22%	Accounting and related services	2.16%
Education, general	1.87%	Education, general	1.55%
Registered nursing, nursing administration, nursing research and clinical nursing	1.85%	Registered nursing, nursing administration, nursing research and clinical nursing	1.35%
Engineering, general	1.02%	Economics	1.00%
Business operations support and assistant services	0.82%	Liberal arts and sciences, general studies, and humanities	0.95%
Cosmetology and related personal grooming services	0.78%	Computer science	0.90%
Precision metal working	0.74%	Psychology, general	0.81%
Vehicle maintenance and repair technologies	0.73%	Design and applied arts	0.76%
Computer science	0.73%	Electrical, electronics and communications engineering	0.75%
Electrical and power transmission installers	0.70%	Finance and financial management services	0.75%
Electrical, electronics and communications engineering	0.67%	Engineering, general	0.72%
Geological and Earth sciences/geosciences	0.67%	Cosmetology and related personal grooming services	0.72%
Economics	0.66%	Human development, family studies and related services	0.64%
Finance and monetary management services	0.66%	Computer and information sciences and support services, general	0.63%
Mechanical engineering	0.66%	English language and literature, general	0.61%
Liberal arts and sciences, general studies, and humanities	0.65%	Marketing	0.60%
Psychology, general	0.65%	Vehicle maintenance and repair technologies	0.58%
Computer and information sciences and support services, general	0.53%	Political science and government	0.57%

Four-Digit CIP Ranking by City – Calgary and Montreal (% total population)

Of the top 20 four-digit CIPs for each of Montreal and Ottawa, 13 are common and seven are unique to each city. Calgary has a higher proportion of business operations, mechanical engineering, electrical and power transmission, and geological sciences; whereas Montréal has a higher proportion of communication and media studies, culinary arts, design and applied arts, fine arts, finance, and language studies.

Calgary	%	Montreal	%
Business administration, management, and operations	2.31%	Business administration, management, and operations	3.02%
Business/commerce, general	2.28%	Accounting and related services	2.10%
Accounting and related services	2.22%	Liberal arts and sciences, general studies, and humanities	1.44%
Education, general	1.87%	Education, general	1.43%
Registered nursing, nursing administration, nursing research and clinical nursing	1.85%	Business operations support and assistant services	1.24%
Engineering, general	1.02%	Registered nursing, nursing administration, nursing research and clinical nursing	1.22%
Business operations support and assistant services	0.82%	Computer science	1.21%
Cosmetology and related personal grooming services	0.78%	Business/commerce, general	1.06%
Precision metal working	0.74%	Finance and financial management services	0.99%
Vehicle maintenance and repair technologies	0.73%	Design and applied arts	0.94%
Computer science	0.73%	Law (LLB, JD, BCL)	0.83%
Electrical and power transmission installers	0.70%	Cosmetology and related personal grooming services	0.79%
Electrical, electronics and communications engineering	0.67%	Psychology, general	0.75%
Geological and Earth sciences/geosciences	0.67%	Health aides/attendants/orderlies	0.72%
Economics	0.66%	Communication and media studies	0.71%
Finance and financial management services	0.66%	Economics	0.71%
Mechanical engineering	0.66%	Electrical, electronics and communications engineering	0.71%
Liberal arts and sciences, general studies, and humanities	0.65%	Culinary arts and related services	0.68%
Psychology, general	0.65%	Fine arts and art studies	0.66%
Computer and information sciences and support services, general	0.53%	Linguistic, comparative, and related language studies and services	0.65%

Four-Digit CIP Ranking by City – Calgary and Ottawa (% total population)

Of the top 20 four-digit CIPs for each of Montréal and Ottawa, 13 are common and seven are unique to each city. Calgary has a higher proportion of computer and information sciences, mechanical engineering, electrical and power transmission, metal working, and geological sciences, whereas Ottawa has a higher proportion of criminal justice, electrical engineering, law, health aids, human development, finance, political science, teacher education, and vehicle maintenance.

Calgary	%	Ottawa	%
Business administration, management, and operations	2.31%	Business administration, management, and operations	2.00%
Business/commerce, general	2.28%	Education, general	1.81%
Accounting and related services	2.22%	Registered nursing, nursing administration, nursing research and clinical nursing	1.81%
Education, general	1.87%	Business/commerce, general	1.63%
Registered nursing, nursing administration, nursing research and clinical nursing	1.85%	Accounting and related services	1.52%
Engineering, general	1.02%	Computer science	1.04%
Business operations support and assistant services	0.82%	Psychology, general	0.99%
Cosmetology and related personal grooming services	0.78%	Business operations support and assistant services	0.94%
Precision metal working	0.74%	Economics	0.93%
Vehicle maintenance and repair technologies	0.73%	Electrical, electronics and communications engineering	0.88%
Computer science	0.73%	Cosmetology and related personal grooming services	0.82%
Electrical and power transmission installers	0.70%	Vehicle maintenance and repair technologies	0.77%
Electrical, electronics and communications engineering	0.67%	Human development, family studies and related services	0.75%
Geological and Earth sciences/geosciences	0.67%	Health aides/attendants/orderlies	0.75%
Economics	0.66%	Political science and government	0.72%
Finance and financial management services	0.66%	Electrical and electronic engineering technologies/technicians	0.69%
Mechanical engineering	0.66%	Law (LLB, JD, BCL)	0.68%
Liberal arts and sciences, general studies, and humanities	0.65%	Criminal justice and corrections	0.67%
Psychology, general	0.65%	Teacher education and professional development, specific subject areas	0.61%
Computer and information sciences and support services, general	0.53%	Liberal arts and sciences, general studies, and humanities	0.59%

Study 3: Learning System Audit Results

This section reviews the results of the quantitative audit of the certified and non-certified learning system.[1] The results are analyzed based on the three levels of analysis: organization, program, and individuals.

Organization Level

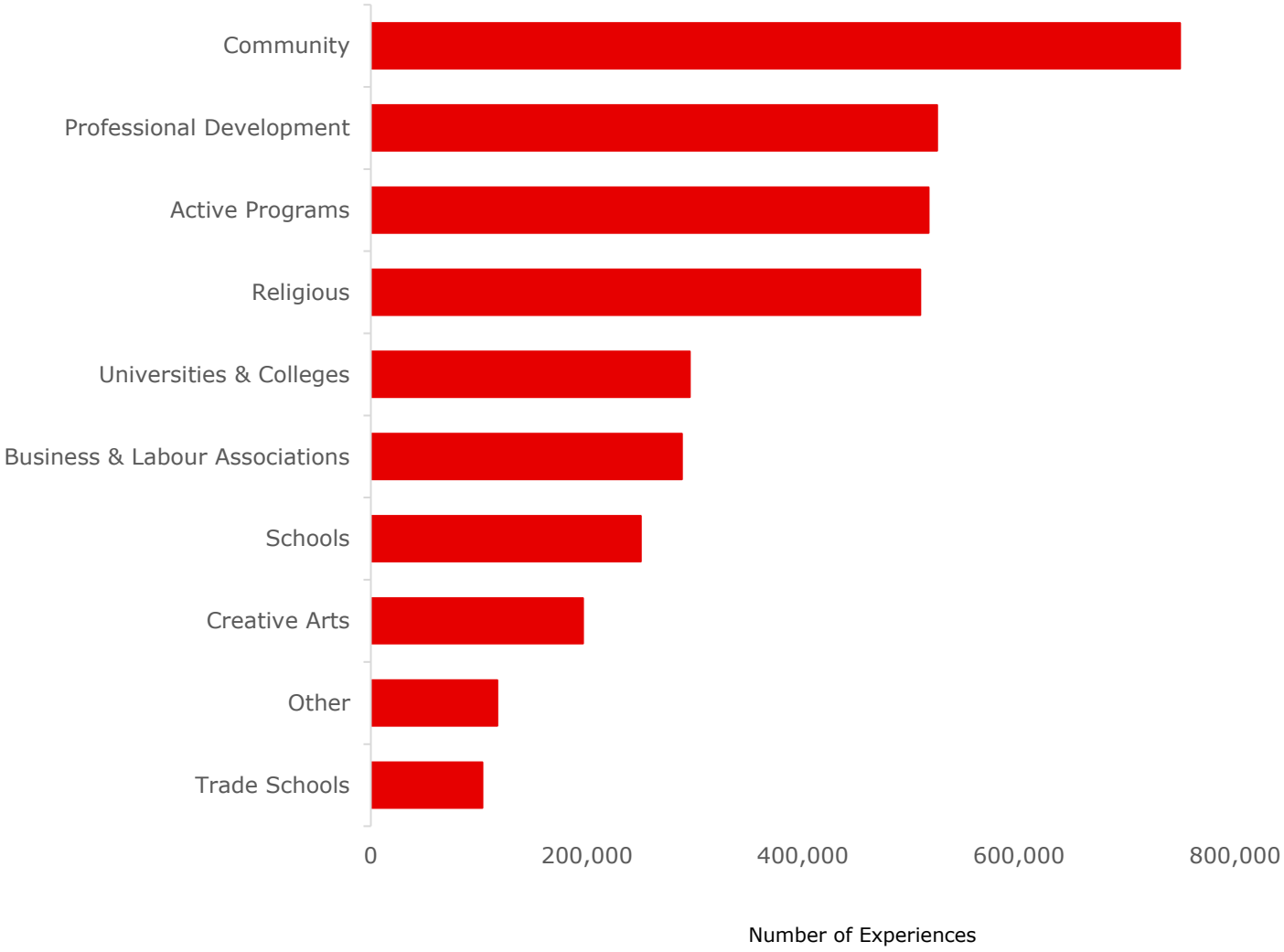
This audit estimates **3,063 organizations** that deliver certified and non-certified learning programming. The organizations range from accredited schools to creative arts to religious organizations.

Skills Developer Clusters	NAICs by Sector
Schools Includes all public and private accredited elementary and secondary schools.	611110 - Elementary and secondary schools
Universities & Colleges Includes all public and private accredited universities and colleges.	611210 - Community colleges and C.E.G.E.P.s 611310 - Universities
Trade Schools Includes, trades, technical and private business schools.	611510 - Technical and trade schools 611410 - Business and secretarial schools
Other Schools Includes all other schools not associated with another category.	611690 - All other schools and instruction
Professional Development Includes computer, language, human resource, and professional development.	611420 - Computer training 611630 - Language schools 611430 - Professional and management development 541612 - Human resources consulting services
Creative Arts Includes fine arts schools and dance companies.	611610 - Fine arts schools 711120 - Dance companies
Active Programs Includes athletic instructions, fitness, sports clubs, and other recreation.	611620 - Athletic instruction 713940 - Fitness and recreational sports centres 713991 - Sports clubs performing before a non-paying audience 713992 - Other sport facilities 721213 - Recreational (except hunting and fishing) and vacation camps
Community Includes community-based programming, including libraries, museums, zoos, and parks, social advocacy organizations, and family/child services.	519121 - Libraries 624310 - Vocational rehabilitation services 623999 - All other residential care facilities 624110 - Child and youth services 624120 - Services for the elderly and persons with disabilities 624190 - Other individual and family services 711322 - Festivals without facilities 712110 - Museums 712130 - Zoos and botanical gardens 712190 - Nature parks and other similar institutions 813310 - Social advocacy organizations
Religious Includes all religious organizations.	813110 - Religious organizations
Business and Labour Associations Includes professional and labour organizations.	813910 - Business associations 813920 - Professional organizations 813930 - Labour organizations

[1] Informal learning and internal corporate professional development were excluded from this audit.

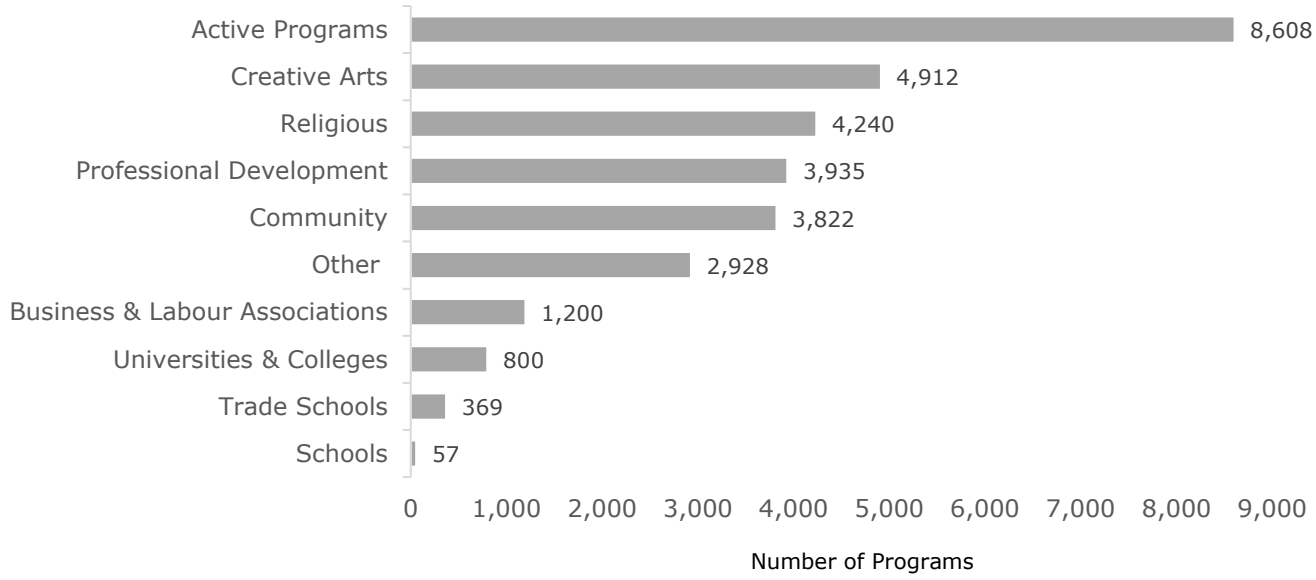
Estimated Total Learning Experiences by Skill Developer Cluster (total experiences)

The estimated number of certified and non-certified learning experiences is a critical data point to understand system capacity. In total the audit team estimates there are 3.5M certified and non-certified experiences currently in the system. Once again, this is an estimate of system capacity, not utilization. Moreover, recognizing the nuances in the structures of experiences is important. For example, universities and college "experiences" by their nature, were coded at an individual course level, whereas, in elementary and secondary school were coded at a semester-level. Thus, the depth and breadth of a coded single learning experience reflects the diversity of the system, as a single learning experience can range form a half-day professional development workshop to a full semester in high school.



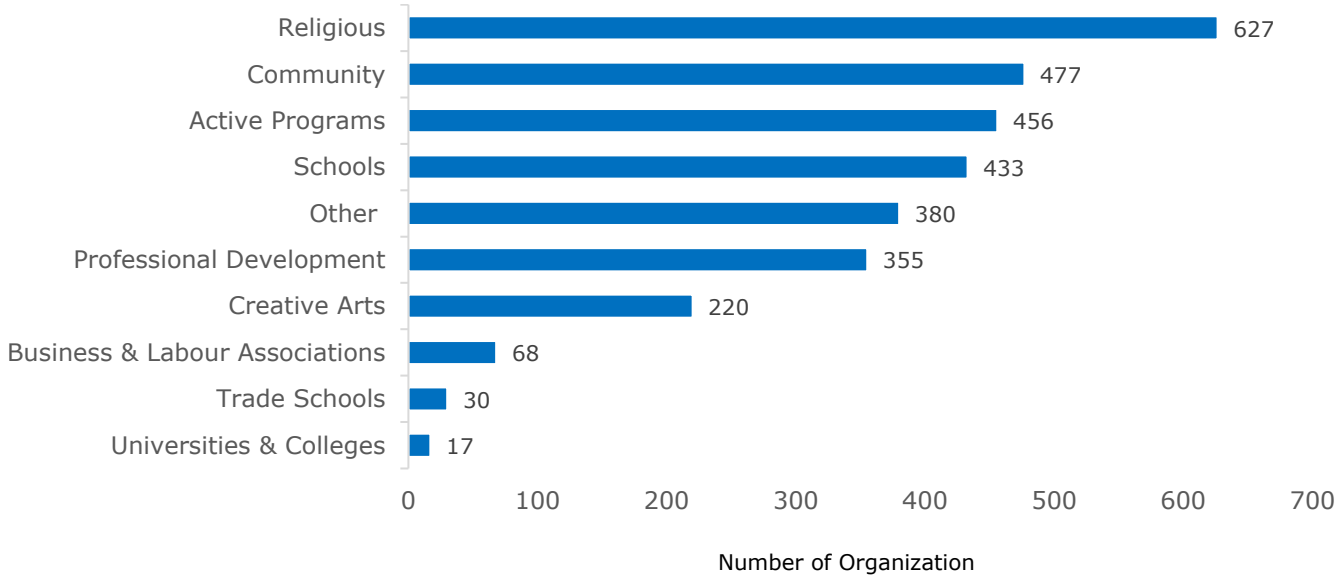
Estimated Total Programs by Skill Developer Cluster (# programs)

This chart shows the system level capacity at a program-level. This chart must be read with caution as programs are extremely diverse in their breadth and depth. For example, programs may range from one-on-one (e.g., professional coaching) to system-level (e.g., high school diploma).



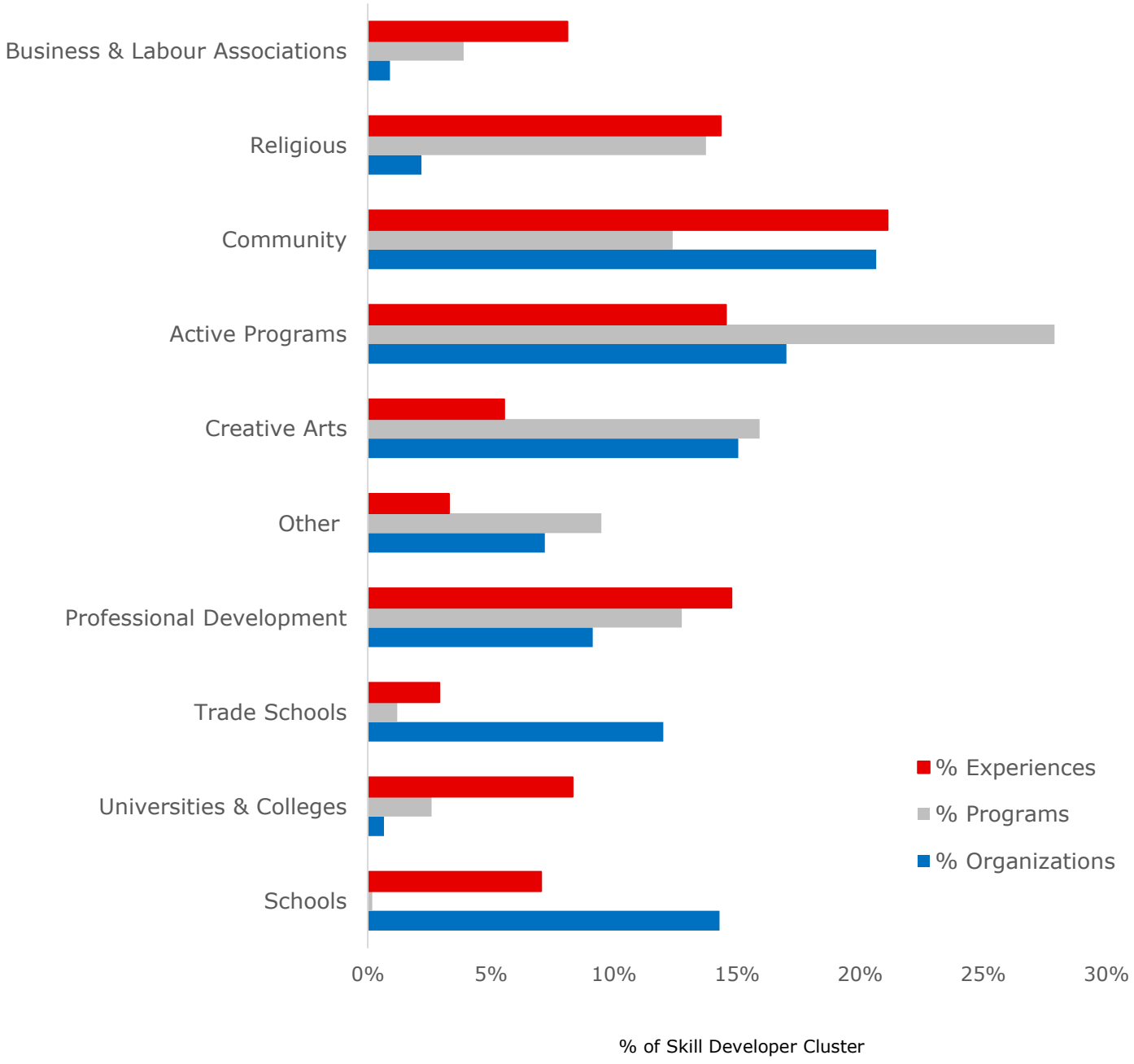
Estimated Total Organizations by Skill Developer Cluster (# organizations)

The chart below provides a summary of the number of organizations in each of the 12 skill developer clusters. From an absolute size perspective, the religious sector is the largest, followed by sports and recreation. It is important to note that the number of organizations in a sector is only weakly related to the number of programs or experiences in this sector. Moreover, the number of organizations in a sector may be a liability as it reflects a fragmentation of learning capacity. Identifying approaches to harness this fragmentation is critical to expanding and aligning system-level capacity to city-level priorities.



Learning System by Skill Developer Cluster (% of total)

The chart below compares the proportional relationship between organizations, program, and experience capacity at a skill developer cluster level. The team cautions interpretation of this data given the diversity of organizations, programs and experiences being delivered. This is because the ratio of organizations to programs to experiences are significantly influenced by the contextual nature of the learning experience. For example, self-directed learning provides an opportunity to scale both the number of programs and experiences. In contrast, the scaling of one-on-one executive coaching faces barriers. For this reason, this chart becomes more meaningful following the analysis of program-level data that considers measures related to both breadth and depth, such as program duration and certification methods.



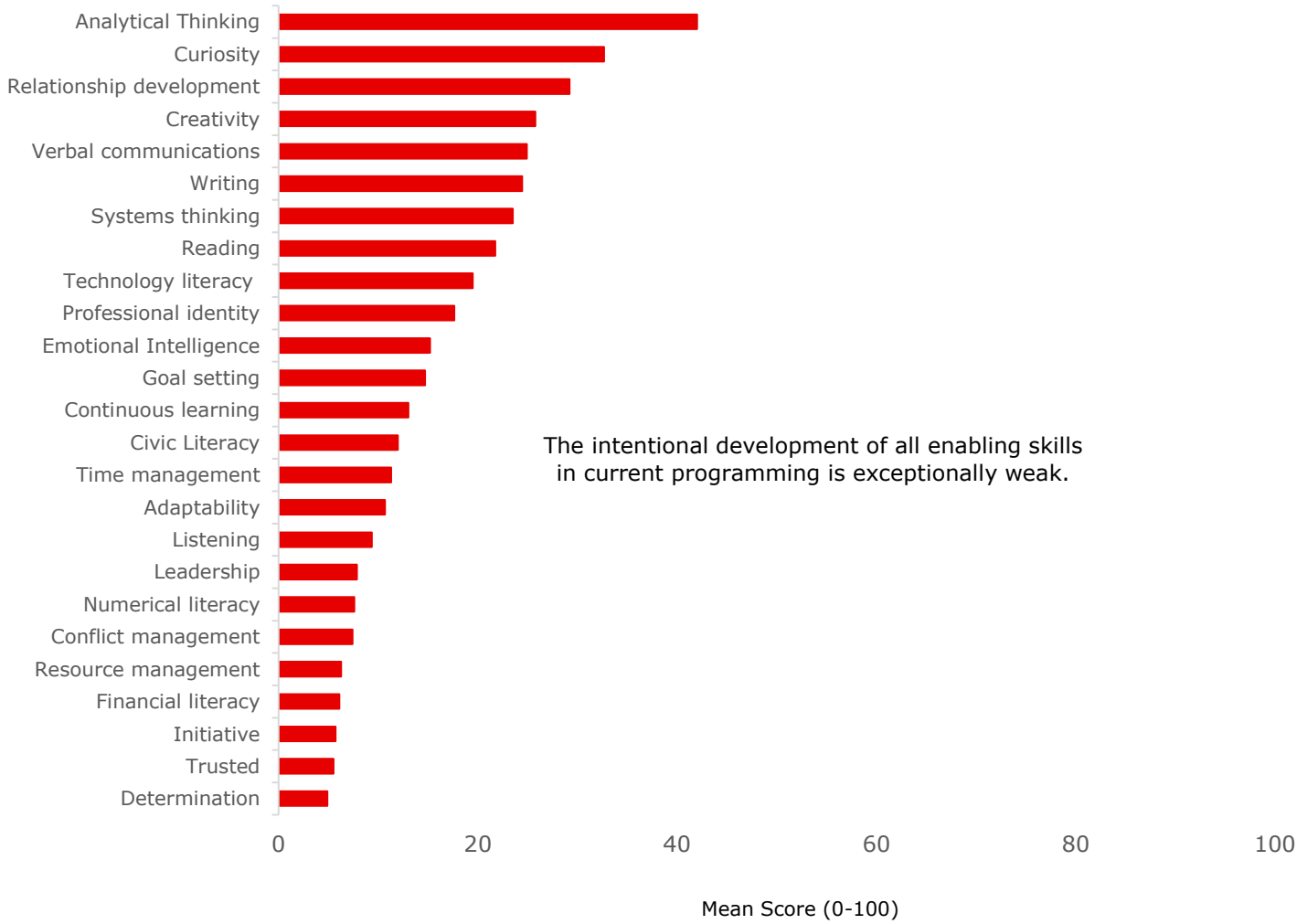
Skills Level

Enabling Skills Development Ranking – High to Low (Mean Score 0–100)

All programs were coded based on their explicit goal of developing the 25 different enabling skills defined in the *Competencies for Life* initiative by the City of Calgary. These 25 skills were the outcome of a study that examined "foundational" skills across 17 different professional fields, ranging from engineering to sales to medicine to social work. The chart below is the mean on a scale of 0 to 100, with 100 being all programs that identify developing these skills as an explicit goal. Analytical thinking is the highest ranked skill at 42. Sixteen of the skills score below 20.

