

D2L

Maximizing Resilience

Accelerating the Shift to a Learning-Integrated Life



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About D2L

D2L is a global learning technology company transforming the way the world learns. We're leading the way into a new era of personalized learning, driven by the belief that everyone deserves access to high-quality education, regardless of their age, ability or location. Our signature technology products—D2L Brightspace and D2L Wave—enhance the learning experience for millions of learners at every stage of life, from the earliest days of school to the working world. Learn more at [D2L.com](https://www.d2l.com).

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Table of Contents

EXECUTIVE SUMMARY	4
TOMORROW'S DESTINATIONS	5
In the driver's seat: Owning the personalized learning journey	6
Route guidance: Personalized professional development	7
Taking the road less travelled: A networked postsecondary education	8
Fueling up: Upskilling to grow careers	10
WHAT POLICY DECISIONS WILL HELP US MAXIMIZE RESILIENCE?	11
RECOMMENDATION #1: INVEST IN PREPARING TEACHERS FOR THEIR OWN LIFELONG LEARNING JOURNEYS	13
1.1 Empower teachers with pre-service and professional learning focused on the learning modes and models of tomorrow	13
1.2 Offer teachers holistic professional development that supports individualized learning pathways	14
RECOMMENDATION #2: TRANSFORM THE LEARNING OF TODAY WITH NEW PARTNERSHIPS	15
2.1 Create the policy infrastructure needed to scale new learner-centric models of education	15
2.2 Incentivize postsecondary institutions to form networks at the state, provincial, and national level to provide students with more choice	16
RECOMMENDATION #3: INVEST IN A LEARNING-INTEGRATED LIFE	17
3.1 Invest in the development of nationally in-demand skills training led by industry	17
3.2 Provide financial support for individuals to meet their ongoing and future training needs	18
RECOMMENDATION #4: ACCELERATE THE SHIFT TO SKILLS-BASED LEARNING AND HIRING	19
4.1 Develop a common skills language	19
4.2 Improve the quality, timeliness, and accuracy of labour market information (LMI)	20
4.3 Improve the dissemination of labour market information to the public	21
CONCLUSION	22

Executive Summary

At D2L, we believe that education is the key to unlocking opportunities, and that learning can and should happen anytime, anywhere, and for everyone. To make this a reality, we have to go beyond maximizing and optimizing today's classroom or workplace, and fundamentally **transform the way the world learns.**

Over the past few years, we have published a series of papers that detail the policy decisions we believe will enable this mission to move forward, including:

- Better alignment of programs and credentials to labour market needs
- Scaling of innovative learner-centric models of education, and
- Strategic investments to ensure learning systems are affordable, accessible, and responsive.

See previous publications in the [**D2L Future of Work and Learning series.**](#)

In 2020, D2L supported millions of learners and instructors across primary and secondary schools, postsecondary institutions, and the corporate and public sectors as we collectively embarked on a journey “through the fog” of unprecedented disruption. As we all continue through it, doing our best to grip the wheel and steer ourselves safely through the crisis, we recognize the need to bring new ways of thinking to the top of the agenda. The challenges faced have raised awareness of, and accelerated, the need for further change to our education systems and policies.

D2L has been actively engaged with education and policy leaders in conversations on how to build a truly resilient learning system, what skills are required to be successful in the jobs of the future, and how our systems of learning need to change to be more equitable.

The findings, stories, and policy recommendations that follow in this paper recognize the extraordinary circumstances of this past year and offer four areas for government action to propel us forward in the future of work and learning:

PRIMARY AND SECONDARY



Invest in preparing teachers for their own lifelong learning journeys that will enable their effectiveness for the learning modes and models of tomorrow and beyond

POSTSECONDARY



Transform the learning of today with new partnerships in order to scale innovative learner-centric models of education and provide students with more choice

WORKFORCE DEVELOPMENT



Invest in a Learning-Integrated Life, by providing financial support for individuals to meet their ongoing and future training needs

Accelerate the shift to skills-based learning and hiring with quality labour market information and a common skills language

This year has forced us all to rethink, to experiment and to build. Our goal with this paper is to support that process and to inspire discussion, and action, on a longer-term vision for technology-enabled education and training that is more sustainable, inclusive, and empowering for learners. If we do that, together we can produce favourable outcomes of employability, career fulfilment, and personal growth.

Educational institutions, non-traditional education and training providers, companies, and governments all have a role to play in developing a roadmap for lifelong learning for all. If we go the distance, the opportunities for learners are boundless.