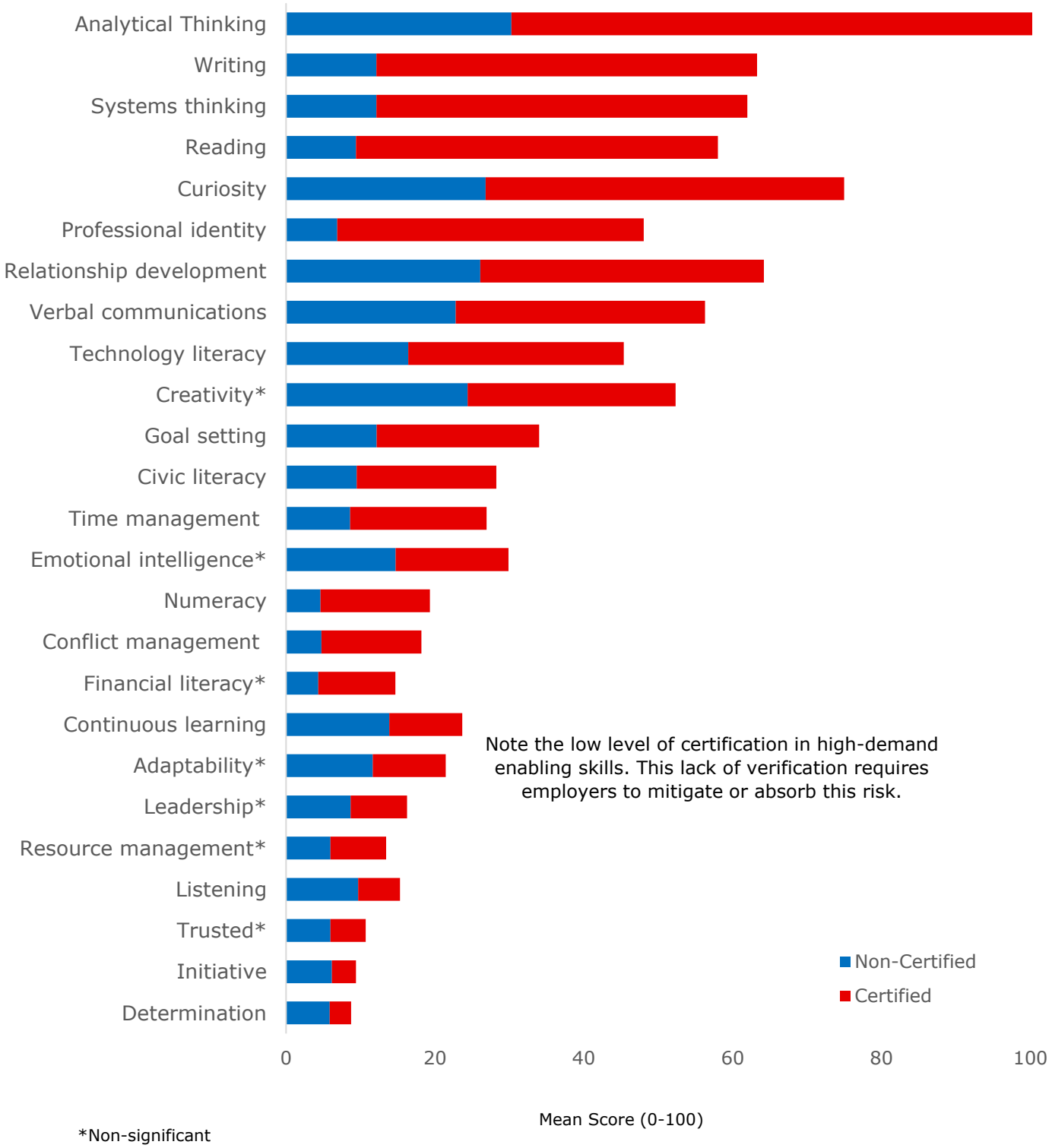
The prioritization of developing job skills over enabling skills was a central risk identified in *Calgary on the Precipice*. Enabling skills anchor an individual's adaptive capacity. The lack of explicit development of these skills contributes to a static labour force, with a limited capacity to transition between different roles and fields.

To possess the adaptive capacity essential for an individual, organization, or community to compete today, Calgary must be intentional in developing incentives to stimulate the explicit development and certification of enabling skills. This system approach must systematically incorporate employers, skills developers, and individuals. First, employers must explicitly prioritize these skills. Second, skills developers must explicitly prioritize both the development and certification of enabling skills. Third, individuals must adopt a mindset that acknowledges that job skills, though valuable, have a limited lifespan. To possess the capacity to quickly adopt new job skills will be the core skills today and in the future.



Enabling Skill Development Ranking – Certified v. Non-Certified (Mean Score 0-100)

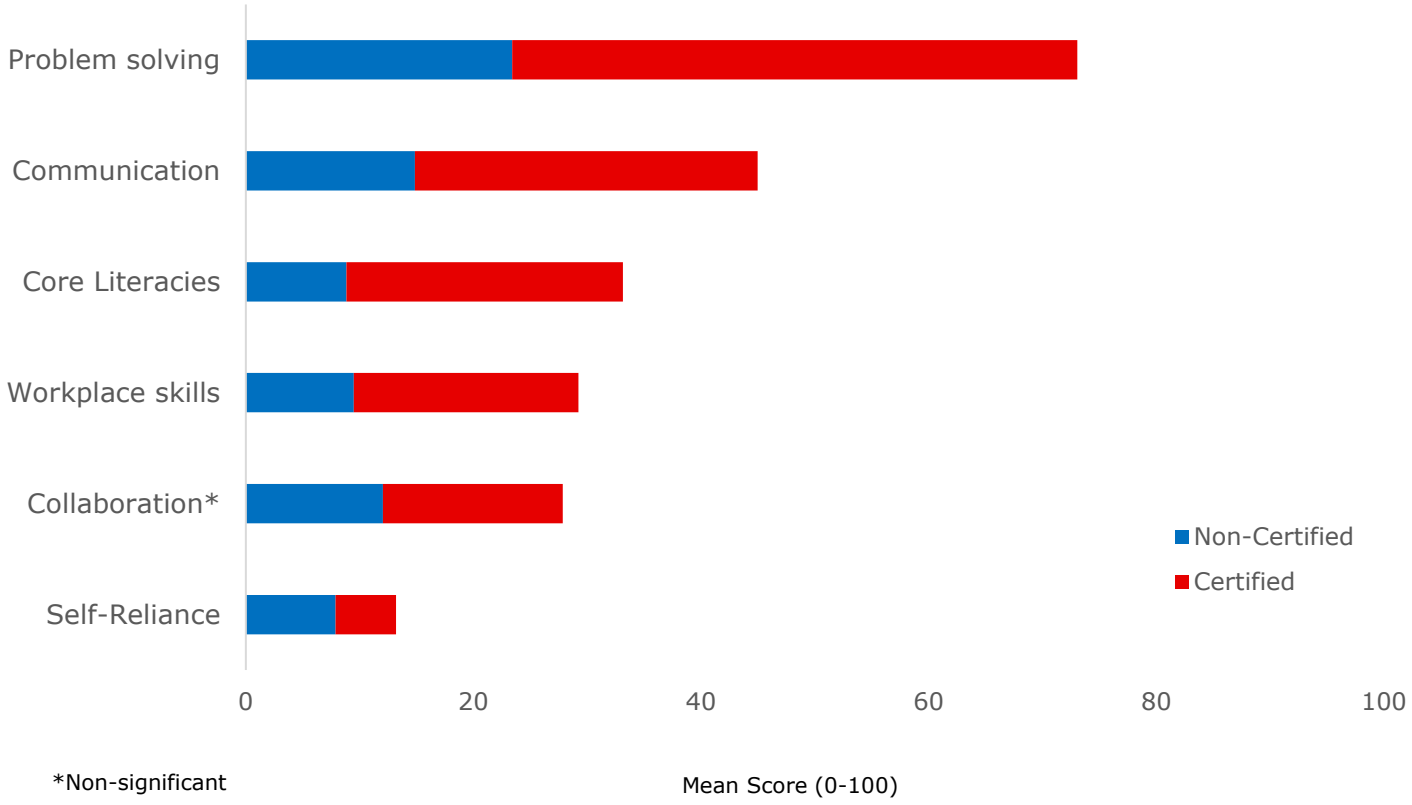
The chart below compares the certified and non-certified programs based on explicit enabling skills development on the standardized scale of 100. For 15 of the enabling skills, certified learning is significantly more likely to develop this skill. For two of the enabling skills, non-certified learning is significantly more likely to develop this skill. For eight enabling skills, there is no significant variance.



*Non-significant

Enabling Skill Development Ranking by Learning Category (Mean Score 0–100)

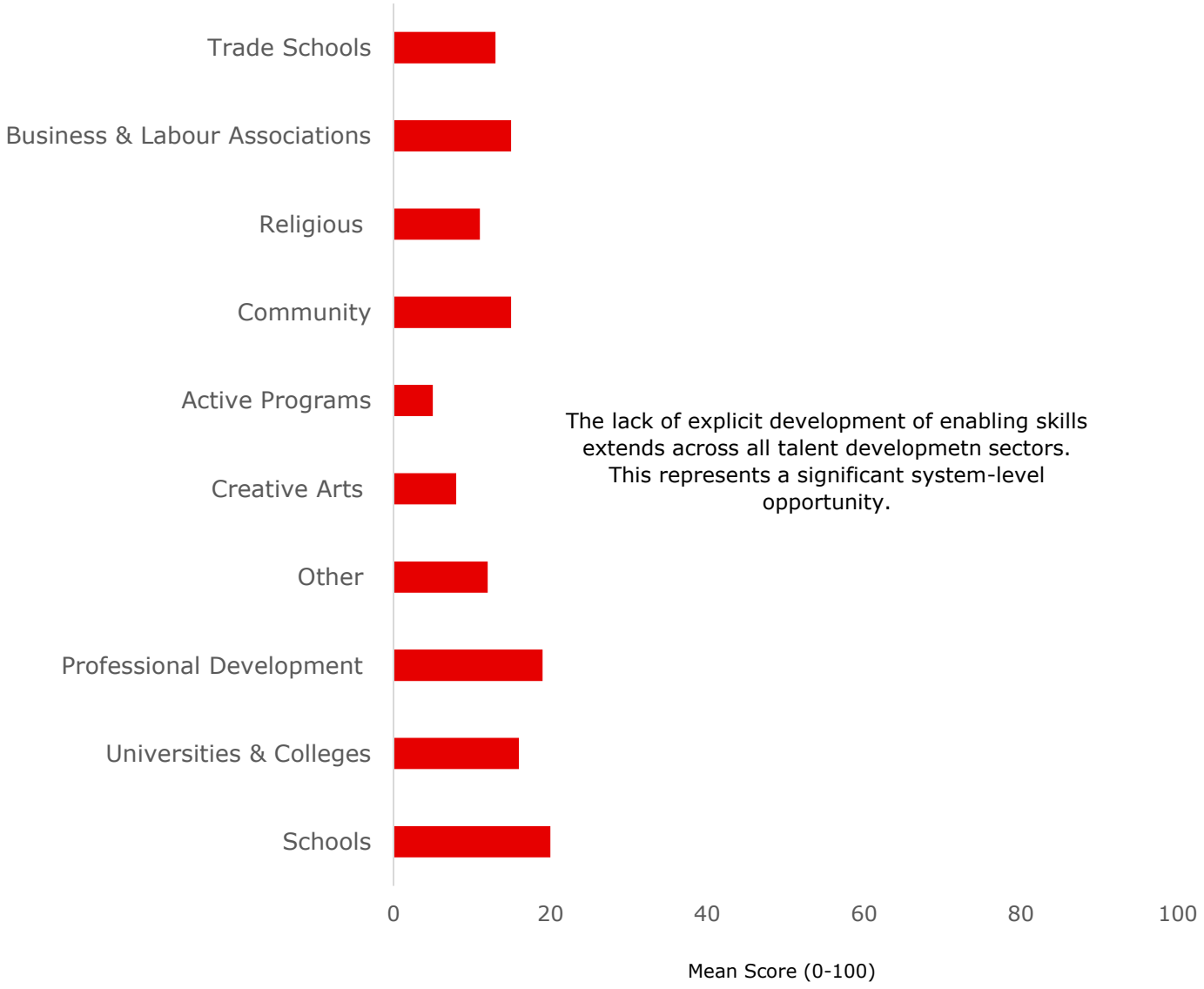
The chart below compares certified and non-certified programs based on explicit ES development at a category level. Certified learning is significantly more likely to explicitly develop problem solving, communications, core literacies, and workplace skills. Whereas non-certified learning is explicitly more likely to significantly develop self-reliance. For collaboration, there is no significant variance between certified and non-certified learning.



*Non-significant

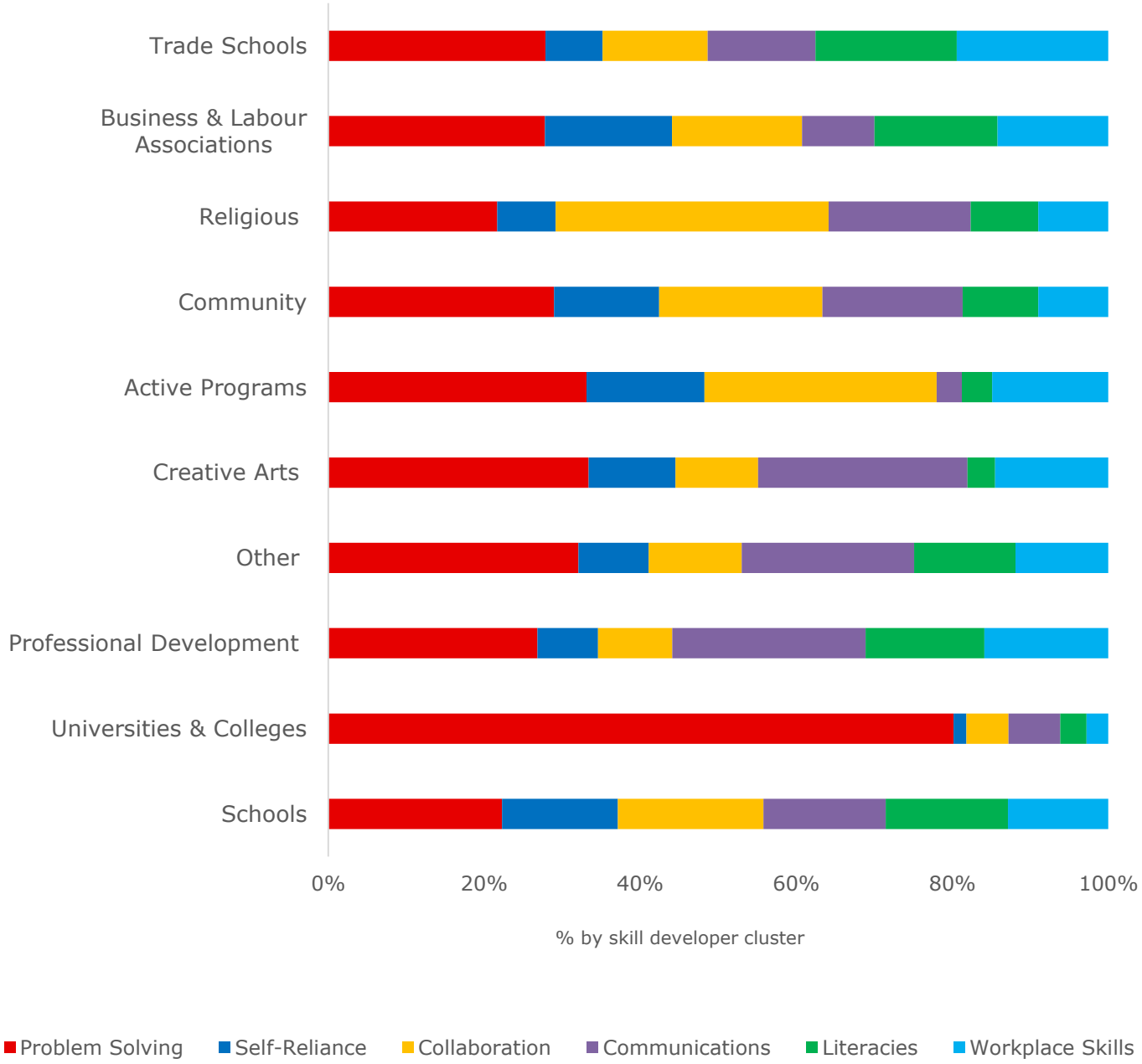
Enabling Skill Development Ranking by Skill Developer Cluster (Mean Score 0–100)

Each program was analyzed for their explicit development of ES. The chart below reflects a standardized aggregated ES score for each skill developer cluster at 100. If every one of the 25 ES were explicitly coded, a sector would score 100. The highest scored skill developer cluster was 22 out of 100. The lowest scored sector was active at five out of 100. This does not reflect the actual learning in each sector, rather it highlights the explicit mention of the 25 ES. For example, many active programs would embed development of collaboration skills in their team sports, but the development of these skills are implicit, not explicit. This gap between explicit and implicit is important as it provides clarity to individuals the skills that are being developed. If skills are implicitly developed, this requires an individual to recognize the skills and then identify potential approaches to certification.



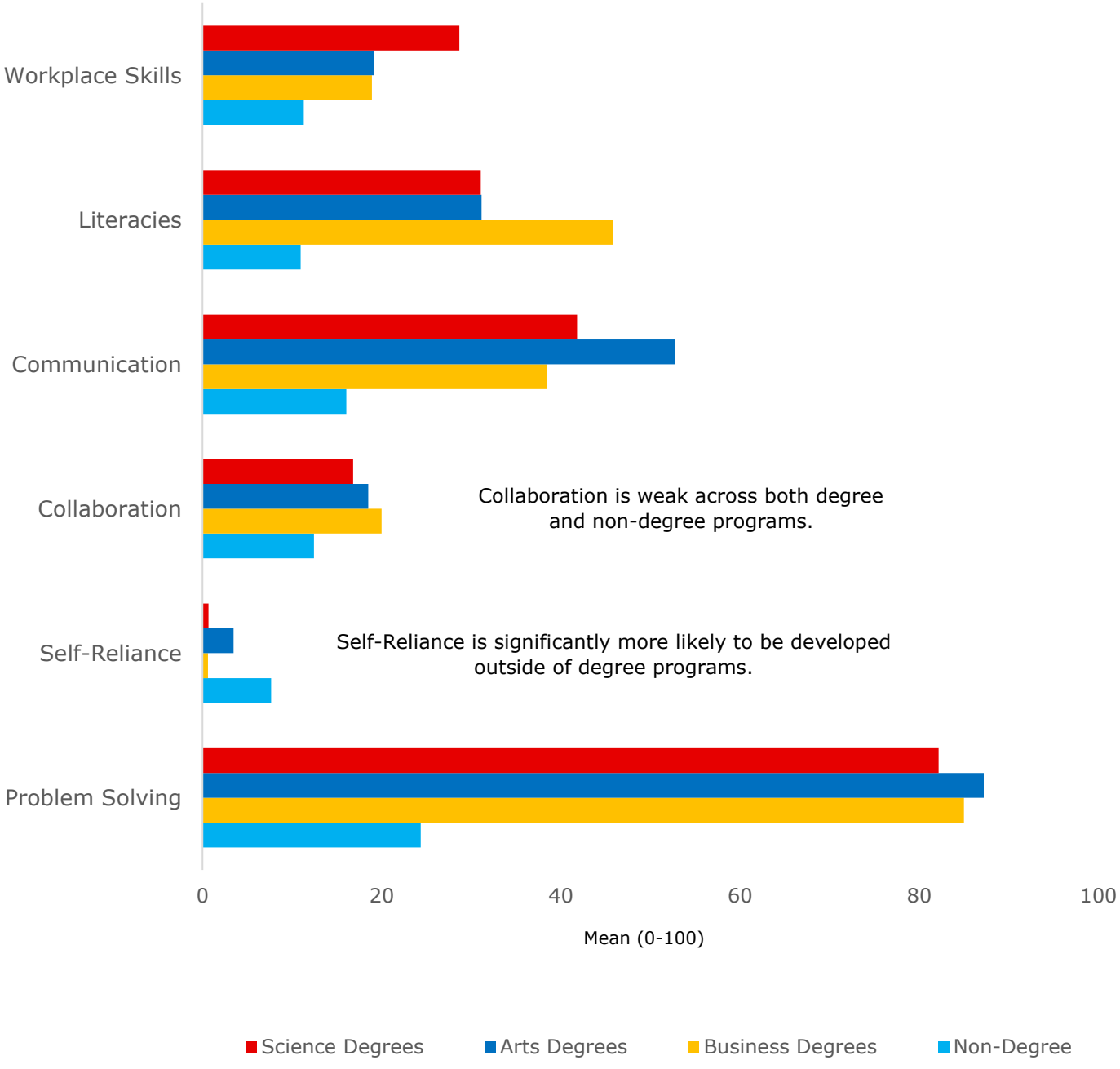
Enabling Skill Categories by Skill Developer Cluster - Explicit Development (% programs sampled)

This chart builds on the previous chart by providing a breakdown of each sector by the proportion of ES explicitly developed in each category. This chart is standardized at 100. This chart provides guidance on areas of strengths for each sector. For example, universities and colleges are heavily weighted in problem solving, but weak in workplace skills. Whereas elementary and secondary schools are relatively well balanced across all six areas. It is important to consider this chart relative to the overall ES being developed from the previous chart.