Tomorrow's destinations

The future demands a “Learning-Integrated Life” —in which individuals are always in a learning mindset, and intensive and episodic opportunities for learning are woven through the fabric of our lives, preparing us for successful careers and rich life experiences. This extends across the learning continuum—from primary school to postsecondary education through to learning while working.

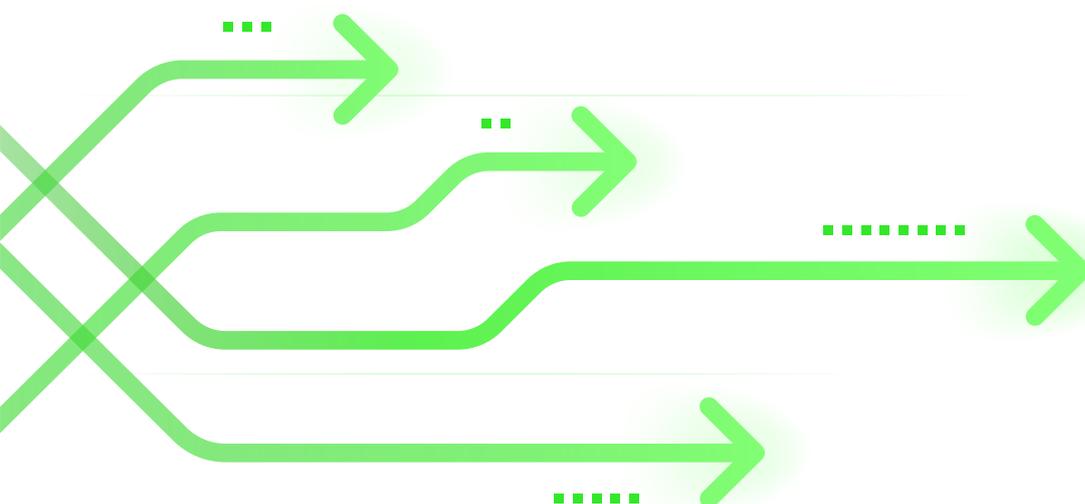
Here we present four vignettes of the Learning-Integrated Life—beginning in secondary school, continuing through postsecondary education, and continuing learning while working. These vignettes are informed by interviews with experts in education pedagogy and policy, and reflect future-oriented stories of a world we can build in real life and real-time with specific policy changes.

In the first story, we meet a student whose **self-initiated and self-directed learning in secondary school** is equipping her with the lifelong learning mindset she will need to succeed and thrive after graduation. Her school's investment in competency-based education allows her to learn actively using different pathways and varied pacing while ensuring her knowledge and skills are being assessed against rigorous and common standards.ⁱ

In the second story, we look at what kind of professional development support a teacher would need to succeed in a competency-based classroom. School districts should be providing personalized supports for their teachers and engaging them in the creation of professional development offerings, just as they do for students.ⁱⁱ Teachers need access to a customized pathway to learning that is aligned to the professional competencies they need to excel in their classroom.

In the third story, we meet a prospective postsecondary student who enrolls in a program that allows her to “stack” **four skills-based credentials from multiple postsecondary institutions** into a customized full degree. This networked approach to credential completion allows the student to benefit from the thought leaders and networks at a multitude of universities, colleges, and polytechnic institutions, and to gain the relevant skills and knowledge she needs to join the workforce.

In the final story, we meet an individual in her search for a new job using a platform that is defined by labour market information (LMI) that connects her with an employer in a high-growth industry. She needs to upgrade her skills and **receives a stipend from her employer to take on specific upskilling courses** to ensure she is prepared to work.





In the driver's seat: Owning the personalized learning journey



Name: **Marama**

Age: **14**

Policy prescriptions: Prepare teachers for their own lifelong learning journeys; Accelerate the shift to skills-based learning and hiring

Marama is enrolled in a school with a **competency-based education model**. Students are responsible for owning the personalization of their learning pathways, making choices alongside their teachers in how and when they learn.ⁱⁱⁱ Teachers play a central role in guiding and validating all learning, regardless of where it takes place—offering formative assessments to evaluate a student's mastery of skills and knowledge. Teachers use data from these assessments, gathered through an online learning management system (LMS), to differentiate instruction and provide targeted supports so that all students progress toward graduation. As a student diagnosed with a learning disability, Marama is supported in her education by this personalized learning pathway.