Enabling Skill Clusters by Degree vs. Non-Degree - Explicit Development (Mean Score 0–100)

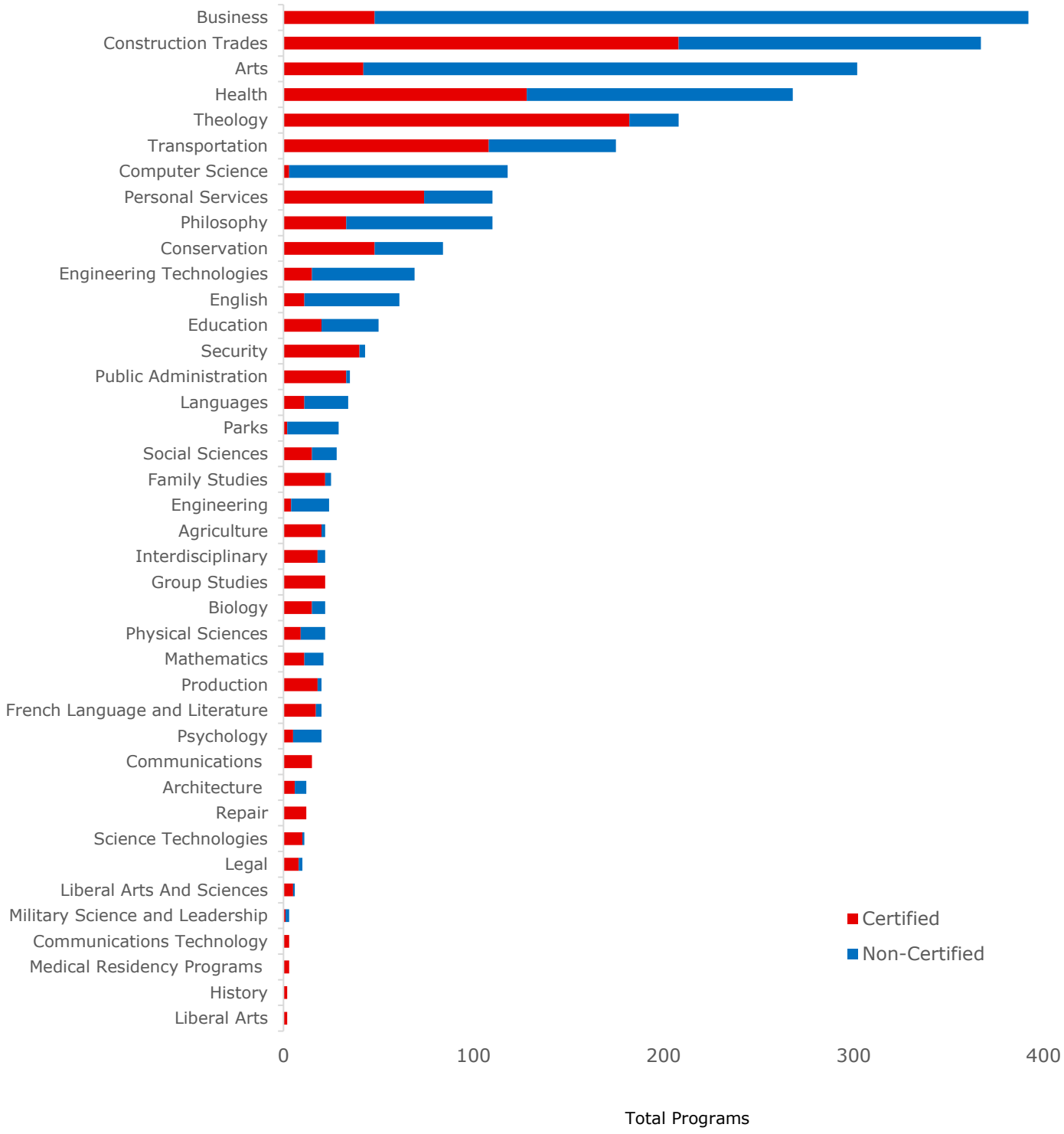
Based on the previous chart, the audit team analyzed ES clusters across university degree programs. Problem solving is equally dominant across all degree areas. However, different degree areas emerged with areas of strengths: Arts in communications (led by writing); Business in foundational literacies (led by numeracy and financial literacies); and Science in workplace skills (led by time management and professional identity). Non-degree programs are significantly more likely to develop self-reliance than degree programs. Though collaboration is significantly more likely to be developed in degree programs, it is overall weak.



*Each cluster has one or more areas of significant variance.

Job Skills (Two-Digit CIP Programs)

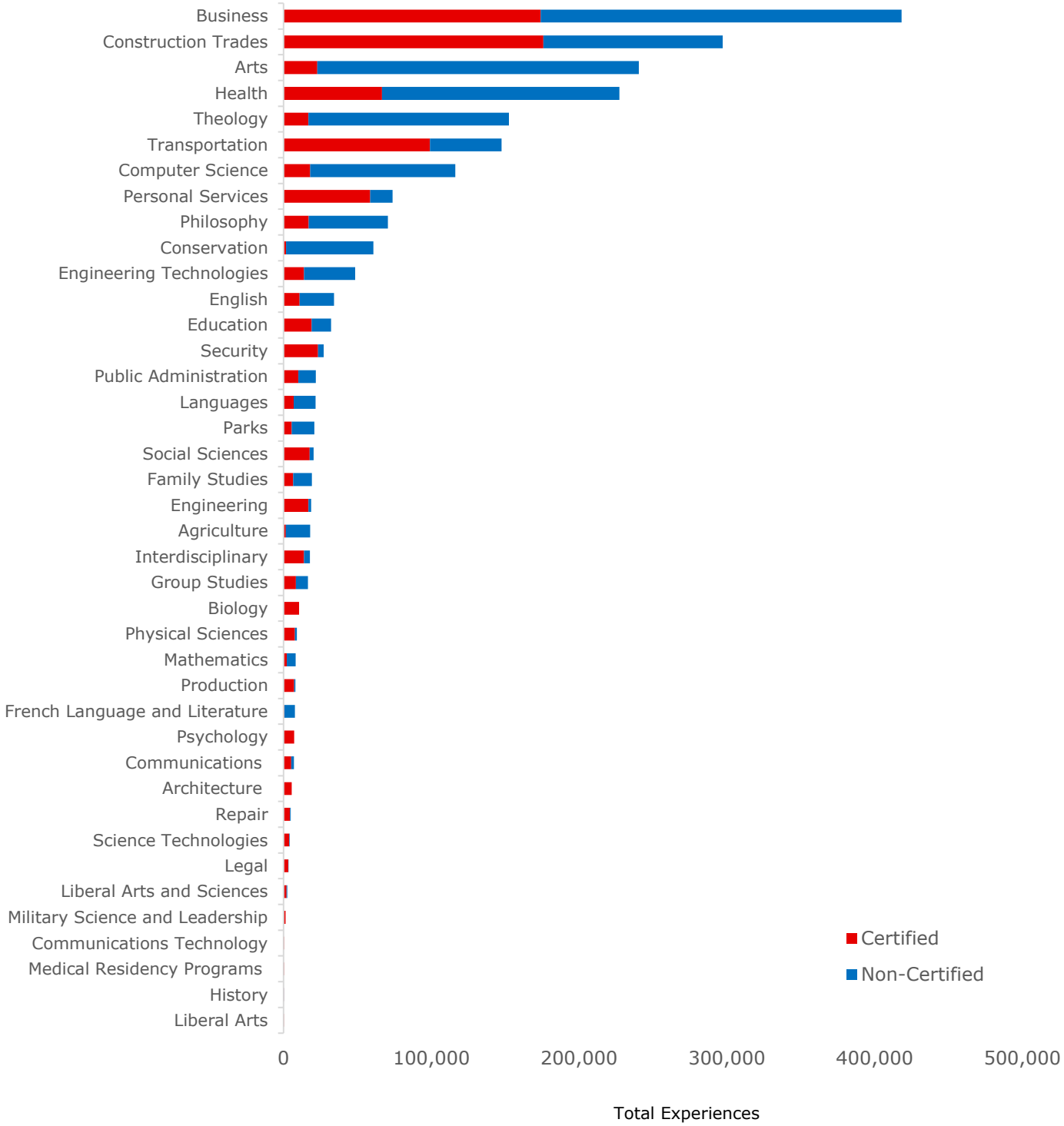
Below, the audit examined the development of job skills using two- and four-digit CIPs. CIPs provide a framework to isolate specific job skills being developed. Two-digit CIPs provide a high-level lens of the primary job skills being developed (e.g., engineering); whereas a four-digit CIP provides a more precise lens to the specific job skills being development (e.g., petroleum engineering). Below are the two-digit job skills CIP programs, broken between certified and non-certified learning.



Note: Programs defined as primarily ES related CIPs were removed. This included programs such as primary and secondary education, interpersonal skills, and recreation.

Job Skills (Two-Digit CIP Experiences)

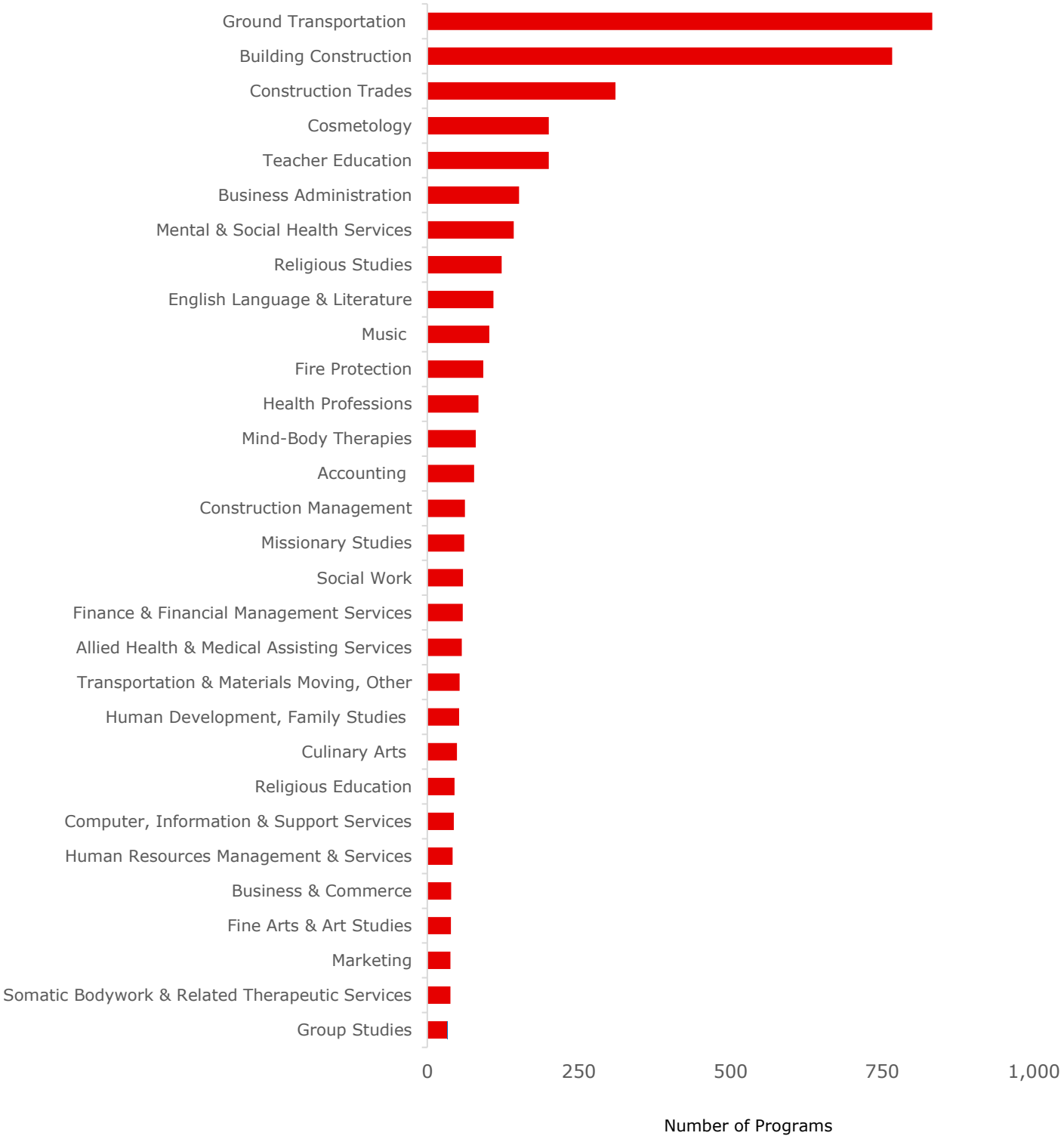
Below is the two-digit job skills CIP projecting the number of experiences available, broken between certified and non-certified learning. The division between certified and non-certified experiences is important as it reflects potential capacity in the system for increasing the intentionality and certification of CIPs. In this model, 61% or 1.34M of job skills experiences are non-certified.



Note: Experiences defined as primarily ES related CIPs were removed. This included programs such as primary and secondary education, interpersonal skills, and recreation.

Job Skills (Four-Digit CIP Certified Programs)

Below are the top 30 (out of a 219 coded) four-digit job skills CIP certified programs. Note that certified programs represent an estimated 1.14M, or 32% of all four-digit CIP annual experiences. 2.4M CIP experiences are non-certified.



Job Skills - (Four-Digit CIP Programs and Experiences – all)

The following table breaks 219 four-digit CIPs by number of annual programs and experiences, including the proportion certified. The table is ranked by total annual experiences.

Four-Digit CIP	Total Annual Programs	Total Annual Experiences	% Experiences Certified
Leisure and recreational activities	7,666	563,722	1%
Education, general	3	250,440	100%
Building/construction finishing, management, and inspection	1,533	204,584	50%
Ground transportation	1,278	134,576	65%
Health-related knowledge and skills	1,036	126,173	29%
Movement and mind-body therapies	1,584	108,160	5%
Bible/Biblical studies	853	102,390	0%
Dance	2,377	98,569	0%
Construction trades, general	371	77,119	84%
Computer/information technology administration and management	215	76,570	5%
Music	1,459	68,885	7%
Religion/religious studies	571	68,154	21%
Business administration, management, and operations	384	63,900	39%
Citizenship activities (not for credit)	383	63,528	4%
Mental and social health services and allied professions	726	61,730	20%
Wildlife and wildlands science and management	284	56,079	1%
Cosmetology and related personal grooming services	212	55,280	95%
Crafts/craft design, folk art and artisanry	850	37,880	0%
Religious education	269	32,957	17%
English language and literature, general	412	31,839	26%
Construction management	217	26,177	29%
Accounting and related services	92	24,510	84%
Mechanical engineering related technologies/technicians	187	22,398	0%
Fire protection	109	20,319	85%
Teacher education and professional development, specific levels, and methods	409	18,000	49%
Business/commerce, general	84	17,210	47%
Agricultural and domestic animal services	262	16,800	5%
Culinary arts and related services	179	16,561	27%
Social work	113	16,510	52%
Drama/theatre arts and stagecraft	196	14,962	11%
Computer and information sciences and support services, general	124	14,099	35%
Allied health diagnostic, intervention, and treatment professions	91	13,199	93%
Missions/missionary studies and missiology	87	12,959	70%
Finance and financial management services	75	12,000	78%
Outdoor education	144	11,520	0%

Human resources management and services	48	11,120	87%
Human development, family studies and related services	95	10,950	56%
Computer programming	63	9,960	0%
Area studies	47	8,960	67%
Health aides/attendants/orderlies	37	8,670	71%
Environmental control technologies/technicians	48	8,360	57%
Fine arts and art studies	45	7,840	87%
Electrical and power transmission installers	27	7,800	30%
French language and literature, general	50	7,730	7%
Work and family studies	32	7,680	0%
Ethnic, cultural minority, gender, and group studies	106	7,520	31%
Precision metal working	32	7,440	88%
Air transportation	21	6,560	76%
Linguistic, comparative, and related language studies and services	60	6,560	3%
Mathematics	106	6,400	6%
Transportation and materials moving, other	53	6,399	100%
Computer software and media applications	30	6,070	33%
Business operations support and assistant services	33	5,990	64%
Peace studies and conflict resolution	20	5,760	100%
Plumbing and related water supply services	20	5,500	80%
Quality control and safety technologies/technicians	22	5,440	71%
Health and physical education/fitness	26	5,440	100%
Public health	32	5,320	100%
Criminal justice and corrections	34	5,180	88%
Hospitality administration/management	30	5,130	100%
Allied health and medical assisting services	57	5,100	100%
Design and applied arts	13	4,840	92%
Mining and petroleum technologies/technicians	35	4,800	22%
Computer systems networking and telecommunications	34	4,440	88%
Visual, digital, and performing arts, general	41	4,330	73%
Biology, general	9	4,320	100%
Sustainability studies	17	4,320	50%
Social sciences, other	17	4,320	50%
Teaching English or French as a second or foreign language	30	4,080	75%
Marketing	45	4,060	85%
Engineering-related technologies	29	3,880	67%
Parks, recreation, and leisure facilities management	16	3,840	0%
Nuclear and industrial radiologic technologies/technicians	16	3,840	100%
Clinical, counselling, and applied psychology	8	3,840	100%
Human services, general	16	3,840	0%
Registered nursing, nursing administration, nursing research and clinical nursing	8	3,840	100%

International business/trade/commerce	8	3,840	100%
Theological and ministerial studies	28	3,680	50%
Second language learning	40	3,410	30%
Linguistic, comparative, and related language studies and services	7	3,360	100%
Geological and Earth sciences/geosciences	7	3,360	100%
Psychology, general	7	3,360	100%
Geography and cartography	7	3,360	100%
Real estate	7	3,360	100%
Somatic bodywork and related therapeutic services	38	3,340	100%
Vehicle maintenance and repair technologies	14	3,280	86%
South Asian languages, literatures, and linguistics	80	3,200	40%
Modern Greek language and literature	27	3,200	0%
Natural resources conservation and research	50	2,880	40%
Educational assessment, evaluation, and research	6	2,880	100%
Computer engineering	6	2,880	100%
Film/video and photographic arts	23	2,880	63%
Mechanical engineering	7	2,800	86%
Petroleum engineering	7	2,800	86%
Chemistry	21	2,760	83%
Civil engineering	6	2,600	100%
Communication and media studies	10	2,570	50%
Liberal arts and sciences, general studies, and humanities	6	2,490	83%
Teacher education and professional development, specific subject areas	9	2,404	71%
English rhetoric and composition/writing studies	5	2,400	100%
Philosophy, logic, and ethics	5	2,400	100%
Astronomy and astrophysics	6	2,400	67%
Archaeology	5	2,400	100%
Economics	5	2,400	100%
Health services/allied health/health sciences, general	5	2,400	100%
Computer systems analysis/analyst	10	2,370	60%
Rehabilitation and therapeutic professions	34	2,320	50%
Health and medical administrative services	10	2,290	100%
Computer science	19	2,080	75%
Management information systems and services	6	1,930	75%
Natural resources and conservation, other	48	1,920	0%
Public relations, advertising, and applied communication	4	1,920	100%
Funeral service and mortuary science	4	1,920	100%
Bioengineering and biomedical engineering	4	1,920	100%
Surveying engineering	4	1,920	100%
Legal research and advanced professional studies (post-LLB/JD)	4	1,920	100%
Classical and ancient studies	4	1,920	100%

Anthropology	4	1,920	100%
Sociology	4	1,920	100%
Radio, television, and digital communication	7	1,850	71%
Science, technology, and society	33	1,760	33%
Statistics	4	1,740	100%
Management sciences and quantitative methods	20	1,720	67%
Entrepreneurial and small business operations	18	1,640	83%
Social sciences, general	18	1,600	67%
Business, management, marketing, and related support services, other	5	1,560	100%
Carpentry/carpenter	6	1,500	100%
City/urban, community and regional planning	3	1,440	100%
Environmental design/architecture	3	1,440	100%
Landscape architecture (BS, BSc, BSLA, BLA, MSLA, MLA, PhD)	3	1,440	100%
Teaching assistants/aides	19	1,440	75%
Biochemistry/biophysics and molecular biology	3	1,440	100%
Neurobiology and neurosciences	3	1,440	100%
Military science, leadership, and operational art	3	1,440	100%
Computational science	3	1,440	100%
Political science and government	3	1,440	100%
Veterinary medicine (DVM)	3	1,440	100%
Electrical and electronic engineering technologies/technicians	6	1,200	17%
Business/managerial economics	3	1,160	100%
Special education and teaching	17	1,120	50%
Bilingual, multilingual, and multicultural education	4	1,080	25%
Electromechanical and instrumentation and maintenance technologies/technicians	4	1,080	75%
High school/secondary diploma and certificate programs	18	1,040	67%
Architecture (BArch, BA, BS, BSc, MArch, MA, MS, MSc, PhD)	2	960	100%
Engineering, general	16	960	0%
Microbiological sciences and immunology	2	960	100%
Security and protective services, other	2	960	100%
Public policy analysis	2	960	100%
Germanic languages, literatures, and linguistics	10	900	0%
Clinical/medical laboratory science/research and allied professions	4	900	100%
Pharmacy, pharmaceutical sciences, and administration	4	900	100%
Electrical, electronics and communications engineering	3	880	100%
Taxation	4	810	100%
Masonry/mason	3	800	100%
Legal support services	5	730	100%
Drafting/design engineering technologies/technicians	4	720	50%
Dental support services and allied professions	4	710	100%
Journalism	2	680	100%

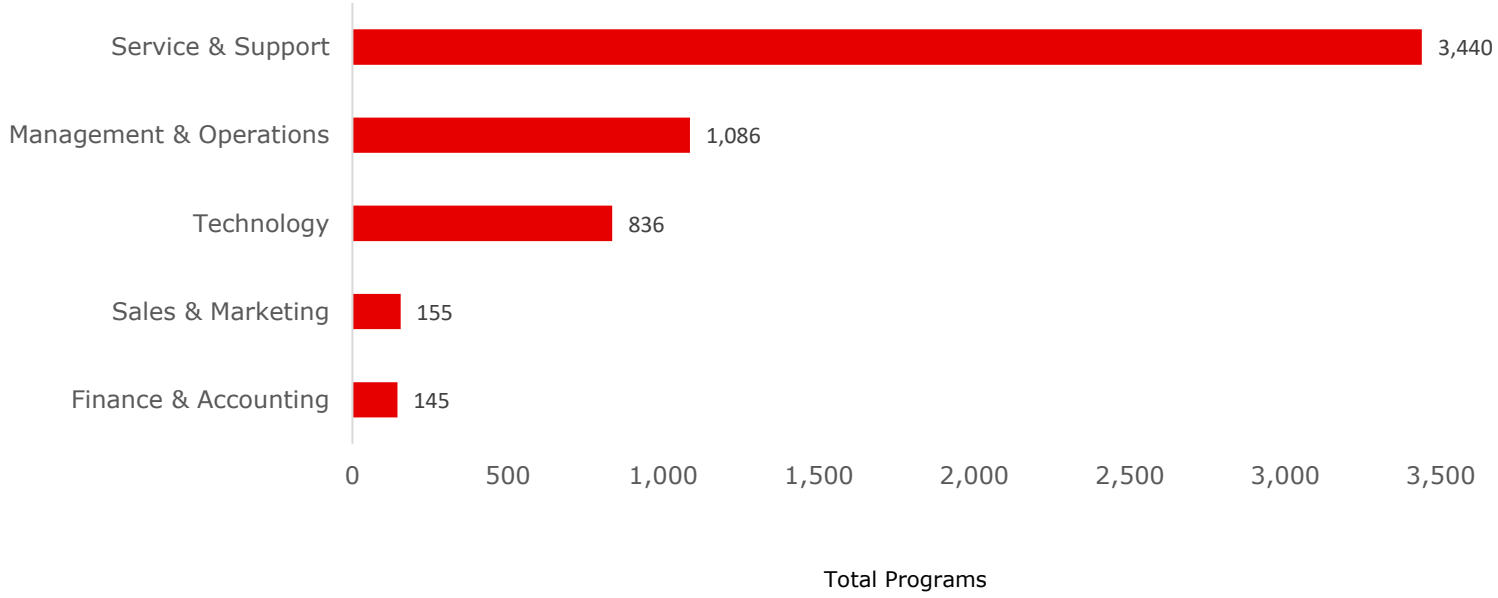
Chemical engineering	2	680	100%
Environmental/environmental health engineering	2	680	100%
Security and protective services, specialized programs	2	680	100%
General sales, merchandising and related marketing operations	2	680	0%
Data processing and data processing technology/technician	16	640	100%
Biological and physical sciences	16	640	0%
Educational/instructional media design	2	600	0%
Heating, air conditioning, ventilation, and refrigeration maintenance technology/technician	3	600	100%
Heavy/industrial equipment maintenance technologies	3	600	100%
Woodworking	3	600	100%
Practical nursing, vocational nursing, and nursing assistants	3	600	100%
Agriculture, general	2	480	0%
Applied horticulture/horticultural business services	1	480	100%
Curriculum and instruction	1	480	100%
Architectural engineering	1	480	100%
East Asian languages, literatures, and linguistics	1	480	100%
Slavic, Baltic and Albanian languages, literatures, and linguistics	1	480	100%
Housing and human environments	1	480	100%
Law (LLB, JD, BCL)	1	480	100%
Botany/plant biology	1	480	100%
Cell/cellular biology and anatomical sciences	1	480	100%
Zoology/animal biology	1	480	100%
Biomathematics, bioinformatics, and computational biology	1	480	100%
Ecology, evolution, systematics, and population biology	1	480	100%
Behavioural sciences	1	480	100%
Natural sciences	1	480	100%
Intercultural/multicultural and diversity studies	1	480	100%
Multidisciplinary/interdisciplinary studies, other	1	480	100%
Pastoral counselling and specialized ministries	1	480	100%
Physics	1	480	100%
Community organization and advocacy	1	480	100%
International relations and national security studies	1	480	100%
Urban studies/affairs	1	480	100%
Medicine (MD)	1	480	100%
Alternative and complementary medical support services	1	480	100%
Energy-based and biologically based therapies	1	480	100%
History	2	480	80%
Medical residency programs - subspecialty certificates	1	480	100%
Industrial production technologies/technicians	2	400	50%
Library science and administration	2	400	100%
Science technologies/technicians, general	2	400	0%

Electrical/electronics maintenance and repair technology	2	400	100%
Dietetics and clinical nutrition services	2	400	100%
Communications technology/technician	2	290	100%
Non-professional general legal studies (undergraduate)	1	240	0%
Agricultural mechanization	1	200	100%
Architectural sciences and technology	1	200	100%
Graphic communications	1	200	100%
Arts, entertainment, and media management	1	200	100%
Health/medical preparatory programs	1	200	100%
Optometry (OD)	1	200	100%
Ophthalmic and optometric support services and allied professions	1	200	100%
Specialized sales, merchandising and marketing operations	1	200	0%
Advanced/graduate dentistry and oral sciences (Cert., MS, MSc, PhD)	2	180	100%
Construction engineering technology/technician	1	120	0%
Student counselling and personnel services	1	90	100%
Public administration and social service professions, other	1	90	0%

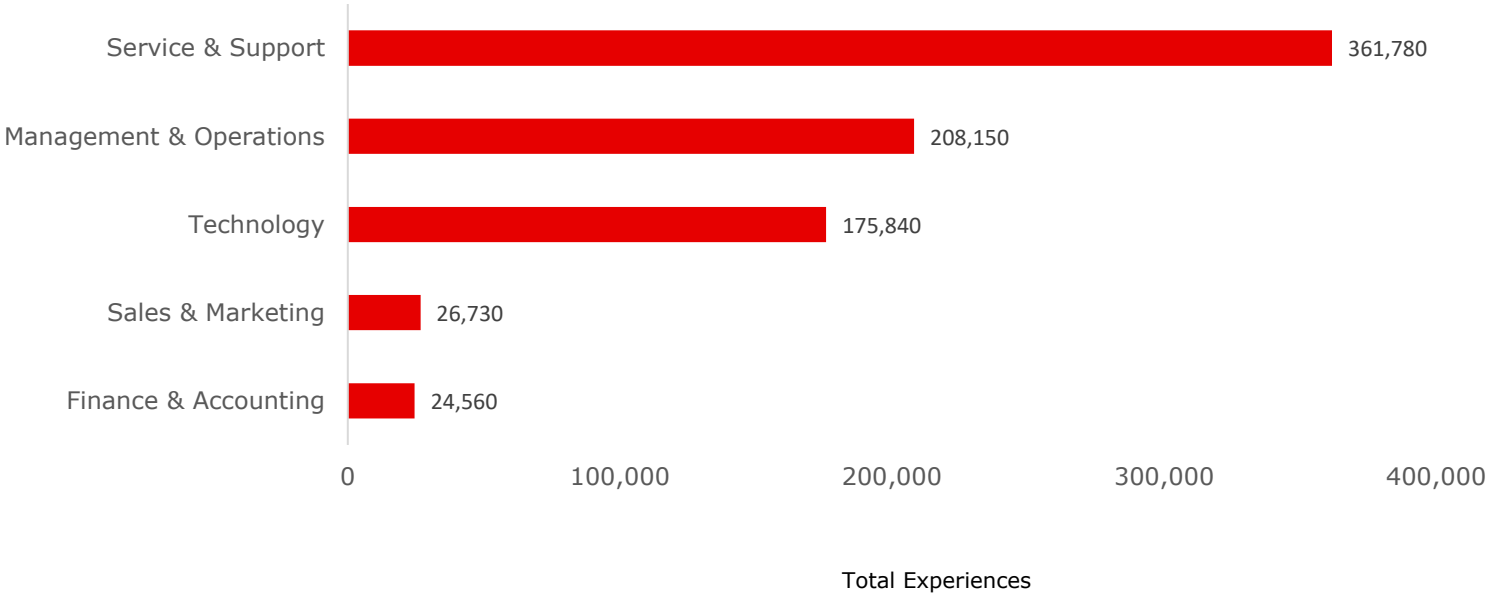
Functional Skill Development

Below, the audit considers the five functional skill categories identified in the skill demand analysis study (Study 1). In total, 5,662 programs, or 18% of all programs were identified as contributing to developing one of the five functional skill categories. These programs represent 797,060 annual experiences, or 22% of all learning experiences.

Total Functional Skill Programs (total programs)



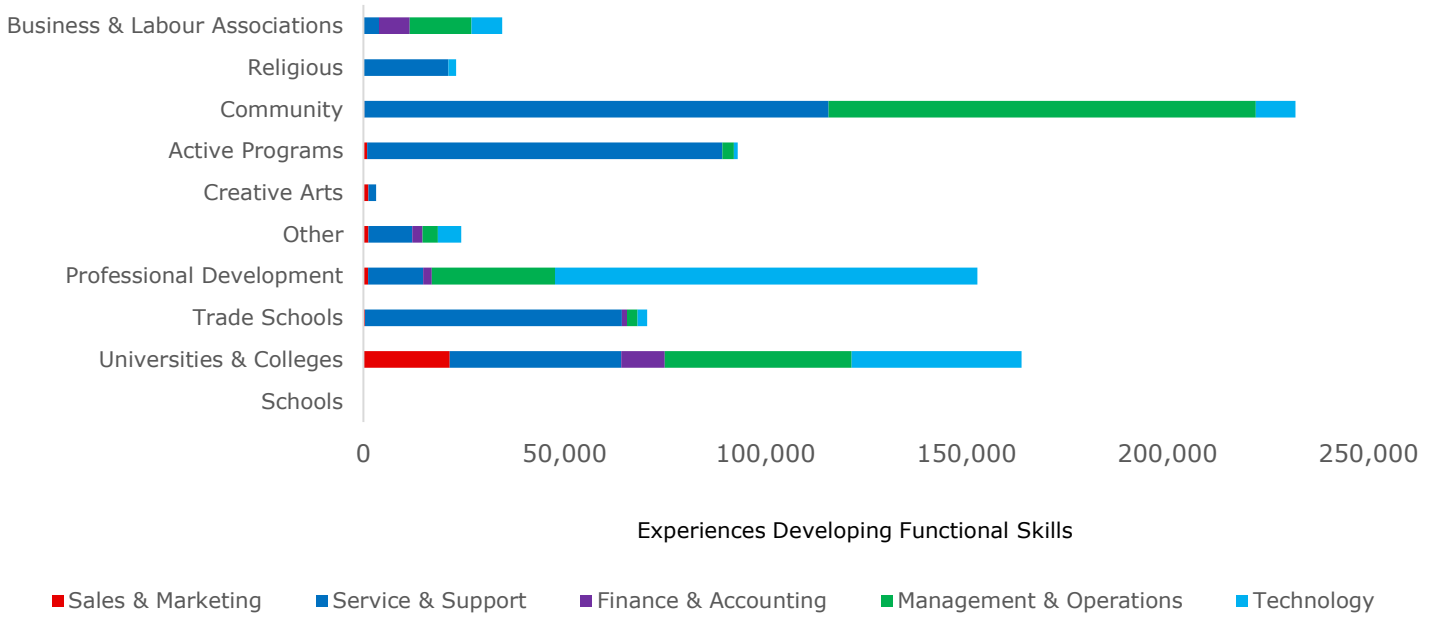
Total Functional Skill Experiences (total experiences)



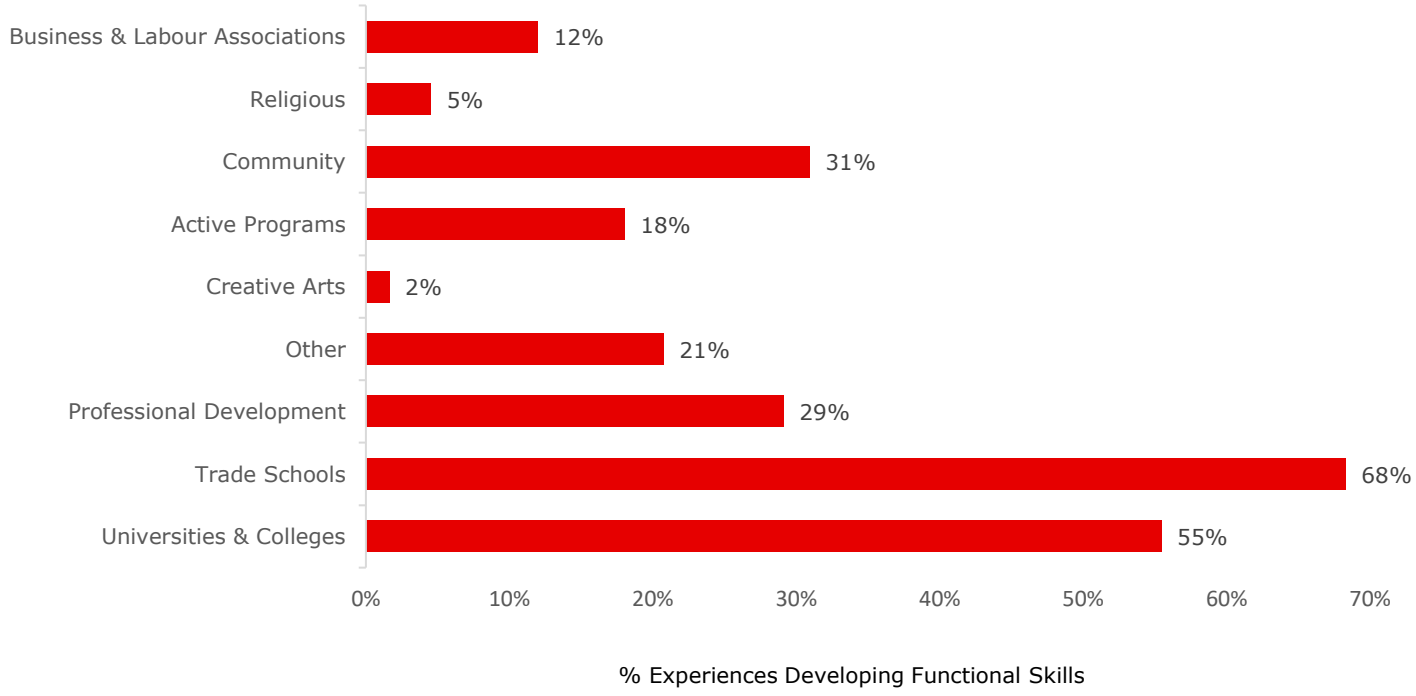
Functional Skill Development by Skill Developer Cluster

The figures below explore the proportion of experiences linked to developing functional skills. The proportion of experiences reflects similar trends to the programs from above. In both cases, sales & marketing appears to have limited capacity.

Total Functional Skill Experiences By Skill Developer Cluster (total)



Proportion of Experiences Developing Functional Skill (total)



Sectoral Expertise Development (Four-Digit CIP Programs and Experiences by Sector)

The following table breaks 219 four-digit CIPs by number of annual programs and experiences, including the proportion certified organized by Calgary Economic Development sectors.

Four-Digit CIP by Calgary Economic Development Sector	Total Annual Programs	Total Annual Experiences	% Experiences Certified
Financial Services			
Accounting and related services	92	24,510	84%
Finance and financial management services	75	12,000	78%
Taxation	4	810	100%
Total	**171**	**37,320**	**82%**
Transportation & Logistics			
Air transportation	21	6,560	76%
Ground transportation	1,278	134,576	65%
Transportation and materials moving, other	53	6,399	100%
Total	**1,352**	**147,535**	**67%**
Agribusiness			
Agriculture, general	2	480	0%
Agricultural mechanization	1	200	100%
Agricultural and domestic animal services	262	16,800	5%
Applied horticulture/horticultural business services	1	480	100%
Natural resources conservation and research	50	2,880	40%
Wildlife and wildlands science and management	284	56,079	1%
Natural resources and conservation, other	48	1,920	0%
Total	**648**	**78,839**	**4%**
Creative Industries (excluding software development)			
Architecture (BArch, BA, BS, BSc, MArch, MA, MS, MSc, PhD)	2	960	100%
City/urban, community and regional planning	3	1,440	100%
Environmental design/architecture	3	1,440	100%
Landscape architecture (BS, BSc, BSLA, BLA, MSLA, MLA, PhD)	3	1,440	100%
Architectural sciences and technology	1	200	100%
Communication and media studies	10	2,570	50%
Journalism	2	680	100%
Radio, television, and digital communication	7	1,850	71%
Public relations, advertising, and applied communication	4	1,920	100%
Communications technology/technician	2	290	100%
Graphic communications	1	200	100%
Electrical, electronics and communications engineering	3	880	100%
Drafting/design engineering technologies/technicians	4	720	50%
Visual, digital, and performing arts, general	41	4,330	73%
Crafts/craft design, folk art and artisanry	850	37,880	0%
Dance	2,377	98,569	0%
Design and applied arts	13	4,840	92%
Drama/theatre arts and stagecraft	196	14,962	11%
Film/video and photographic arts	23	2,880	63%
Fine arts and art studies	45	7,840	87%
Music	1,459	68,885	7%
Arts, entertainment, and media management	1	200	100%
Marketing	45	4,060	85%
General sales, merchandising and related marketing operations	2	680	0%
Specialized sales, merchandising and marketing operations	1	200	0%
Parks, recreation, and leisure facilities management	16	3,840	0%
Outdoor education	144	11,520	0%
Total	**5,258**	**275,276**	**14%**

Software Development			
Computer and information sciences and support services, general	124	14,099	35%
Computer programming	63	9,960	0%
Data processing and data processing technology/technician	16	640	100%
Computer systems analysis/analyst	10	2,370	60%
Computer science	19	2,080	75%
Computer software and media applications	30	6,070	33%
Computer systems networking and telecommunications	34	4,440	88%
Computer/information technology administration and management	215	76,570	5%
Computer engineering	6	2,880	100%
Computational science	3	1,440	100%
Total	**520**	**120,549**	**19%**
Life Sciences			
Biology, general	9	4,320	100%
Biochemistry/biophysics and molecular biology	3	1,440	100%
Botany/plant biology	1	480	100%
Cell/cellular biology and anatomical sciences	1	480	100%
Microbiological sciences and immunology	2	960	100%
Zoology/animal biology	1	480	100%
Biomathematics, bioinformatics, and computational biology	1	480	100%
Ecology, evolution, systematics, and population biology	1	480	100%
Neurobiology and neurosciences	3	1,440	100%
Biological and physical sciences	16	640	0%
Health and physical education/fitness	26	5,440	100%
Clinical, counselling, and applied psychology	8	3,840	100%
Health services/allied health/health sciences, general	5	2,400	100%
Advanced/graduate dentistry and oral sciences (Cert., MS, MSc, PhD)	2	180	100%
Dental support services and allied professions	4	710	100%
Health and medical administrative services	10	2,290	100%
Allied health and medical assisting services	57	5,100	100%
Allied health diagnostic, intervention, and treatment professions	91	13,199	93%
Clinical/medical laboratory science/research and allied professions	4	900	100%
Health/medical preparatory programs	1	200	100%
Medicine (MD)	1	480	100%
Mental and social health services and allied professions	726	61,730	20%
Optometry (OD)	1	200	100%
Ophthalmic and optometric support services and allied professions	1	200	100%
Pharmacy, pharmaceutical sciences, and administration	4	900	100%
Public health	32	5,320	100%
Rehabilitation and therapeutic professions	34	2,320	50%
Veterinary medicine (DVM)	3	1,440	100%
Health aides/attendants/orderlies	37	8,670	71%
Dietetics and clinical nutrition services	2	400	100%
Alternative and complementary medical support services	1	480	100%
Somatic bodywork and related therapeutic services	38	3,340	100%
Movement and mind-body therapies	1,584	108,160	5%
Energy-based and biologically based therapies	1	480	100%
Registered nursing, nursing administration, nursing research and clinical nursing	8	3,840	100%
Practical nursing, vocational nursing, and nursing assistants	3	600	100%
Medical residency programs - subspecialty certificates	1	480	100%
Total	**2,723**	**244,499**	**36%**

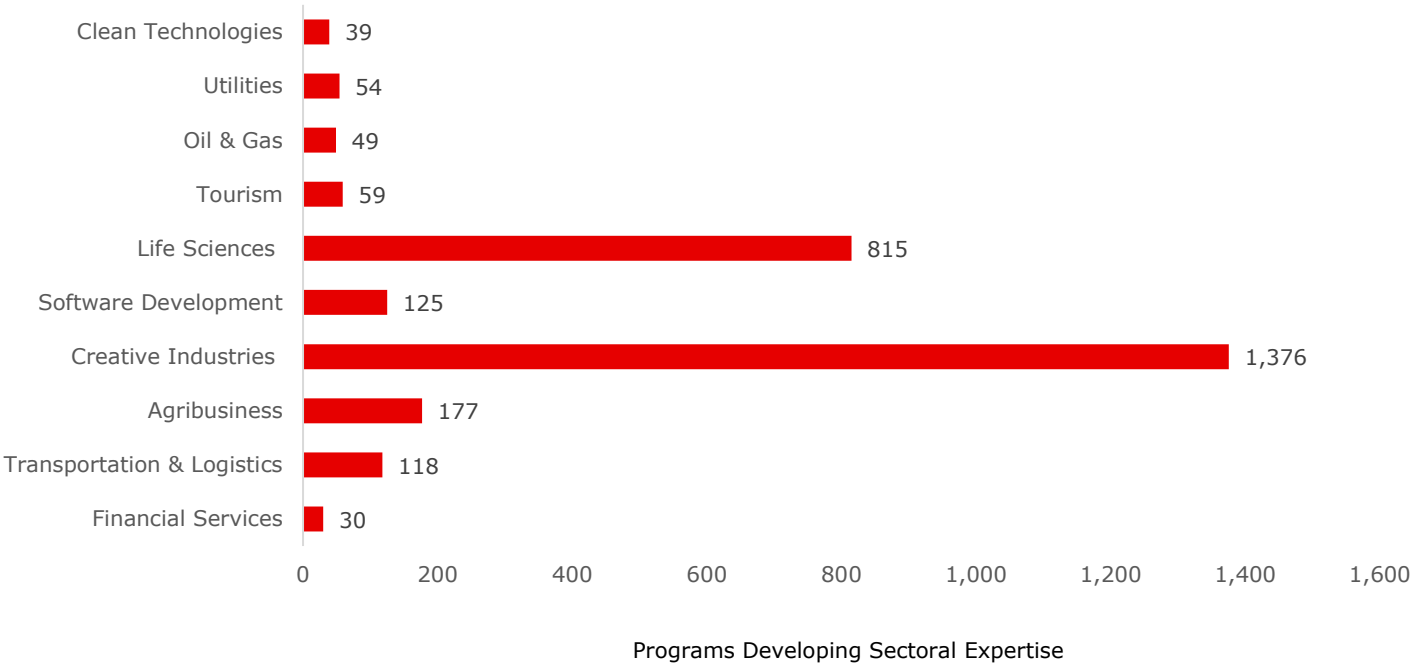
Tourism			
Culinary arts and related services	179	16,561	27%
Hospitality administration/management	30	5,130	100%
Total	**209**	**21,691**	**44%**
Oil & Gas			
Chemical engineering	2	680	100%
Petroleum engineering	7	2,800	86%
Mining and petroleum technologies/technicians	35	4,800	22%
Total	**44**	**8,280**	**50%**
Utilities			
Electrical and electronic engineering technologies/technicians	6	1,200	17%
Electromechanical and instrumentation and maintenance technologies/technicians	4	1,080	75%
Environmental control technologies/technicians	48	8,360	57%
Electrical/electronics maintenance and repair technology	2	400	100%
Heating, air conditioning, ventilation, and refrigeration maintenance	3	600	100%
Total	**63**	**11,640**	**58%**
CleanTech			
Bioengineering and biomedical engineering	4	1,920	100%
Environmental/environmental health engineering	2	680	100%
Chemistry	21	2,760	83%
Geological and Earth sciences/geosciences	7	3,360	100%
Sustainability studies	17	4,320	50%
Total	**51**	**13,040**	**80%**

*Designated four-digit CIP codes were allocated to a single sector based on the strength of its link to a sector.

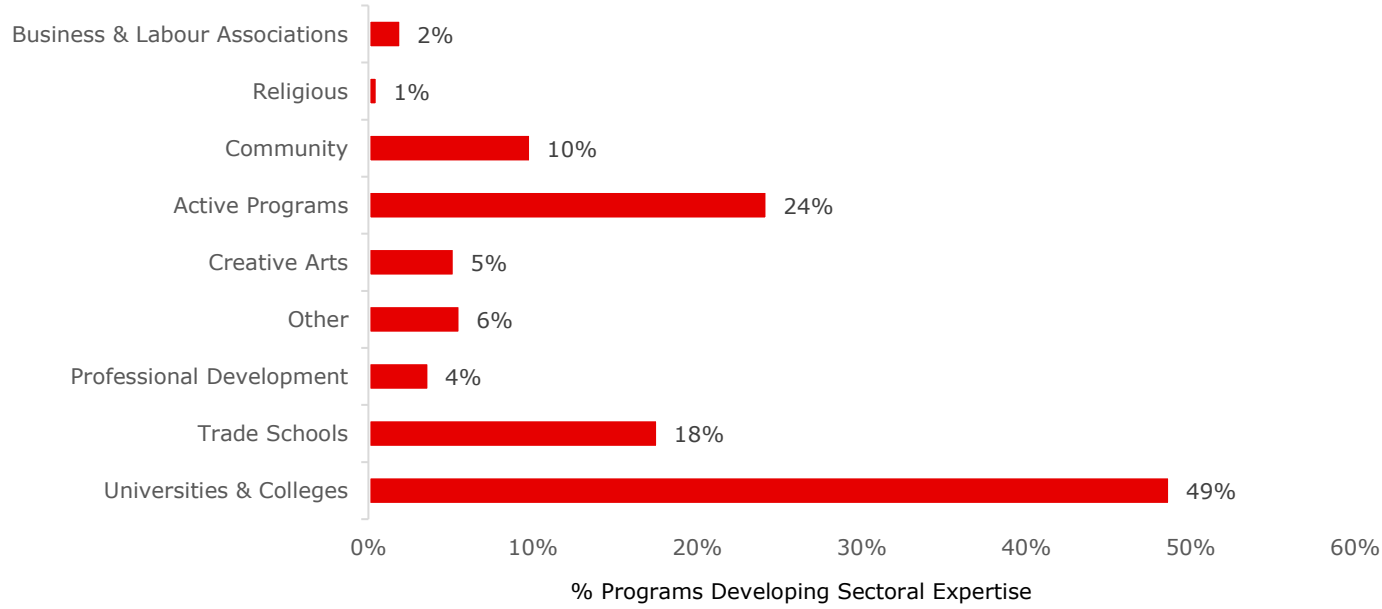
Sectoral Expertise Development Programs

The figure below exams the number of programs supporting the development of sectoral expertise. One challenge with the current sector model, is the broad definition of creative industries and life sciences does not provide sufficient precision to guide decision-making. The second figure identifies the skill developer clusters association with sectoral expertise development. 49% of university & college programs are linked to sectoral expertise, with these being concentrated in life sciences and the creative industries.

Total Sectoral Expertise Develop Programs (total)



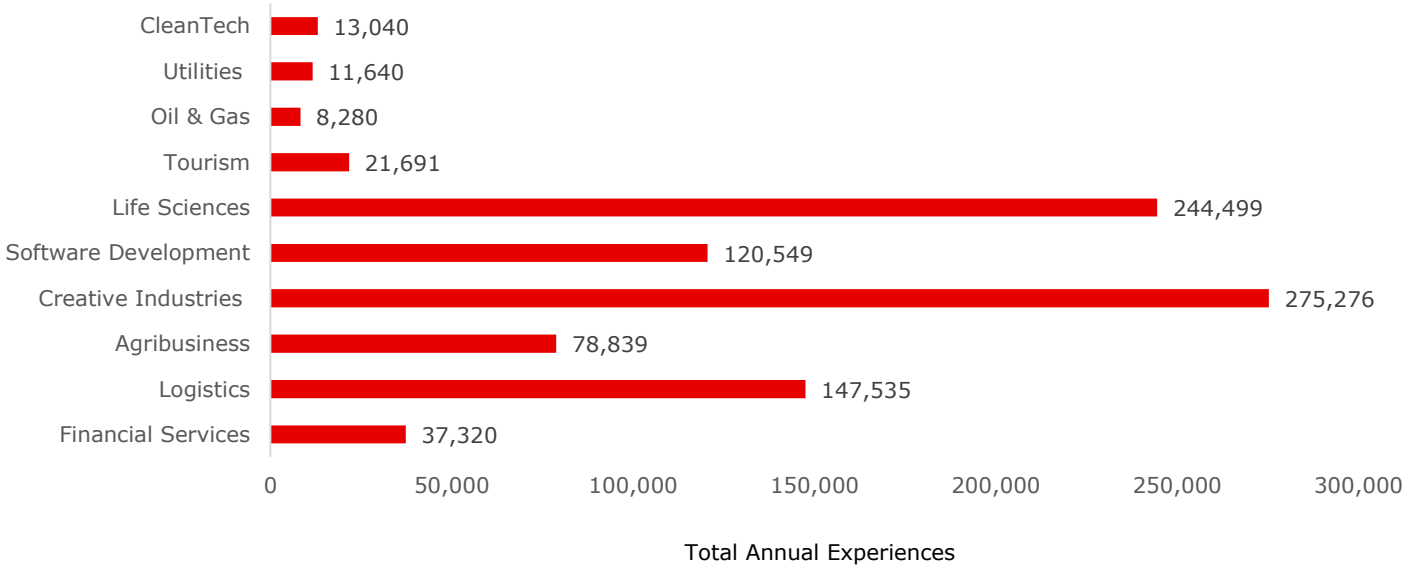
Proportion of Programs Developing Sectoral Expertise (total)



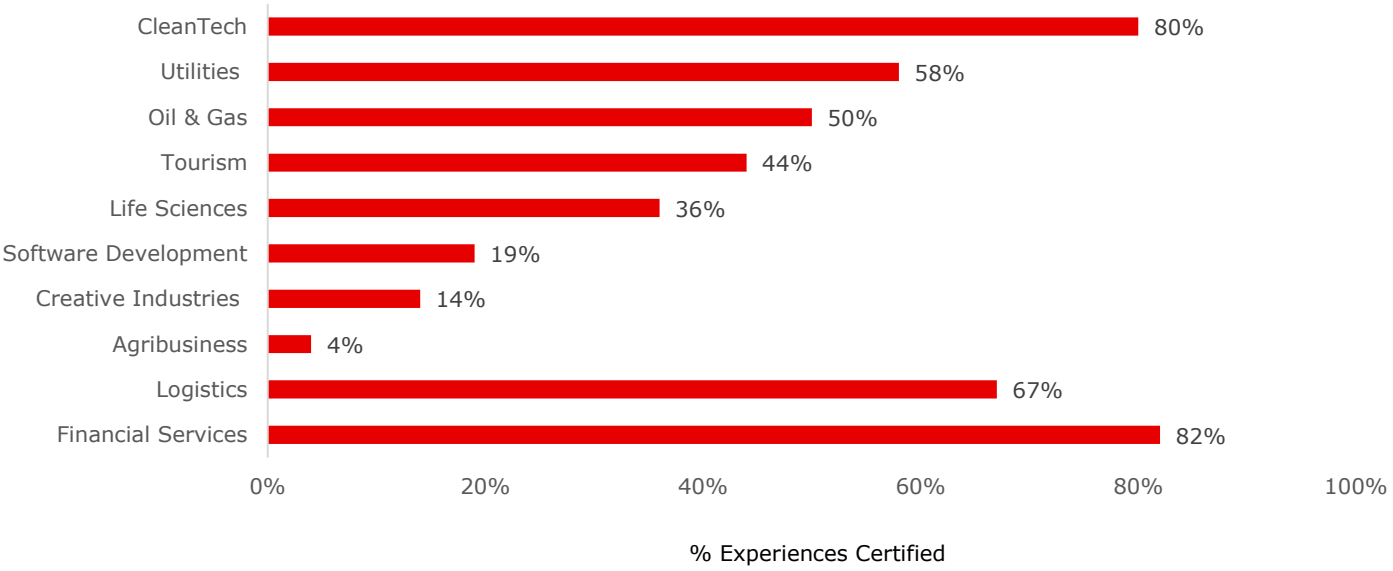
Sectoral Expertise Development Experiences

The figure below exams the number of experiences supporting the development of sectoral expertise. The Life Sciences and Creative Industries dominate the total number of experiences. Life Sciences is heavily influenced by "movement and mind-body therapies" which represent over 108,000 experiences. Creative Industries is heavily influenced by dance and music programs. The second figure overlays the proportion of experiences that are certified. Financial services has the highest proportion of certified experiences, whereas agribusiness has the lowest proportion. The proportion of low agribusiness experiences is linked to continuing education experiences associated with domestic animals and agriculture.

Sectoral Expertise Development Experiences (total)



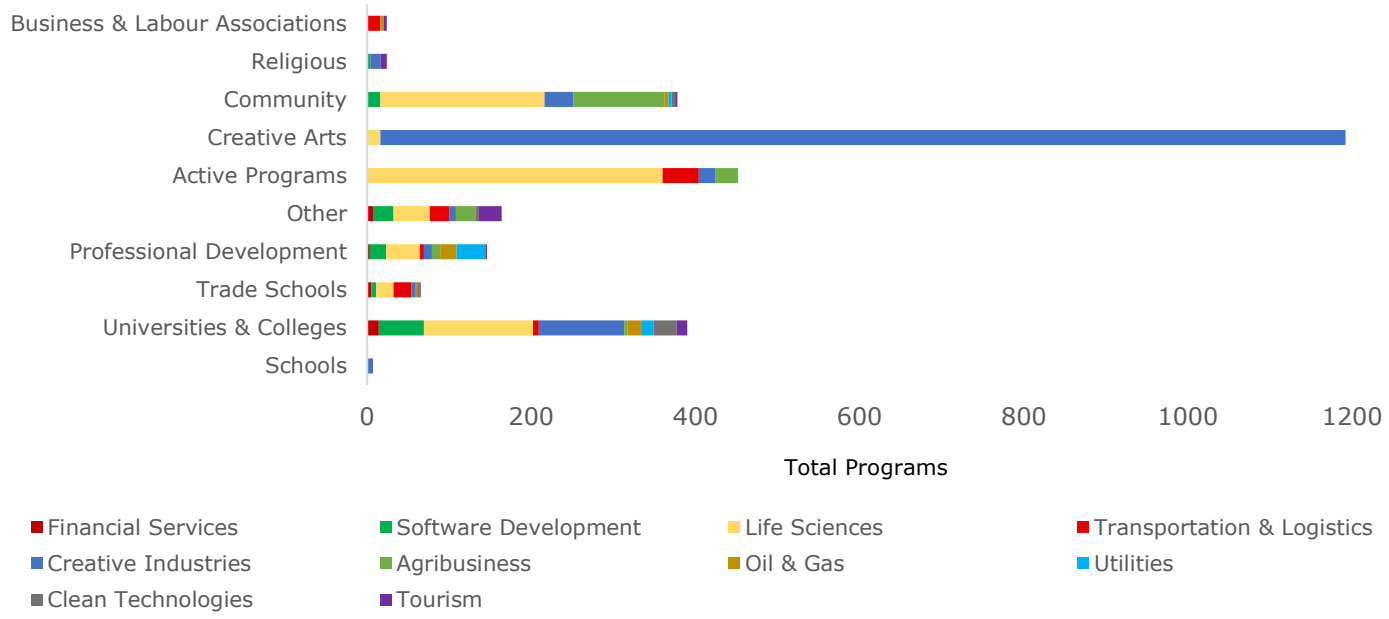
Percentage Sectoral Expertise Development Certified



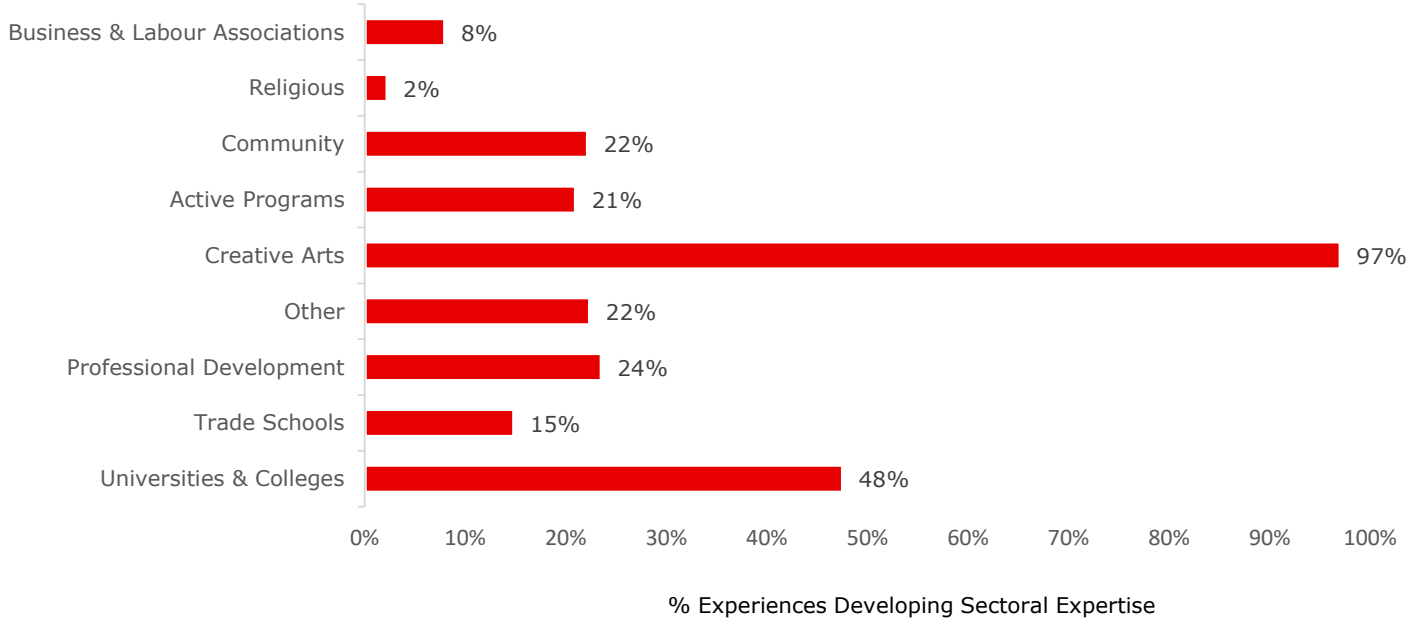
Sectoral Expertise Development by Skill Developer Cluster

Below the sectors are broken by the ten skill developer clusters. When broken down further, computer programs lead with 86% of all programs, followed by colleges at 53%, universities at 48%, and trade schools at 27%. At the lower end, schools, religious and community programming had no link to developing skills associated to the 10 sectors.

Total Sectoral Programs by Skill Developer Cluster (total)

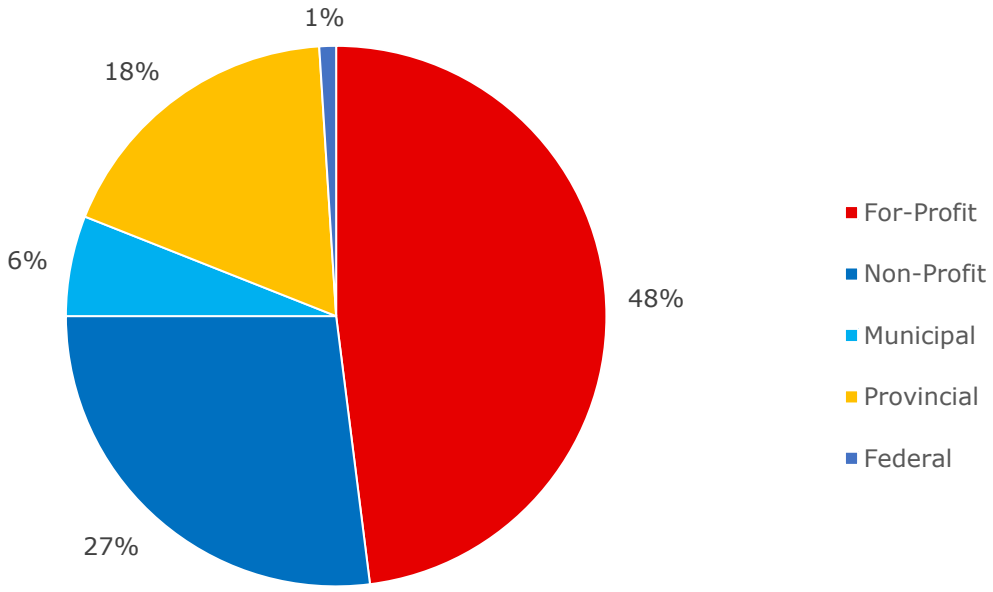


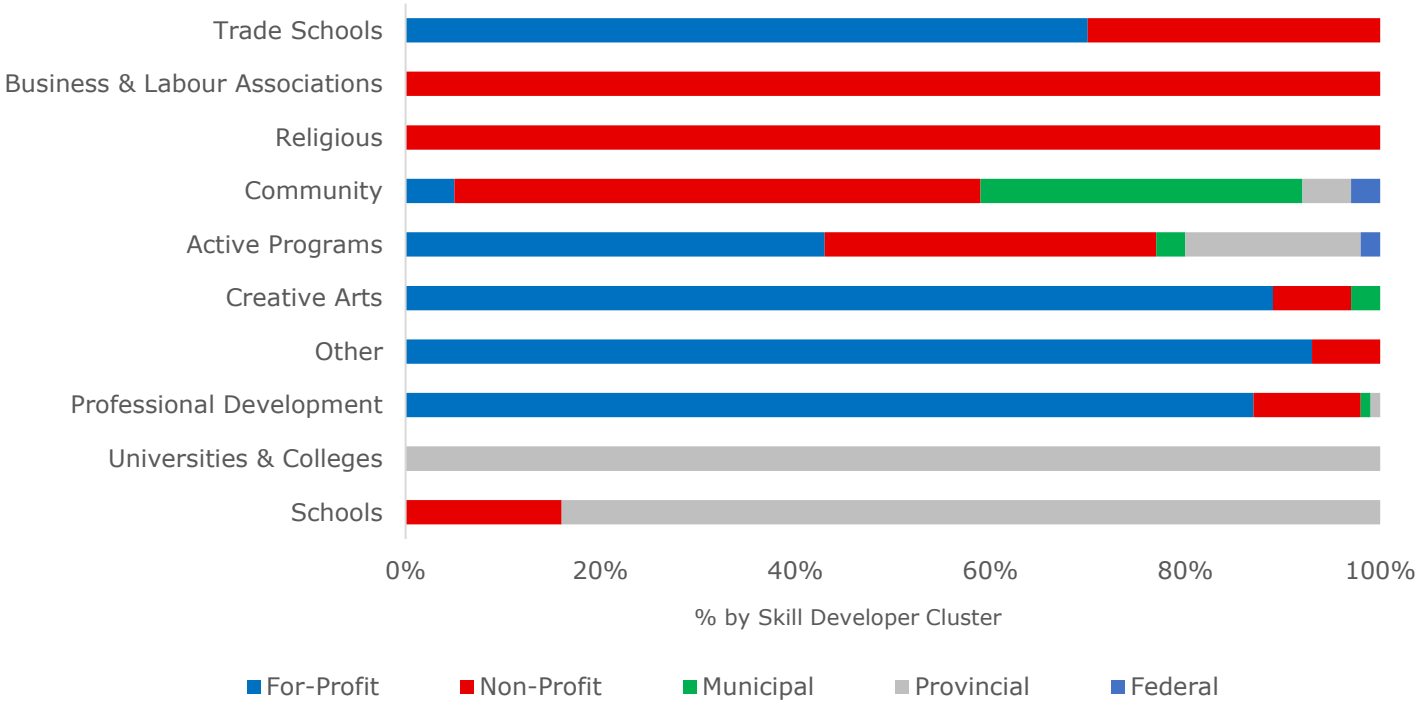
Proportion of Experiences Developing Sectoral Expertise (total)



Program Orientation (% programs sampled)

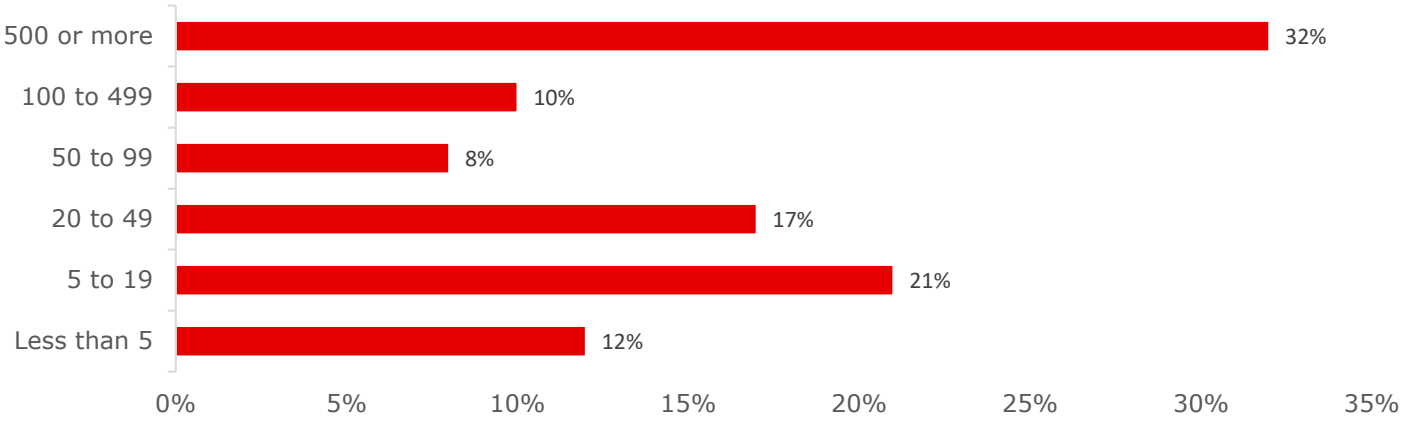
Three-quarters of learning organizations are non-profit or for-profit, with 48% of skill developer cluster organizations as being for-profit, and 27% being non-profit. One in four organizations are public sector, this includes provincially accredited school boards, universities, and colleges. When broken down at a sector-level, the dominance of for-profit organizations in the trades, human resources, creative arts, and professional development sectors. Social programs are primarily in the business & labour, religious, and community sectors. Finally, the public sector dominates elementary, secondary, universities, and colleges, and a secondary role in the community sector.

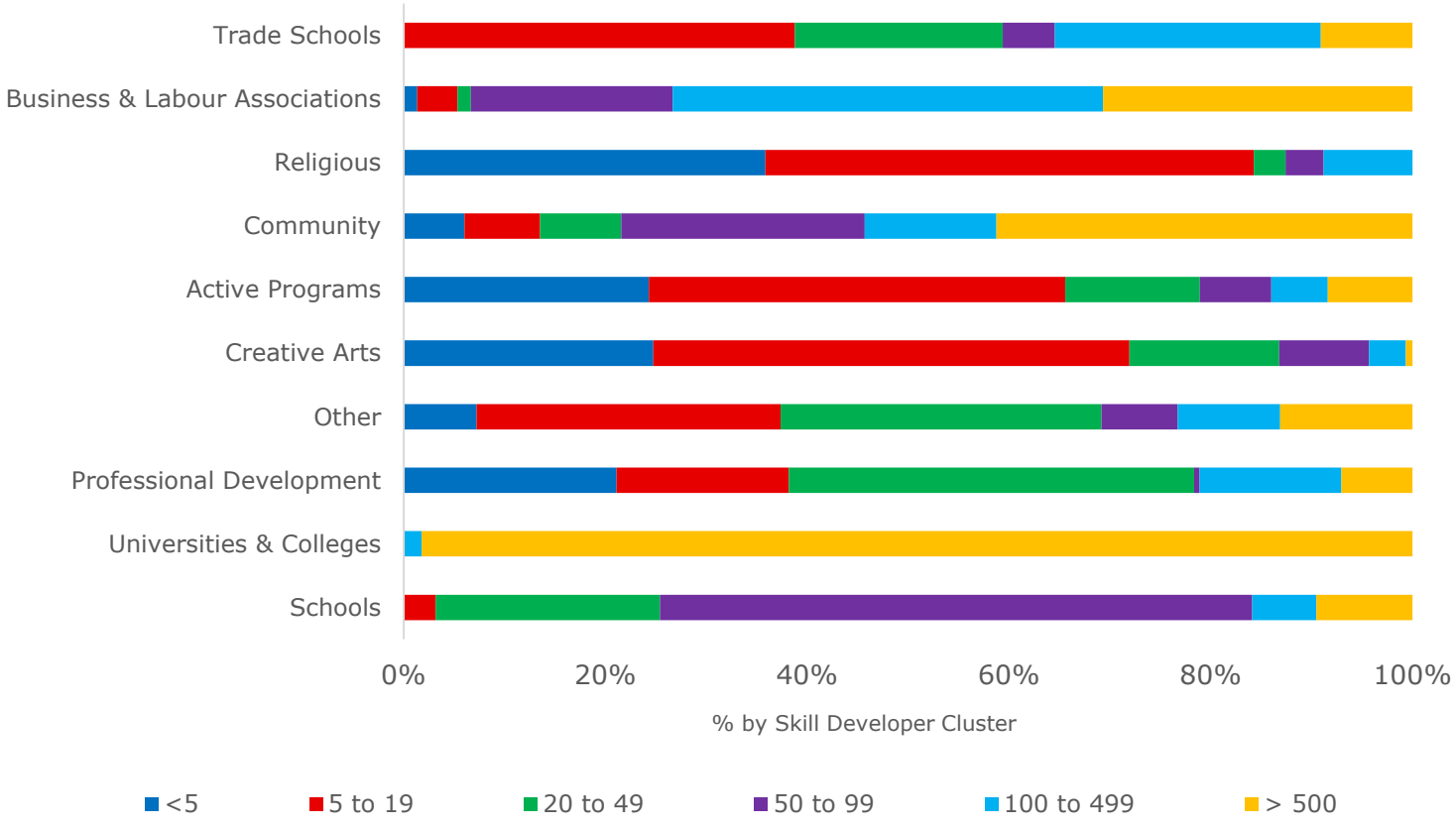




Program Delivery by Organization Size (% programs sampled)

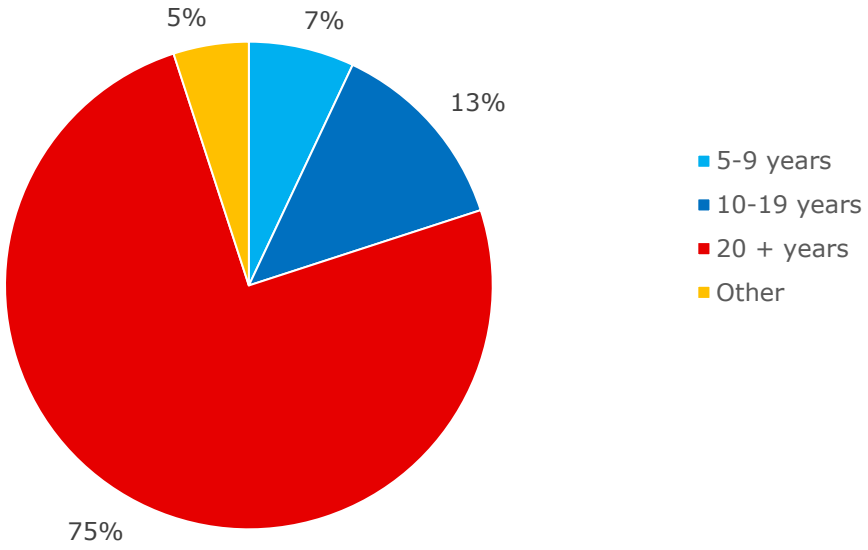
Seven of 10 learning organizations have less than 100 employees. As per above, many of the smaller organizations are clustered in non-certified learning, including creative arts, religious, sports and recreation. Larger organizations are dominated by universities, colleges, and some larger community organizations. The expansion and alignment of learning capacity will demand a systematic harnessing of small-medium enterprise delivery capacity. Options may include increasing system level alignment, or a consolidation of providers to support program scaling.





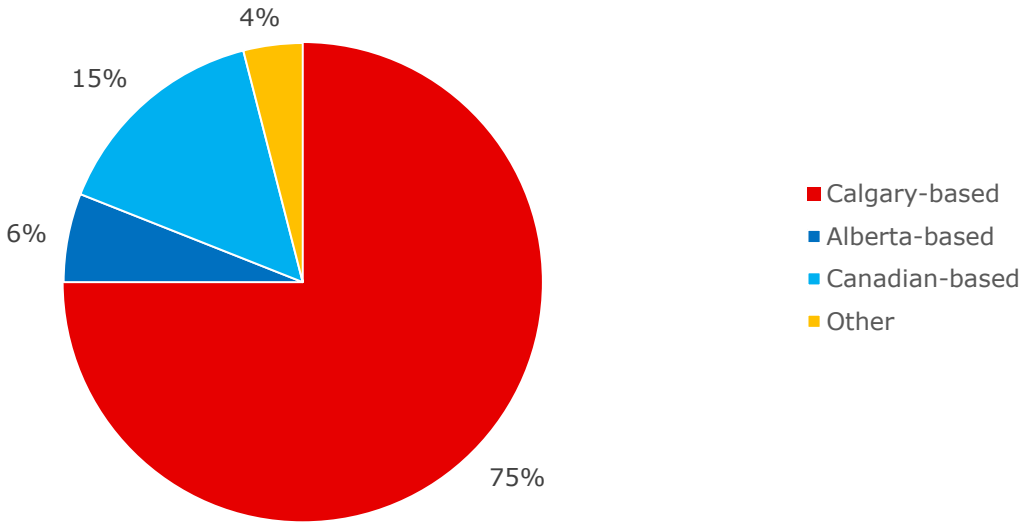
Program Delivery by Organization Age (% programs sampled)

Three-quarters of learning organizations are more than 20 years old. Only 7% were founded in the past decade. This suggests that aligning the capacity in the learning system could incorporate a two-pronged strategy. First, our community must establish the market conditions for existing non-profit and for-profit organizations to adapt to align to emerging priorities. Simultaneously, Calgary must establish the market conditions to incentivize new skill developers to enter the market in areas where skill demand surpasses system capacity.



Program Delivery by Organization Location (% programs sampled)

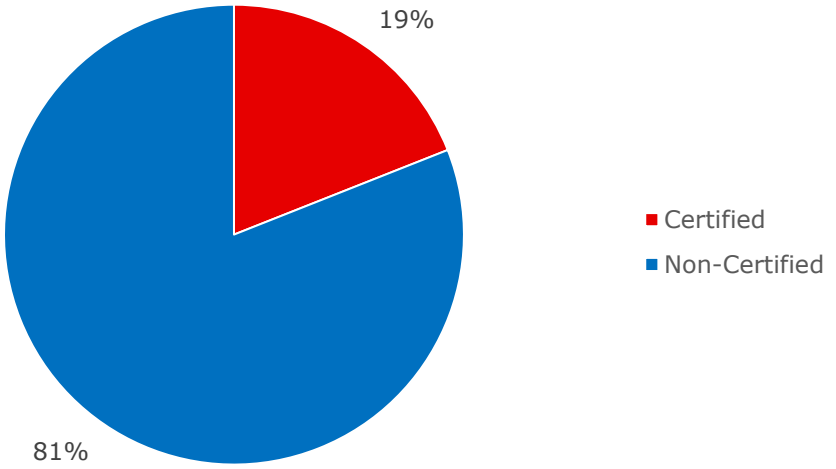
Almost three-quarters of learning organizations are Calgary-based. This is consistent with the fact that the majority of 10 learning organizations are smaller enterprises. This reinforces the assertion that the learning system is driven by local market supply and demand conditions. However, the current fragmented system does not possess the underlying structural capital required to optimize system-level capacity. The result is a highly inefficient system that possesses barriers to adapting at scale.

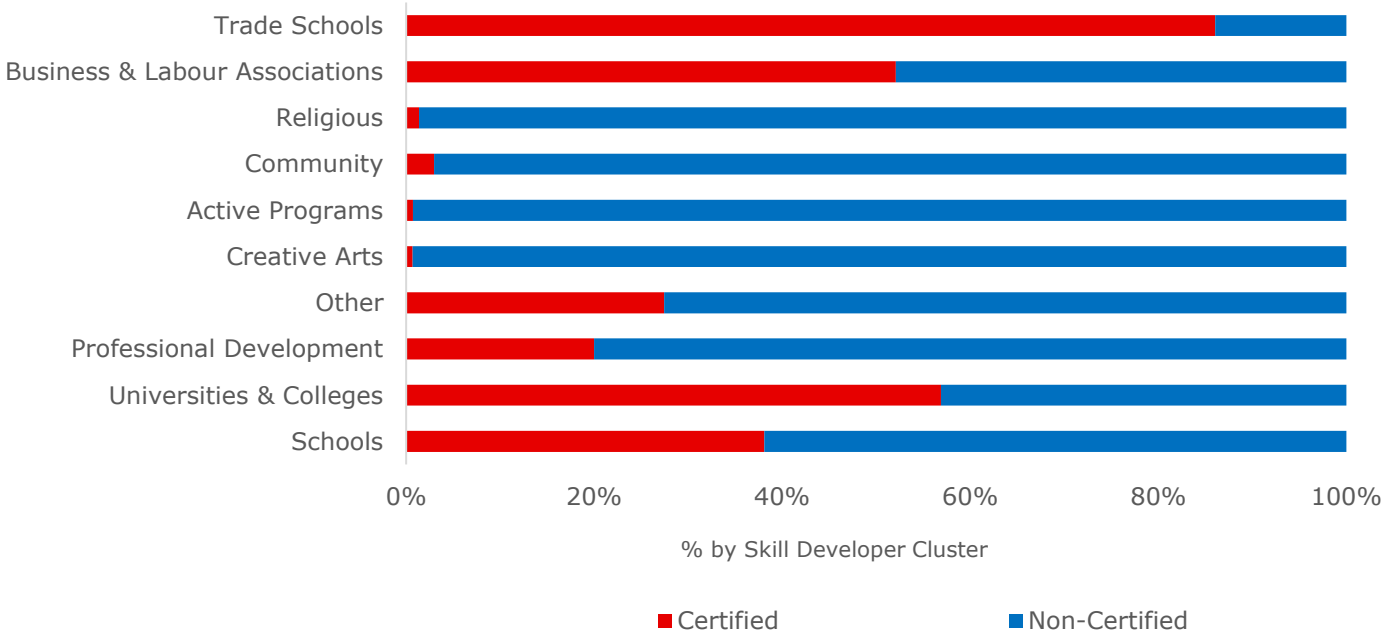


Program Level

Estimated Programs by Certified vs. Non-Certified (% total programs)

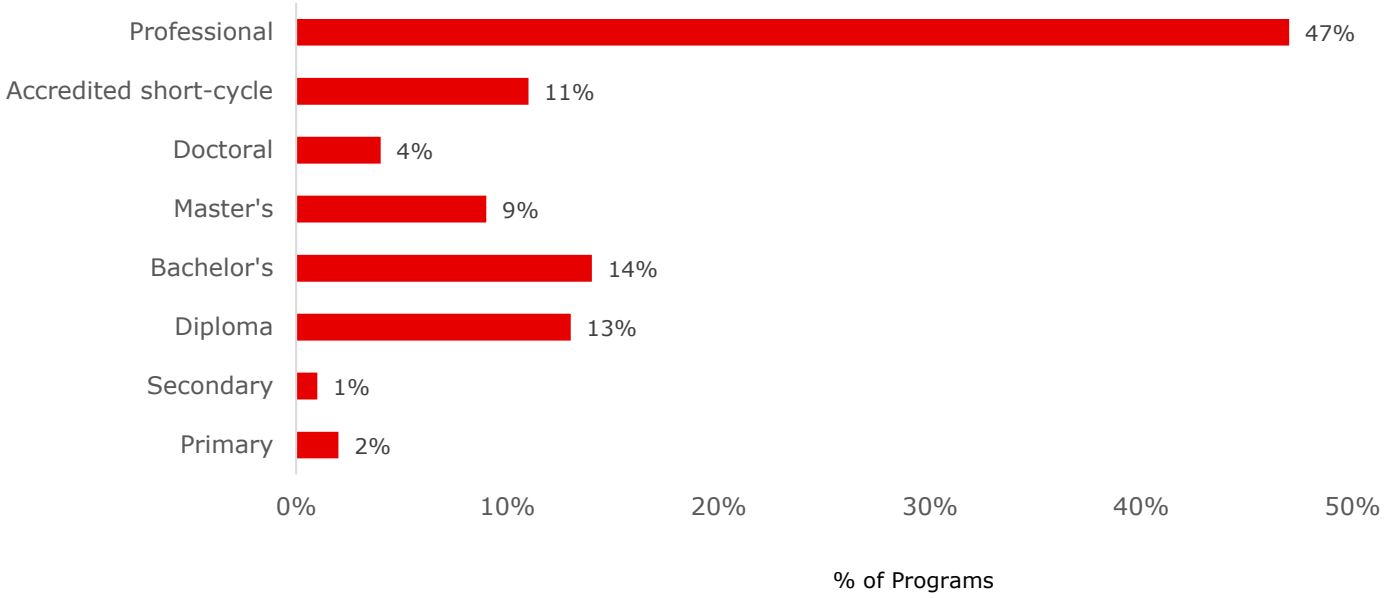
Based on an estimated 30,870 different learning programs offered in Calgary, 19% are certified. These include provincially accredited elementary, secondary, university, and college system, and professional certification (e.g., trades, law). In contrast, entire sectors, from creative arts to active programs are non-certified. The lack of any forms of certification in these programs is the root of the friction in the system as individuals who complete these programs have no third-party certification of the skill developed. It is essential that mechanisms, are developed to recognize the skill developed through non-certified and informal learning to optimize the learning system capacity.

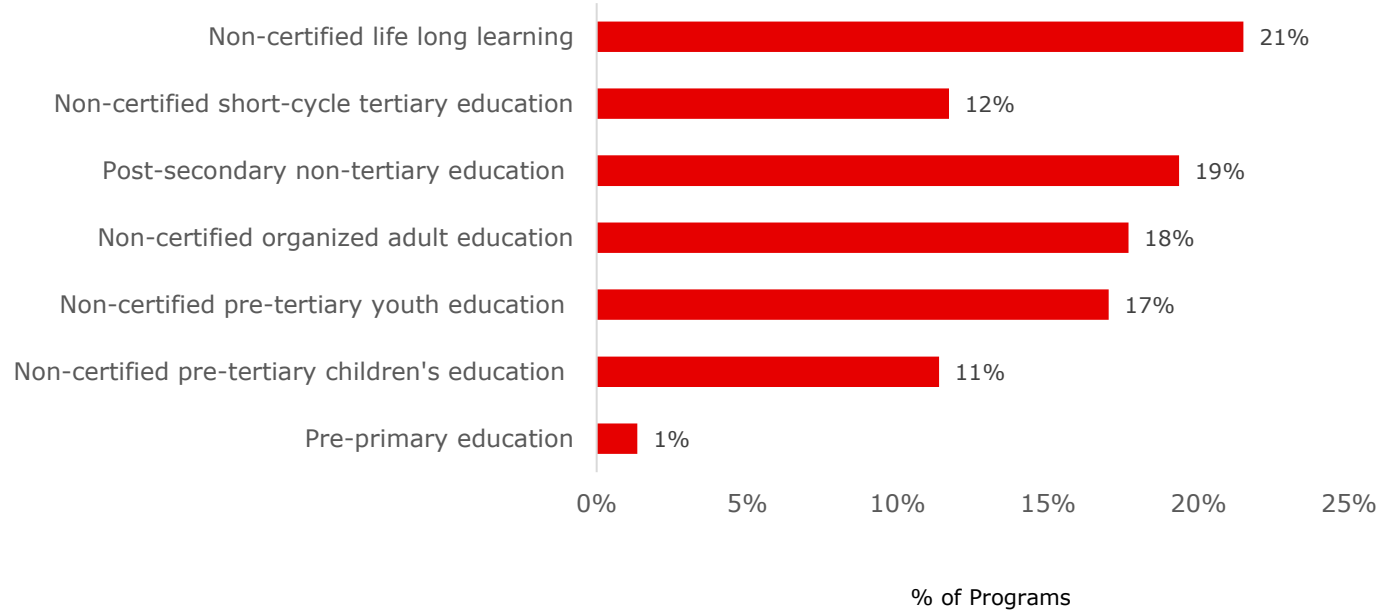




Certified Programming by Category (% programs sampled)

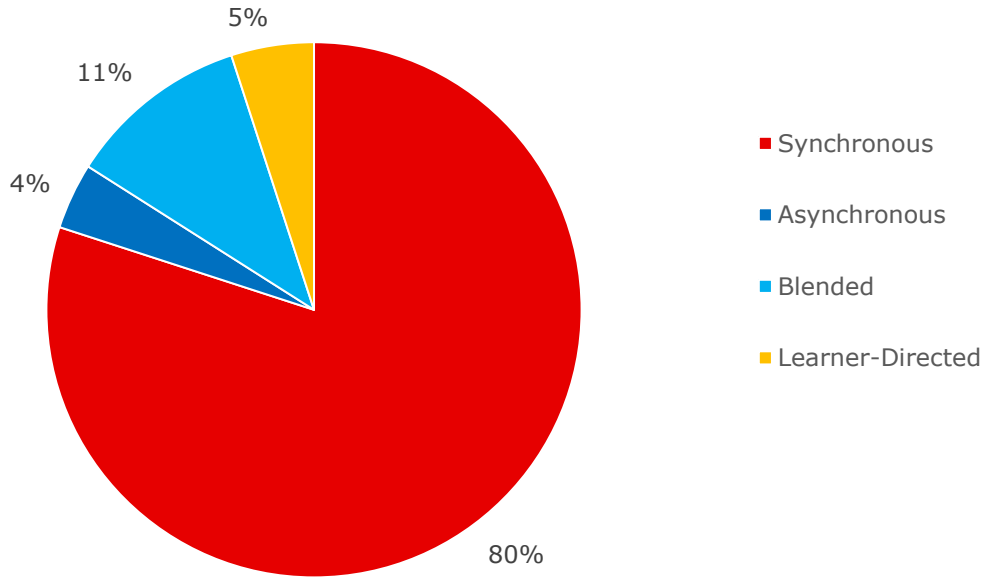
Professional certifications represent 47% of all certified programs. The remaining programs incorporate certified learning accredited by the Government of Alberta. Similar, to the organization-level data, program-level data does not reflect the quantity of certifications awarded. For example, secondary education represents only 1% of the certified learning programs (due to a common curriculum), but they dominate the volume of certificates awarded (e.g., high school diplomas). In contrast, professional certification dominates program-level certificates, but only a small number of certificates awarded annually. Thus, though the provincial government appears proportionally a small player in the overall learning system, it plays a central role during an Albertan's formative years. This represents an opportunity to position provincially accredited learning as a unifying role for the larger learning system.

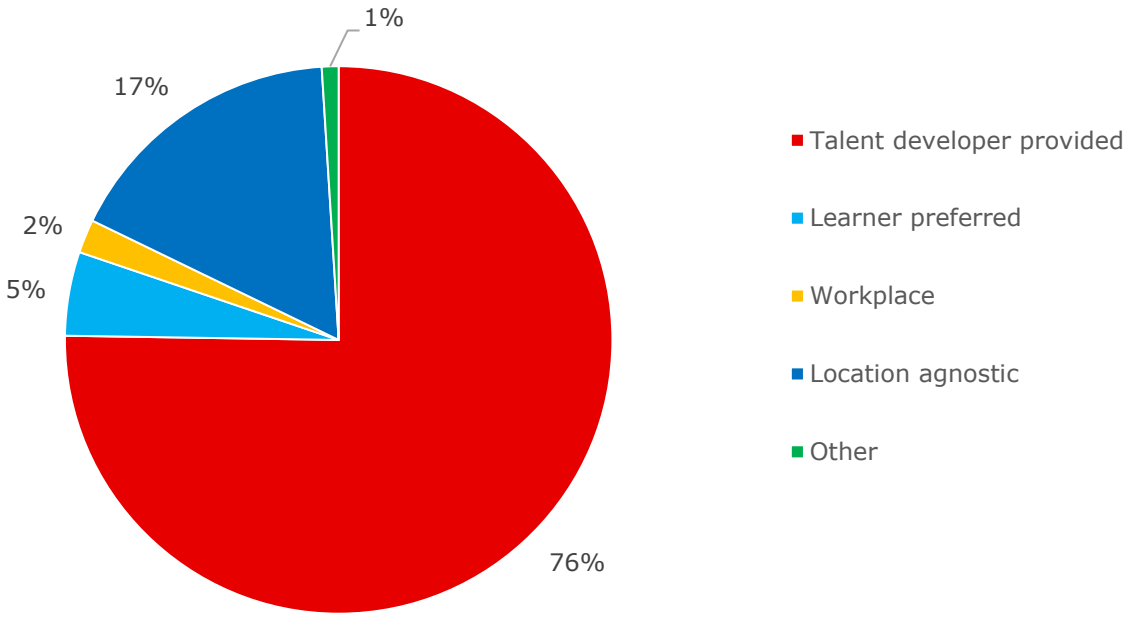




Program Delivery Methods (% programs sampled)

The two charts below analyze two dimensions associated with program delivery. The first chart shows that prior to COVID-19, eight of 10 programs were delivered synchronously. The second chart shows that 75% of these were delivered at a skill developer location (e.g., classroom, recreation centre). The impact of COVID-19 may radically rebalance this model as both individuals and organizations reframed the approaches to delivering programs in either an asynchronous or blended format.





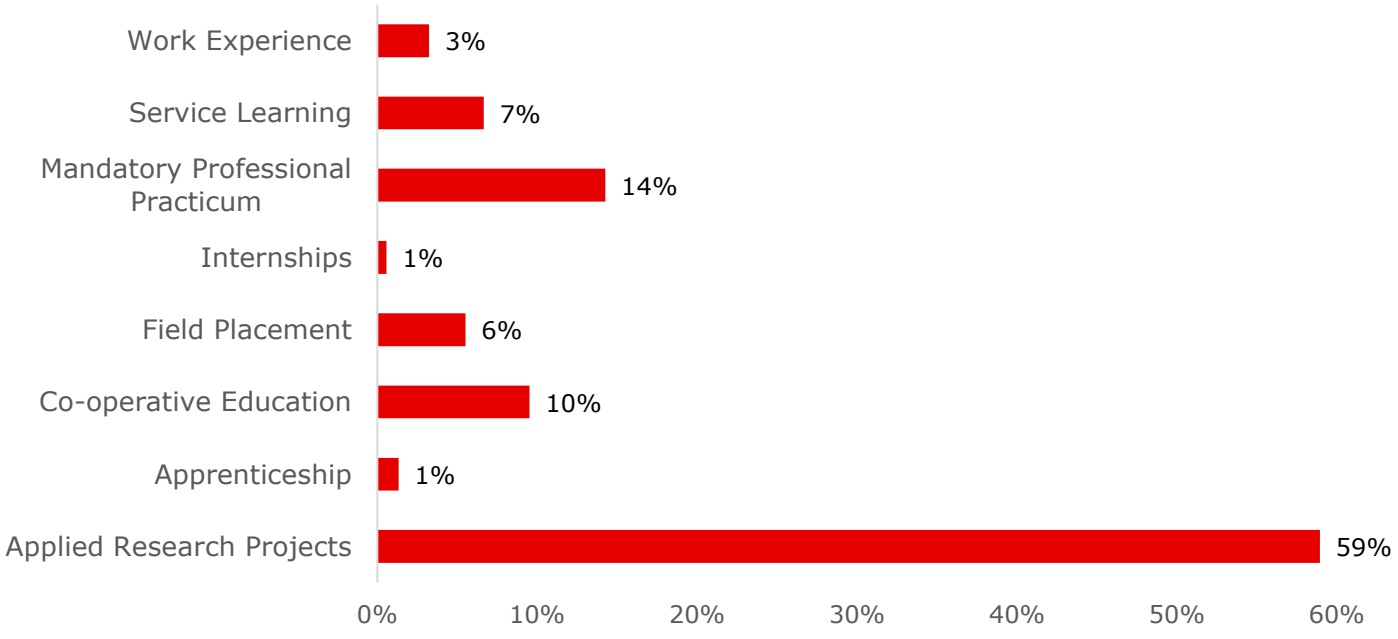
Experiential Skill Development

This audit also explored the scope of experiential learning in the current learning system. Experiential learning bridges conceptual learning with lived experiences in the form of internships, apprenticeships, live case studies, field school's entrepreneurship, and community-engaged research. Experiential learning has been shown to enhance student engagement, increasing situational cognition and the rate of employment pre- and post-graduation. This combination of knowledge acquisition and applied learning experience yields the expertise required for new economy careers (refer to *Calgary on the Precipice*, for a full overview of experiential learning).

Only 15% of all learning incorporates embedded explicit experiential learning. In many learning contexts, such as sports & recreation, experiential learning does not align with the program outcomes. Not surprisingly, experiential learning is heavily concentrated in university, college, and trade schools. For example, 47% of university and college programs explicitly identified forms of experiential learning in their program description. More specifically, as per the chart below, of the experiential learning initiatives explicitly mentioned, almost 60% were related to applied research projects, followed by 30% being a combination of internships, co-operative education, or mandatory practicums.

Experiential learning has the potential to play a far more impactful role in Calgary's learning system. This could include a mandate to expand experiential learning as a requirement in all certified programs. Moreover, there is a large opportunity to expand and scale experiential learning beyond postsecondary learning. For example, this could include establishing mechanisms to enable community and religious organizations to embed experiential learning initiatives in their programming.

Experiential Programming by Delivery Method (% of coded experiential learning sampled)

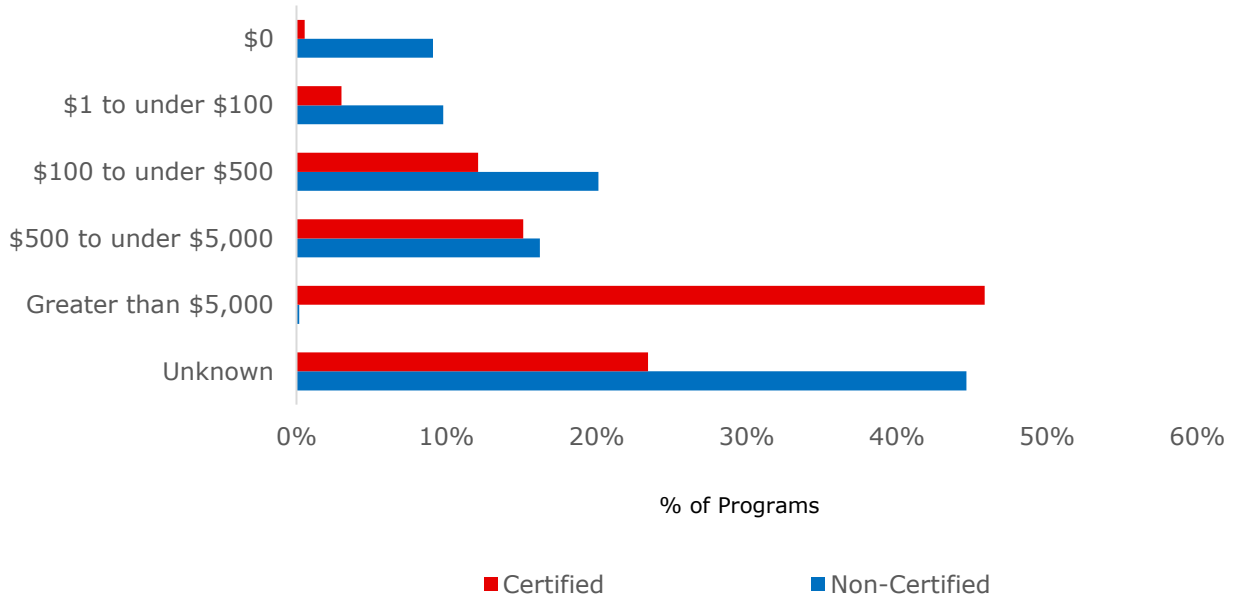


Program Cost

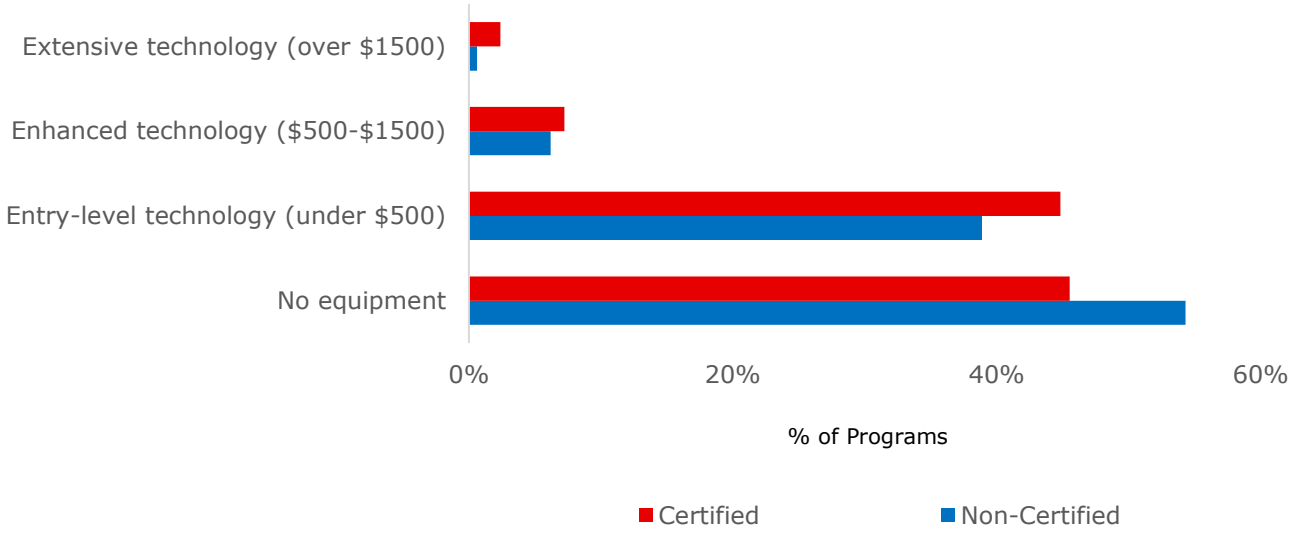
This audit explored two dimensions, tuition, and technology cost. Program cost is an important variable as the systematic expansion of Calgary's learning system requires learning pathways to be accessible to ensure all Calgarians have equitable capacity to reach their full potential.

As per the chart below, our analysis shows that tuition varies dramatically, with 25% being under $100 and 20% being over $5000 (primarily in multi-year postsecondary programs). As per the lower chart, the vast majority of programs require no explicit investment in technology, while a large portion require under $500.

Program Cost – Tuition (% programs sampled)

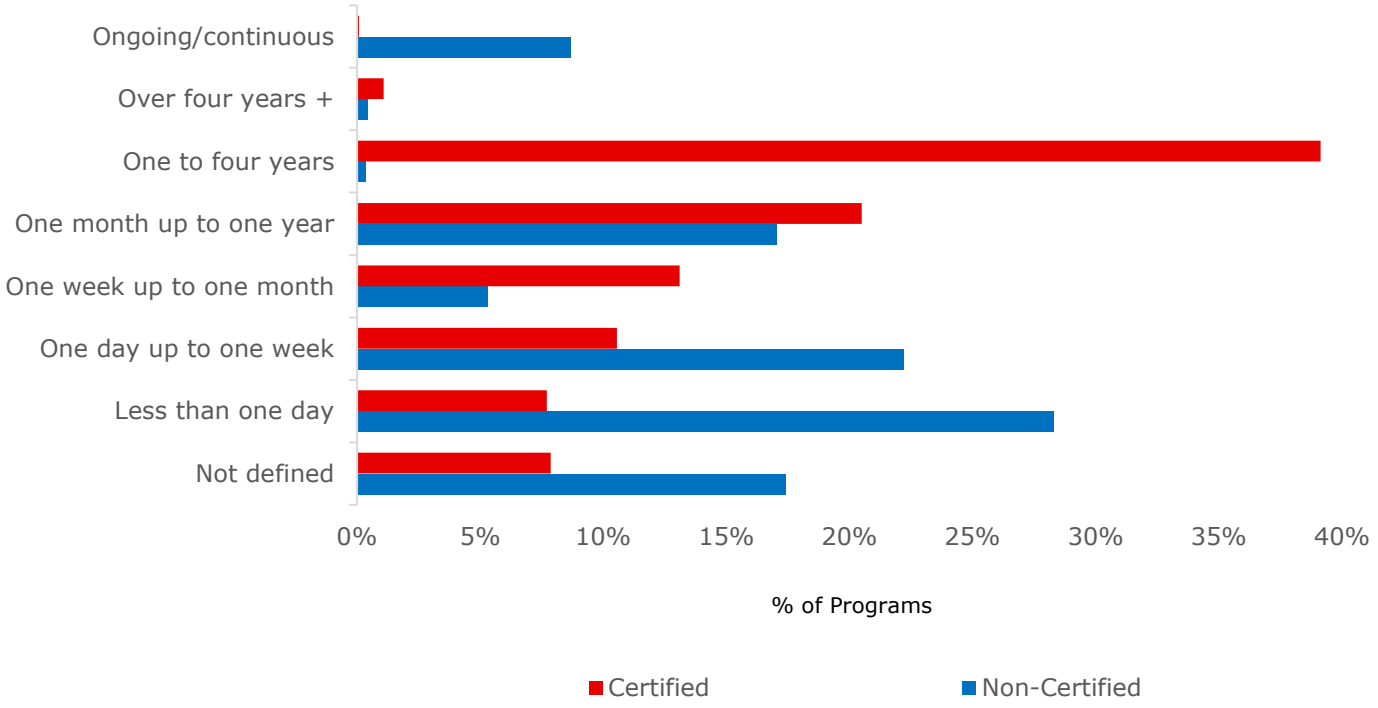


Program Cost – Technology (% programs sampled)



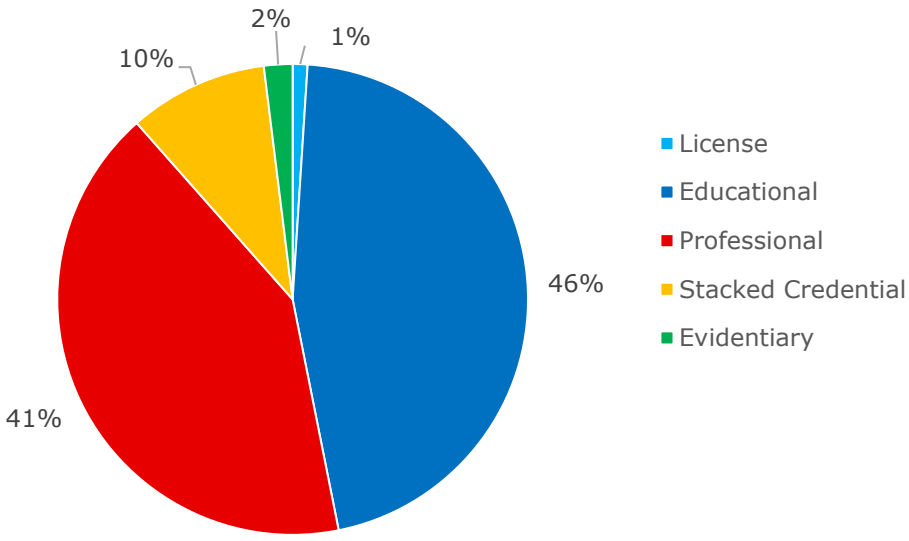
Program Duration (% programs sampled)

Program duration varies dramatically. Not surprisingly, certified learning has a longer duration, whereas two-thirds of non-certified learning programming is a week or less.



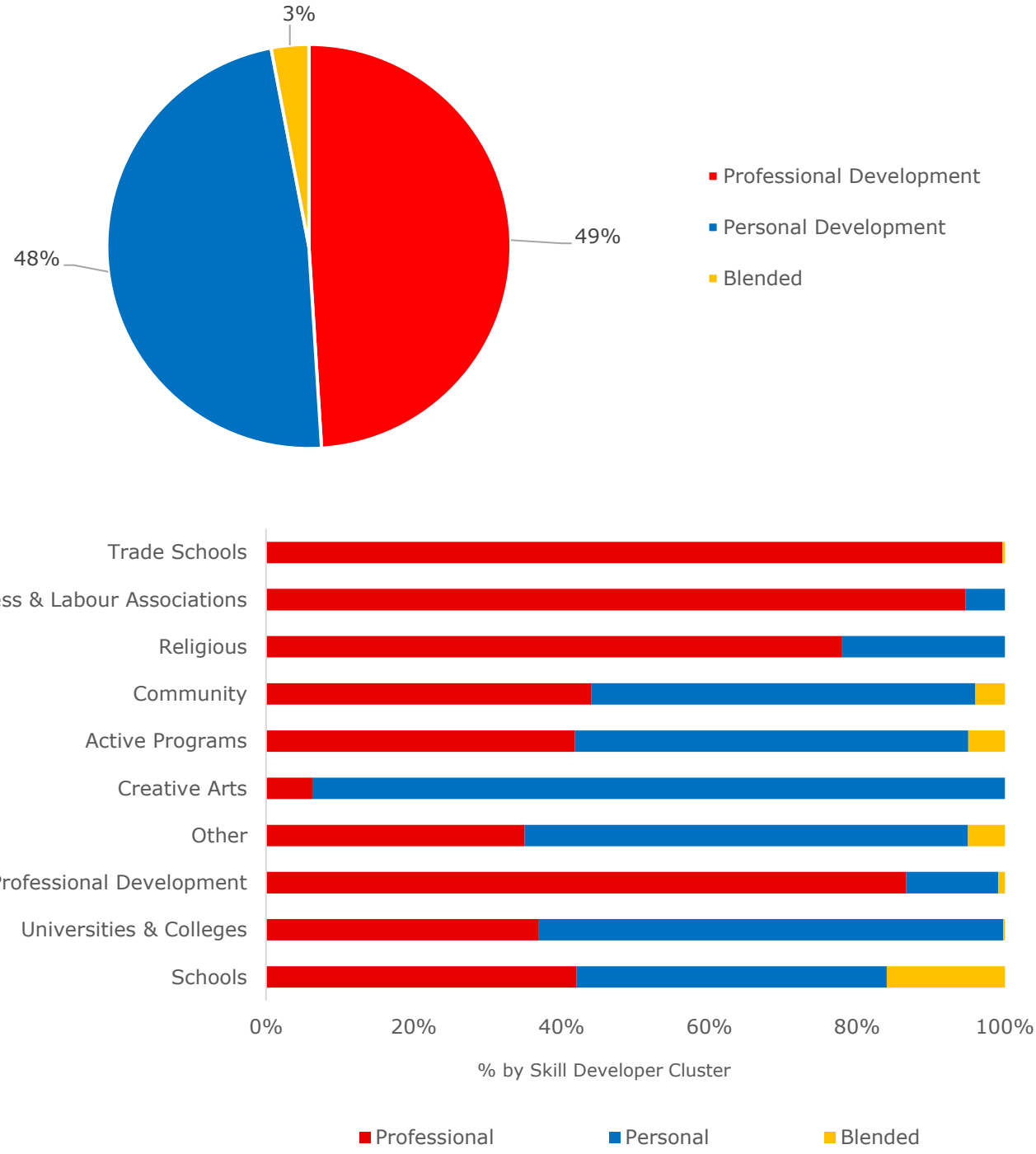
Certified Programs by Certification Channel (% programs)

Educational (e.g., academic credential) and professional (e.g., Chartered Professional Accountant) certification are the dominant certification channel. Evidentiary (e.g., portfolio) represent only 2% of identified certification mechanisms.



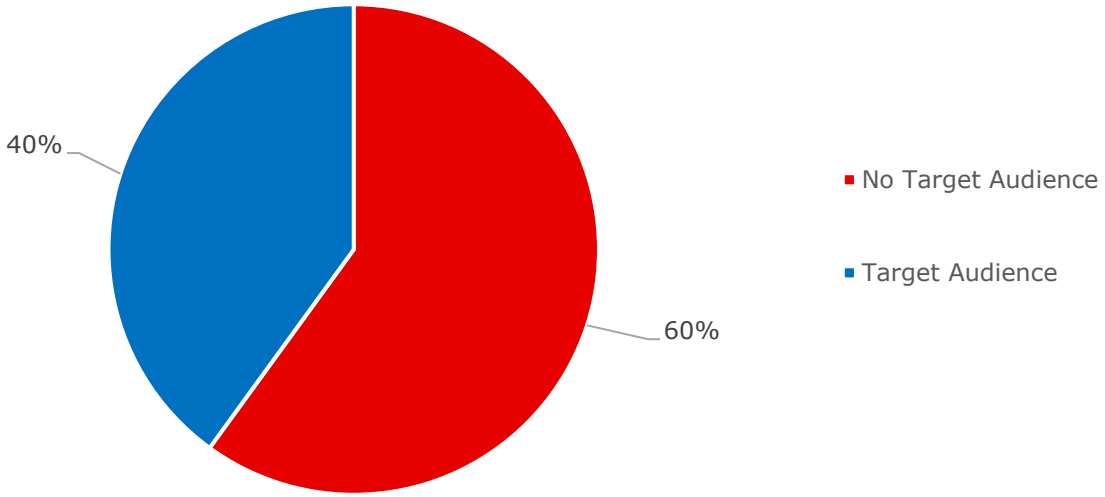
Primary Program Value (% programs sampled)

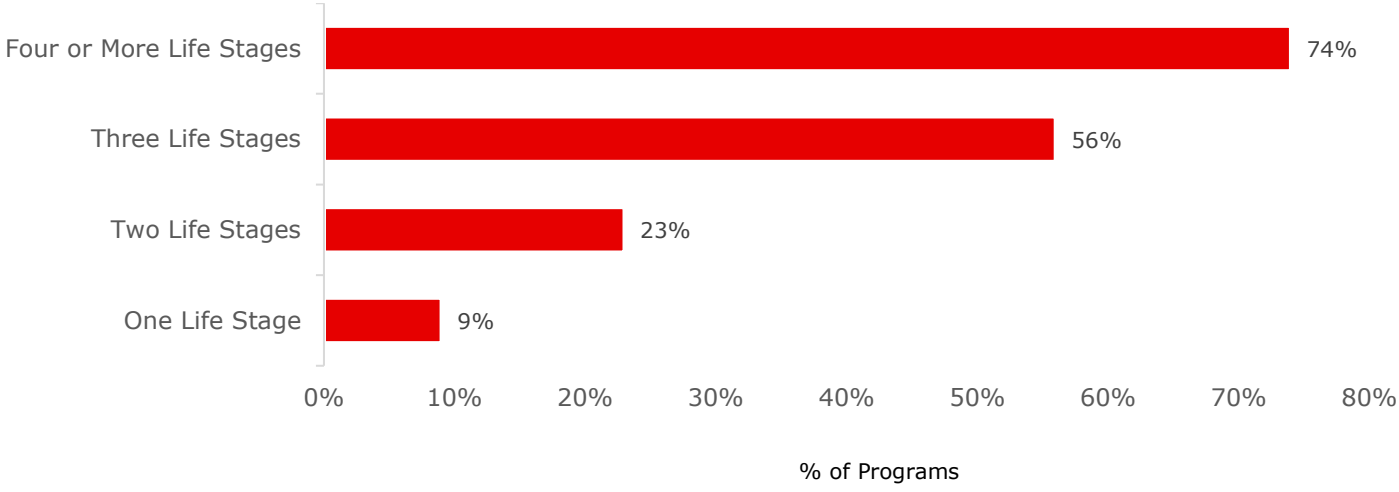
The proportion of programs defined as primarily professional or primarily personal development was evenly split and logically aligned to the associated skill developer cluster. However, given the prioritization of ES by employers, the explicit separation of professional and personal development is counter-productive and risks amplifying a perception that specific types of learning are more valuable than others. Instead, a more effective model is isolating programming by learning goals.



Target Audience (% programs sampled)

All programs were analyzed for a specific target audience. Only 40% of the programs were identified as targeting at a clear audience. Moreover, programs were analyzed for how they were positioned to serve a specific life stage (e.g., children, young adults, seniors). Though skill development opportunities can often extend to a variety of life stages, the positioning of programming often reflects the unique dynamics of a specific life stage. Examples of life stage programming include children's art classes or yoga classes for seniors. Surprisingly, only 9% of skill development programming targets a specific life stage (and these were overwhelming targeting children). The remaining 91% of programs attempt to target two or more life stages, with 74% attempting to target four or more life stages in a single program. This issue needs further study, but it may reflect an inefficiency in the current learning system, as programs try to become all things to all people to maximize registration. The result may dilute the value of the program to specific audiences, while risking duplication or cannibalizing or programming across different services providers.



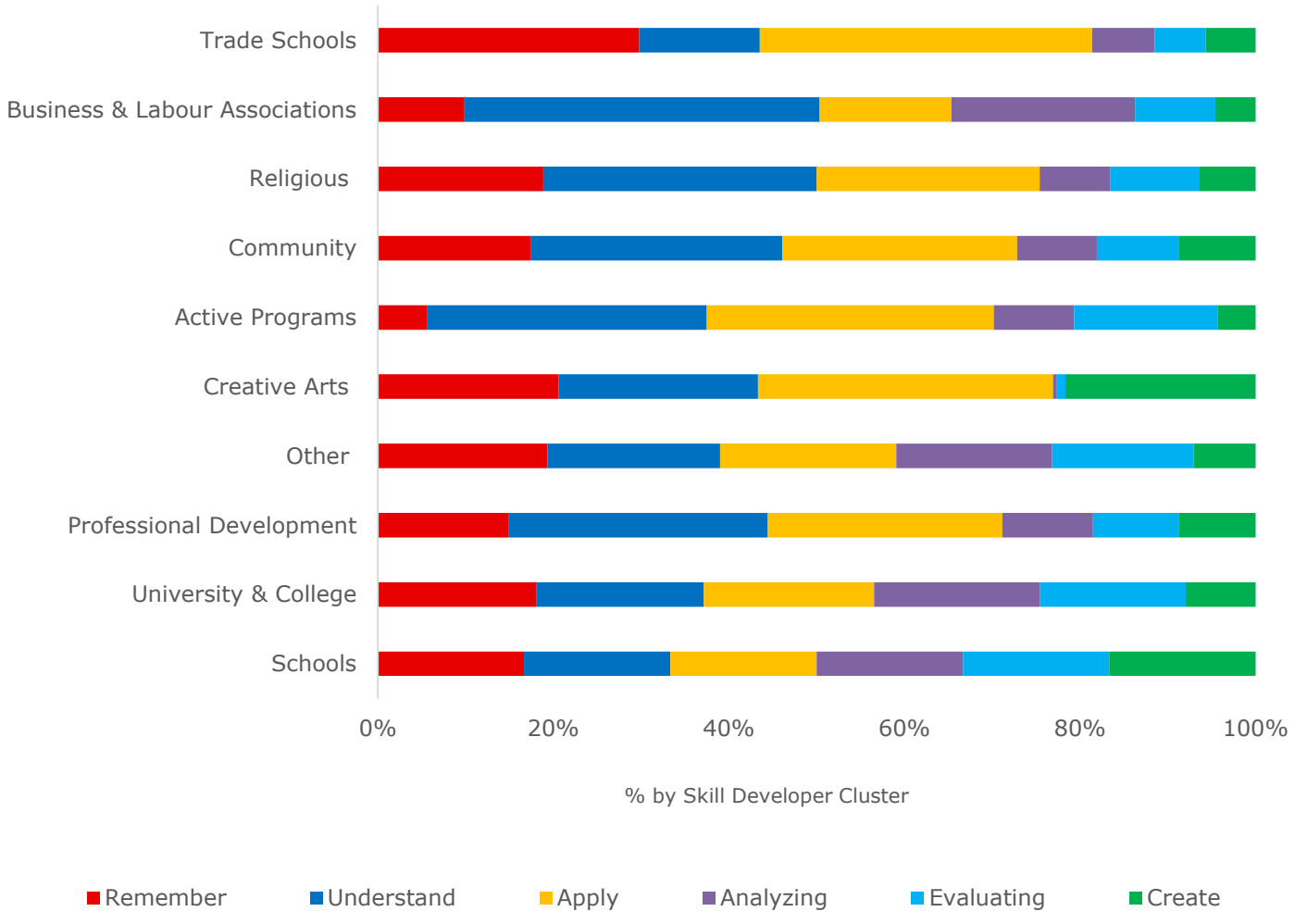


Cognitive Processing by Skill Developer Cluster (% programs sampled)

Each program was analyzed for cognitive processing being developed. The above chart reflects a standardized score for each of the six laddered cognitive processing categories.

1. ***Remember:*** Retrieving relevant knowledge from long-term memory
2. ***Understand:*** Determining the meaning of instructional messages, including oral, written, and graphic communication.
3. ***Apply:*** Carrying out or using a procedure in each situation.
4. ***Analyze:*** Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose.
5. ***Evaluate:*** Making judgments based on criteria and standards.
6. ***Create:*** Putting elements together to form a novel, coherent whole or make an original product.

The standardized scores were transformed to provide a composite score of 100%. This provides guidance on how the different skill developer clusters play different roles in the system. This can guide future skill development in two ways. First, it can provide guidance on sector cognitive processing orientation. Similarly, it may provide an opportunity for sector leaders to explore how their skill development initiatives can be more effectively harnessed to develop higher-order cognitive processing, such as creating.



Knowledge Orientation by Skill Developer Cluster (% programs sampled)

Each program was analyzed for their knowledge orientation. The above chart reflects a standardized knowledge orientation score for each of the four forms of knowledge orientation.

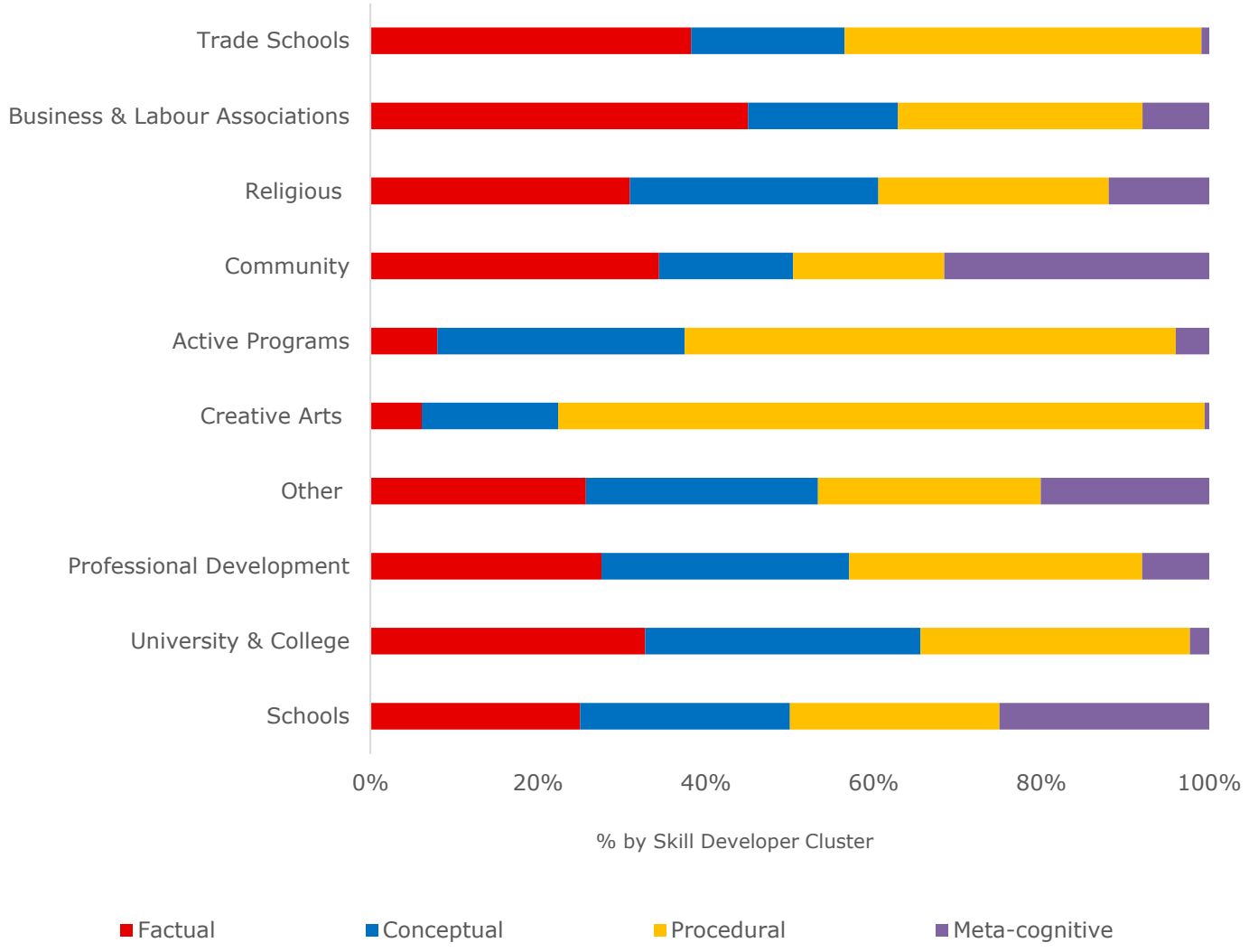
Factual knowledge: The basic elements that an individual must know to understand a discipline or solve problems in it.

Conceptual knowledge: The interrelationships among the basic elements within a larger structure that enable them to function together.

Procedural knowledge: How to do something; methods of inquiry, and criteria for using skills, algorithms, techniques, and methods.

Meta-cognitive knowledge*:* Knowledge of cognition in general as well as awareness and knowledge of one's own cognition.

This is important as it provides a lens into the current development activities by each of the 12 sectors. As per the chart, many sectors, such as the trades, have a heavy orientation around factual knowledge. Similarly, sports & recreation and creative arts have a focus on procedural knowledge. An opportunity exists to leverage different parts of the system to accelerate the laddering of knowledge across all sectors.



APPENDIX-11: STUDY 3 CODEBOOK GLOSSARY

The codebook glossary is structured by organization-level, program-level, and individual-level.

ORGANIZATION-LEVEL

Organization Orientation

For-profit [46]

Net income is available for distribution to owners or shareholders or can be used for other business investments. Income from such commercial institutions is taxed in the same manner as other corporate earnings.

Non-profit [21]

All net income must be retained by the institution and used to support its educational or charitable mission. Such income is not subject to taxation by the government if it is derived from and used to support the institution's central educational purposes.

Municipal [47]

The local government sub-sector contains all local governments and all the non-market producing units under their control. These entities are engaged in the creation and implementation of local government policy and the delivery of services within their jurisdiction. They are classified in the Canadian System of National Accounts (CSNA) – Classification of Institutional Units by Sector within this structure local government sub-sector, local general government component, municipalities and other local public administrations subcomponent, non-autonomous funds and organizations subcomponent, autonomous funds and organizations subcomponent, school boards component.

Provincial [22]

The provincial and territorial government sub-sector contains all provincial and territorial governments as well as all non-market producing units under their control. These entities are engaged in the creation and implementation of government policy and/or the delivery of government services within their jurisdiction. The sub-sector is divided into components and subcomponents that group units according to their activity. The provincial and territorial government sub-sector is divided into these components: general government; non-autonomous pension plans; universities and colleges; and health and social service institutions. There are subcomponents that segregate the component constituents into greater detail, for example ministries, universities, and health boards.

Federal [22]

The federal government sub-sector contains the federal government and all non-market producing units under its control. These entities are engaged in the creation and implementation of federal government policy and the delivery of services such as justice, civil order, and the regulation of economic and social actions. They are classified in the Canadian System of National Accounts (CSNA). The federal government sub-sector is divided into these components federal ministries and departments subcomponent, federal non-autonomous funds and organizations subcomponent, federal autonomous funds and organizations subcomponent, and federal non-autonomous pension plans component.

PROGRAM-LEVEL

Certified Learning [6]

Primary Education

Primary education is designed to provide students with fundamental skills in reading, writing and mathematics (i.e., literacy and numeracy) and establish a solid foundation for learning and understanding core areas of knowledge, personal and social development, in preparation for lower secondary education. It focuses on learning at a basic level of complexity with little, if any, specialization. In Calgary, this is defined as kindergarten through elementary school. Primary education usually begins at ages five, six or seven. These programs typically last six years in the Calgary context but can range from four to six years. Programs at the primary level require no previous formal education.

Lower Secondary Education

Lower secondary education is typically designed to build on the learning outcomes from primary level education. Usually, the aim is to lay the foundation for lifelong learning and human development upon which education systems may then expand further educational opportunities.

Programs in this category are referring to junior high, middle school, or anything that is of an equivalent level of certification. Lower secondary programs typically begin between ages 10 and 13, with age 12 being the most common. In the Calgary context, this level of education usually consists of three years of schooling but can vary between two to six years of schooling.

Upper Secondary Education

Upper secondary education is typically designed to complete secondary education in preparation for tertiary education or provide skills relevant to employment, or both. This is high school in the Calgary context; however, this category may apply to other programs that are of an equivalent certification level. This category corresponds to the final stage of secondary education in most countries. Instruction is often more organized along subject-matter lines than at lower secondary. Students typically enter this level typically between ages 14 and 16, with 15 being the most common in Calgary. Upper secondary education typically lasts for three years within the Calgary metropolitan area but could continue for up to 4.

Tertiary Education

Diploma [48]

Diploma programs prepare you to work in a particular field or group of occupations. They can take up to two years of full-time study which may require the completion of high school or specific grades and subjects as a prerequisite.

- Graduate diploma: Graduate diploma programs provide graduate-level study options, without committing to a Master program. These diplomas are usually 1-2 years, with at least 18 credits.
- Post-Master diploma: A post-Master diploma deepens your systematic knowledge in a discipline and fosters professional development. These diplomas typically take between 1-2 years to complete, with at least 18 credits. Individuals usually need a master's degree or post-Master certificate and other program-specific prerequisites for admission.
- Post-Doctorate diploma: These programs integrate advanced research skills with professional skills or knowledge. A post-Doctorate diploma will take 1.5 years or less to complete and require individuals to have attained a Doctorate degree for admission into the program.

Bachelors or Equivalent

Bachelors or equivalent levels are often designed to provide participants with intermediate academic and/or professional knowledge, skills, and skills, leading to a first degree or equivalent qualification. Programs at this level are typically theoretically based but may include practical components and are informed by state-of-the-art research and/or best professional practice. They are traditionally offered by universities and equivalent tertiary educational institutions.

Masters or Equivalent

Master or equivalent level are often designed to provide participants with advanced academic and/or professional knowledge, skills, and skills, leading to a second degree or equivalent qualification. Programs at this level may have a substantial research component but do not yet lead to the award of a Doctorate qualification. Typically, programs at this level are theoretically based but may include practical components and are informed by state-of-the-art research and/or best professional practice. They are traditionally offered by universities and other tertiary educational institutions.

Doctorate or Equivalent

Doctorate or equivalent level are designed primarily to lead to an advanced research qualification. Programs at this level are devoted to advanced study and original research and are typically offered only by research-oriented tertiary educational institutions such as universities. Doctorate programs exist in both academic and professional fields. These programs usually conclude with the submission and defense of a thesis, dissertation, or equivalent written work of publishable quality, representing a large contribution to knowledge in the respective field of study.

Accredited Short-Cycle Tertiary Education

Short-cycle tertiary education is often designed to provide participants with professional knowledge, skills, and skills. Typically, they are practically based, occupationally specific and prepare students to enter the labour market. However, these programs may also provide a pathway to other tertiary education programs. Academic tertiary education programs below the level of a Bachelor program or equivalent are also classified as short-cycle tertiary education. Programs at this level have more complex content than programs at the upper secondary and postsecondary non-tertiary education, but they are shorter and usually less theoretically oriented than a Bachelor/degree program. (e.g., microcredentials)

Professional Certification [23]

This may include certifications from government bodies or third-party organizations. Certificates offer short-term learning that prepares you for work in specific occupations. Certificate programs can take one year or less of full-time study to complete and attain the credential. These programs require the completion of high school studies as a prerequisite. Certificate programs may sometimes be transferred as earned credits or used for admission to a diploma program. The types of certificate programs that are recognized by the Government of Alberta are listed below

- *Post-diploma or post-baccalaureate certificate:* This form of certification may also include some certificate programs that require a completed diploma or degree for admission. These programs will vary in length and are focused on increasing specialized skills. Some of these programs ask for an undergraduate degree and some work experience as a prerequisite.
- Graduate certificate: These programs provide graduate-level study options, without committing to a Master program. Graduate certificates are generally attained after one year or less, with at least 12 credits. Individuals must have completed a bachelor's degree and other program-specific prerequisites for admission.
- *Post-Master certificate:* These certificates help expand your knowledge or skills within a specific discipline. They can also strengthen both your professional and research skills. Programs in this category take one year or less to complete, with at least 12 credits. Individuals generally need a master's degree and other program-specific prerequisites for admission.
- *Post-Doctorate certificate:* These programs integrate advanced research skills with professional skills or knowledge. They can also help build leadership capacities in a specialized field of study. Post-Doctorate certificates require one year or less to complete, with at least 12 credits. Individuals must have attained a Doctorate degree for admission into these programs.
- Journeyman Certificates require the completion of a specific number of on-the-job training hours provided by an employer, technical training with an approved technical training provider, and an industry examination.

Non-Certified Learning [6]

Pre-Primary Education

Pre-primary education is characterized by interaction with peers and educators, through which children improve their use of language and social skills, start to develop logical and reasoning skills, and talk through their thought processes. They are also introduced to alphabetical and mathematical concepts and encouraged to explore their surrounding world and environment. Supervised gross motor activities (i.e., physical exercise through games and other activities) and play-based activities can be used as learning opportunities to promote social interactions with peers and to develop skills, autonomy, and school readiness. Most referred to in Calgary as pre-school. This form of education is non-certified as there is no institutional body that gives credit for the learning completed in this stage of education. Children can enroll in these programs when they are three years old.

Non-certified Pre-Tertiary Children's Education

These programs serve to broaden the knowledge of participants who have already gained or are currently obtaining a primary education. Students are between the ages of 5-12.

Non-Certified Pre-Tertiary Youth Education

These programs serve to broaden the knowledge of participants who have already gained or are currently obtaining a lower secondary or upper lower secondary education. Students are between the ages of 12 and 17.

Non-Accredited Short-Cycle Tertiary Education

Non-accredited short-cycle tertiary education is often designed to provide participants with professional knowledge, skills, and skills. Typically, they are practically based, occupationally specific and prepare individuals to enter the labour market, although this does not have to be the goal. Non-accredited tertiary education programs that fall below the level of a Bachelor program or equivalent are classified as non-accredited short-cycle tertiary education. Programs at this level have more complex content than programs at the non-certified pre-tertiary youth education and postsecondary non-tertiary education, but they are shorter and usually less theoretically oriented than a Bachelor/degree program. (e.g., professional development. Language training)

Postsecondary Non-Tertiary Education

Such programs straddle the boundary between upper secondary and postsecondary education from an international point of view, even though it might clearly be considered upper secondary or postsecondary programs in a national context. Although their content may not be significantly more advanced than upper secondary programs, they serve to broaden the knowledge of participants who have already gained an upper secondary qualification. The students tend to be older than those enrolled at the upper secondary level. (e.g., upgrading courses or taking the general studies courses at Mount Royal University)

Informal Learning

Experiential [49]

The process of acquiring knowledge, skills, and values from daily experiences at home, in the community, or at work. The process may appear unorganized and unsystematic, but it is not necessarily unintentional in that individuals may seek out these experiences to enhance their individual or collective learning.

Applied Research Projects [24]

Students are engaged in research that occurs primarily in workplaces, including consulting projects, design projects, community-based research projects.

Apprenticeship [24]

Apprenticeship is an agreement between a person (an apprentice) who wants to develop a skill and an employer who needs a skilled worker and who is willing to sponsor the apprentice and provide paid related practical experience under the direction of a certified journeyperson in a work environment conducive to learning the tasks, activities, and functions of a skilled worker. Apprenticeship combines about 80 percent at-the-workplace experience with 20 percent technical classroom training, and depending on the trade, takes about 2-5 years to complete. Both the workplace experience and the technical training are essential components of the learning experience.

Co-operative Education (co-op alternating and co-op internship models) [24]

Co-op alternating consists of alternating academic terms and paid work terms. Co-op internship consists of several co-op work terms back-to-back. In both models, work terms provide experience in a workplace setting related to the student's field of study. The number of required work terms varies by program; however, the time spent in work terms must be at least 30 percent of the time spent in academic study for programs over two years in length and 25 percent of time for programs two years and shorter in length.

Entrepreneurship [24]

Allows a student to leverage resources, space, mentorship and/or funding to engage in the early-stage development of business start-ups and/or to advance external ideas that address real-world needs for academic credit.

Field Placement [24]

Provides students with an intensive part-time/short term intensive hands-on practical experience in a setting relevant to their subject of study. Field placements may not require supervision of a registered or licensed professional and the completed work experience hours are not required for professional certification. Field placements account for work-integrated educational experiences not encompassed by other forms, such as co-op, clinic, practicum, and internship.

Internship [24]

Usually offers one discipline-specific, supervised, structured paid or unpaid, and for academic credit work experience or practice placement. Internships may occur in the middle of an academic program or after all academic coursework has been completed and prior to graduation. Internships can be of any length but are typically 12 to 16 months long.

Mandatory Professional Practicum/Clinical Placement [24]

Involves work experience under the supervision of an experienced registered or licensed professional (e.g., preceptor) in any discipline that requires practice-based work experience for professional licensure or certification. Practica are generally unpaid and, as the work is done in a supervised setting, typically students do not have their own workload/caseload.

Service [24]

Community Service (CSL) integrates meaningful community service with classroom instruction and critical reflection to enrich the learning experience and strengthen communities. In practice, students work in partnership with a community-based organization to apply their disciplinary knowledge to a challenge identified by the community.

Work Experience [24]

Intersperses one or two work terms (typically full-time) into an academic program, where work terms provide experience in a workplace setting related to the student's field of study and/or career goals.

Self-Directed Paid Employment [50]

Employment that is sought out by the individual on their own accord.

Self-Directed Volunteering [25]

Volunteering positions that are sought out by the individual on their own accord.

Self-Directed General Interest Activities [25]

Hobbies, household activities, recreational sporting activities, visiting a museum.

Self-Directed Professional Development [11]

Communities of Practice [51]

A community of practice (CoP) is a group of people who share a common concern, a set of problems, or an interest in a topic and who come together to fulfill both individual and group goals. Communities of practice often focus on sharing best practices and creating new knowledge to advance a domain of professional practice. Interaction on an ongoing basis is an important part of this. Many communities of practice rely on face-to-face meetings as well as web-based collaborative environments to communicate, connect and conduct community activities.

Peer to Peer Learning [52]

Peer to peer learning is a two-way, reciprocal learning activity. Peer learning should be mutually beneficial and involve the sharing of knowledge, ideas, and experience between the participants. It can be described as a way of moving beyond independent to interdependent or mutual learning. It encompasses a broad sweep of activities, these could range from the traditional proctor model, in which senior students tutor junior students, in which students in the same year form partnerships to assist each other with both course content and personal concerns. Other models also involve discussion seminars, private study groups, or counseling, peer-assessment schemes, collaborative project

or laboratory work, projects in different sized (cascading) groups, or community activities.

Coaching [53]

Coaching is defined as a partnering with clients in a thought-provoking and creative process that inspires them to maximize their personal and professional potential. The process of coaching often unlocks previously untapped sources of imagination, productivity, and leadership. Coaching is a performance driven form of education, designed to improve the individual's on-the-job performance.

Mentoring [28]

An informal association focused on building a two-way, mutually beneficial relationship for long-term career movement.

Networking Events (Informal) [11]

This category may also include conferences, seminars, or workshops of an informal nature. This form of networking event will be considered informal due to the informal, unstructured, unregulated aspects of the happenings. Even though attendees may have to register for the event once inside, individuals are unregulated and proceed in a completely self-directed manner. An example of this is Mount Royal's business networking event. The function takes place over the course of an entire day and has a variety of presentations and seminars that are held. However, the individuals are completely self-directed once inside, and can attend whichever segments of the event they choose to as well as meet and converse with whomever they choose to. The self-directed nature of this event is what makes it an informal networking event.

Self-Improvement Sessions (Positive Psychology) [54]

Positive psychology is a broad term that encompasses a variety of techniques which encourage individuals to identify and further develop their own positive emotions, experiences, and character traits.

Enabling Skills

Ability to incorporate the knowledge, skills, attitudes, values, and behaviors required to deliver analytical thinking, interpersonal, foundational literacies, and professional enabling skills.

Job Skills

Incorporate the knowledge, skills, attitudes, values, and behaviors required to complete specific tasks associated with a role (e.g., accounting, welding) and/or a sector (e.g., energy, sport).

Delivery Orientation

Primarily Synchronous [55]

Synchronous delivery requires specific on-time exchanges. This term may be used interchangeably with on-time exchanges, real-time, or Real-Time Consumption.

Primarily Asynchronous[56]

Asynchronous forms of communication and information exchanges are intermittent and do not have specific timing requirements. This term may be used interchangeably with intermittent, no specific timing requirement, not interacting at the same time, and non-real time.

Blended[57]

Blended or hybrid learning refers to a combination of synchronous classroom instruction and asynchronous delivery methods, which may include various media, usually online. Typically, some parts of the course are delivered entirely online while other parts are delivered face-to-face, in problem-solving and seminar-style discussion formats. In a blended learning course, students are responsible for much of their own learning., and the teacher is responsible for creating those opportunities for learning.

Individual Preferred [58]

This form of education is up to the individual's discretion and may contain any single option listed or any combination of the options listed. Options for individual preferred methods include no instructor, instructor led, mentors who communicate with students by e-mail or by telephone, virtual, on campus, synchronous, or asynchronous.

AUDIENCE-LEVEL

Skills

Herein, we define skills as the demonstrated ability to obtain and integrate relevant knowledge, competencies, aptitudes, and attitudes to deliver higher value workplace behaviors consistently in variant conditions to deliver productive work in support of a company's goals. Skills can be clustered into two categories: enabling skills (ES) and job skills (JS).

Enabling Skills

ES (also called transferable, human, or soft skills) incorporate aptitude, ability, knowledge, and skills associated with problem solving, self-reliance, collaboration, communications, core literacies, and core workplace skills.

Job Skills (JS)

Job skills incorporate aptitude, ability, knowledge, and skills required to complete a functional task (e.g., accounting, welding) or apply a skill to a unique sectoral context (e.g., oil & gas, logistics).

Functional Skills (FS)

Functional skills are linked to skills required to complete a specific role, such as an accountant, a project manager, a chef, a nurse, or a software developer. Functional skills embed the capacity to adapt and apply these skills across different sectors. Functional skills can be developed through a variety of certified, non-certified, and informal learning. However, the foundation for many functional skills is developed through forms of certified learning. For example, university and college programming is often structured around a functional skill (e.g., Bachelor of Nursing; Culinary Arts Diploma).

Sectoral Expertise (SE)

Sectoral expertise is the unique contextual knowledge or skills required to complete a specific role within a defined sector. For example, a sector may have unique regulatory, legal, or historical contexts that have considerable influence on a functional role. For example, an accountant in oil & gas may require specialized knowledge compared to an accountant in the financial services sector. The challenge with sectoral expertise is the highly contextual nature of sub-sectors within a sector. For example, oil & gas is composed of dozens of specialized sub-sectors, starting with upstream, midstream, and downstream. Within each of these sub-sectors there is additional specialization tied to exploration, drilling, transportation, refining, and distribution.

Unlike functional skills, sectoral expertise is primarily developed and refined through direct experience in a sector. The immersion in a sector contextualizes functional skills to this sector. For example, an individual who has strong functional skills related to marketing, must adapt these skills to shift from consumer-packaged goods to tourism.

Skills Certification

Skills certification is the practice applied to determine if a candidate possesses evidence of the aptitude, ability, knowledge, and skills required to complete a defined task.

Advocacy (e.g., reference)

This certification process requires a reputable source to validate the skills that have been acquired. An advocate could be a coach, mentor, boss, colleague, etc.

Assessment

Assessments are evaluations that determine the capacity of a person or organization. They can be formative or summative, and they perform a function (to evaluate a body of work, to determine the value of work submitted etc.). The findings from an assessment are based on the experience and training of the assessor, and the subjective judgement of the assessor (which might or might not be guided by a rubric). An assessment passes a value judgement and is coupled to an understanding of the learning opportunity from which evidence of the learning outcome is derived, rather than an evaluation of whether something meets a set of specifications. As assessment is integrated with defined learning, it is distinct from certification, though some dimensions may be similar.

Certification [59]

An official document attesting to a status or level of achievement.

Community Certified Skills

Community Certified Skills are enabling or job skills that support the economic development priorities of a city or region. Community Certified Skills are decoupled from a specific learning process and are granted by an independent community body. The legitimacy of a Community Certified Skills is rooted in the rigour of the certification and the potential for ubiquity across a community's learning system.[60] The working brand *Community Certified Skills* in Calgary is *Trusted Skills*.

Decoupling

In a learning context, decoupling involves disconnecting the process of developing skills and the process of certifying skills. In higher education, these paths are often integrated. For example, an individual takes a class and is assessed upon completion of the class as meeting a defined learning outcome. Decoupling puts the primacy of skills certification by recognizing that there are an infinite number of ways to develop skills. The principle of decoupling is widely used today in a variety of professional fields, skilled trades, and motor vehicle licensing.

Educational [61]

This category includes persons who have obtained a secondary or high school diploma or high school equivalency certificate. Includes academic or vocational high school diplomas or certificates as may be obtained by graduating from secondary school, completion of a high school equivalency test such as the General Educational Development (GED) test or obtaining an Adult Basic Education (ABE) certificate. The section also includes university certificates or diplomas below the bachelor level. University certificates or diplomas are commonly connected with professional associations in fields such as accounting, banking, insurance, or public administration. The certificates and diplomas referred to in this category do not require a bachelor's degree as a prerequisite.

Experience

Hours put into a specific learning experience. To be certified hours need to be tracked and documented.

Evidentiary (e.g., portfolio)

Through the learning process there is an outcome of production. This means that there is some form of physical representation of the learning process.

Stacked Credential [62]

Stackable credentials as those that are "part of a sequence of credentials that can be accumulated over time and move an individual along a career pathway or up a career ladder"

Primary Cognitive Processes

Remember

Retrieving relevant knowledge from long-term memory. This includes recognizing and recalling.

Understand

Determining the meaning of instructional messages, including oral, written, and graphic communication. Examples include:

- Interpreting
- Exemplifying
- Classifying
- Summarizing
- Inferring
- Comparing
- Explaining

Apply

Carrying out or using a procedure in each situation. Examples include executing and implementing,

Analyze

Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose. Examples include differentiating, organizing, and attributing.

Create

Putting elements together to form a novel, coherent whole or make an original product. Examples include generating, planning, and producing,

Primary Knowledge Orientation [63]

Factual Knowledge

The basic elements that students must know to be acquainted with a discipline or solve problems in it. Examples include terminology or specific details and elements

Conceptual Knowledge

The interrelationships among the basic elements within a larger structure that enable them to function together. Examples include:

- Classification and categories
- Principles and generalizations
- Theories, models, and structures

Procedural Knowledge

How to do something; methods of inquiry, and criteria for using skills, algorithms, techniques, and methods.

- Subject specific skills and algorithms
- Subject specific techniques and revisions
- Criteria for determining when to use appropriate procedure

Meta-Cognitive Knowledge

Knowledge of cognition in general as well as awareness and knowledge of one's own cognition.

- Strategic knowledge
- Knowledge about cognitive tasks, including appropriate contextual and conditions knowledge.
- Self-knowledge

Primary value: [64]

Primary value is broken into two three categories: professional value, personal value, and blended. Professional value refers to the process of identifying learning goals to help grow and succeed at work. Personal value refers to programs that are unrelated directly to developing skills related to a professional or career context. Blended is a combination of both.

SECTION 7: REFERENCES

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[5] In this audit, Energy & Environment is further broken down into three sub-sectors: oil & gas, utilities, and clean technology. For Creative Industries, the study isolates NAICs related to software development. Therefore, there is Creative Industries (excluding software), and a distinct Software Development category. Refer to the appendix for further breakdown of each sector by NAIC codes.

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The capacity for individuals with oil & gas sector specific expertise to transition to other sectors is highly contextual and debated.

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An additional implication is the aging oil & gas labour force. By 2016, 17 percent of oil & gas workers were 55 or older, increasing from 10 percent in 2006. Moreover, the share of young workers, those under 25, declined from 15 percent to seven percent of the workforce. Refer to: https://www.globenewswire.com/news-release/2018/06/14/1524774/0/en/Canada-s-oil-and-gas-workforce-has-grown-older-more-educated-and-more-culturally-diverse-says-PetroLMI-report.html

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