All students complete an assessment in ninth grade to identify their natural strengths as a learner. Their teachers use the results as inputs to design tailor-made educational pathways with learning materials and activities that suit **the individual students' learning needs**. In Marama's case, this includes:

1. Supplementing lecture-based teaching with structured but independent reading
2. Shadowing professionals who work on the concepts she is learning about
3. Taking the stories and lessons she's learned and sharing it back with classmates by designing a creative and interactive presentation

Over the course of the school year, Marama spends a third of her time in live lectures (sometimes online) with her teacher alongside other classmates—but the rest of her time is spent learning in the ways that suit her best. She can log into her **online LMS from her mobile device to access her school resources** and complete on her own schedule before the assigned deadline. When Marama finds a concept that interests her, she can ask her teachers and counsellor for support in finding a working professional to speak to, or work alongside for a couple weeks, from the network her school has curated over time. And when she has learned something, she is encouraged to reinforce her learning by applying her skills and developing content to share back with her classmates.

Marama's personalized learning journey empowers her to own her education by learning in ways that are effective for her, with the support that allows her to be successful. Her teachers have high-quality data about student strengths and performance they can share with her parents to show them how she is mastering specific skills, and where she may need extra support. Her school experience empowers her to embrace her subject interests very early on, and she advances to deeper topics quickly as she submits evidence of learning that demonstrates her proficiency. She graduates having cultivated a mindset for self-directed learning early in her education.



Route guidance: Personalized professional development



Name: **ZheYuan**
Age: **33**

Policy prescriptions: Prepare teachers for their own lifelong learning journeys; Accelerate the shift to skills-based learning and hiring

ZheYuan is about to join Marama's school as a new secondary school teacher. He completed his professional teacher education a decade ago, and teaching looks a bit different today than it did when he was studying. With the incorporation of learning technologies in the classroom, and expectations of teachers delivering **competency-based education**, he needs personalized professional development to feel comfortable and supported in this new opportunity.

The school district has been on its own learning journey since shifting to a competency-based education model, and has had some growing pains. Over time, the district has come to recognize that success depends on school administrators working closely with teachers to co-create systems of instruction, and pathways to professional development. The district has its own online learning management system (LMS) for teacher professional development, with a catalogue of content covering a range of subjects including:

- Strategies for student-centred instruction
- Design thinking—how to prototype and iterate on solutions to test new approaches
- Online content—using learning management systems to advance competency-based education
- Data analysis—interpreting student progress

ZheYuan is excited that he can take on professional learning to suit his needs on his own schedule. He recalls an earlier time when he had to spend nine hours a month in-person taking the same professional development courses as his peers who were teaching very different subjects and had varied skill levels and pedagogical needs than him, which was less than effective.

ZheYuan can also take advantage of his teacher community in the LMS, connecting both in asynchronous chats and in live discussions with other teachers and experts from across his region to ask questions and share his experiences. He sees some upcoming dialogues hosted by his school district to share learnings and signs up for those sessions, knowing he will get a valuable peer perspective from other teachers. ZheYuan is thankful that his school leaders recognize and value professional learning and provide the supports and the time needed for improvement.

Taking the road less travelled: A networked postsecondary education



Name: Sam
Age: 18

Policy prescriptions: Transform the learning of today with new partnerships

Sam is a prospective postsecondary student who has always been interested in pursuing a global and interdisciplinary education. Sam's siblings have all instilled in her the importance of studying abroad, having spoken fondly of their academic exchange semesters, field research trips, and intensive language immersion programs. She is inspired, but unsure whether this pathway will be available if she chooses not to complete a four-year degree at one institution.

Sam is interested in understanding how emerging technologies can be used to modernize and improve government services—an area in need of talent not only in her home country of Canada but also abroad. She could take on a general political science, public administration, engineering, or computer science degree at the university close to her home, but none of those degrees feels like the right fit to build the skills she needs to pursue this career interest.

While researching options, Sam learns of a new degree completion pathway that allows students to take courses from a network of universities, colleges, and polytechnic institutions throughout Canada and stack them for skills-based credentials that are recognized by major Canadian employers.

A set of four of these credentials grants an individual a degree-equivalent endorsed by each institution. Sam identifies the skills and knowledge she wants to work towards and charts out four credential pathways:

1. Service delivery design
2. Change management
3. Applications of emerging technologies (e.g., artificial intelligence)
4. Machinery of government

With this customized learning pathway, Sam has full flexibility to decide how she wants to structure her courses, the institutions within the network she will study at, and the format and model of courses she prefers—whether live in-class instruction or online courses.

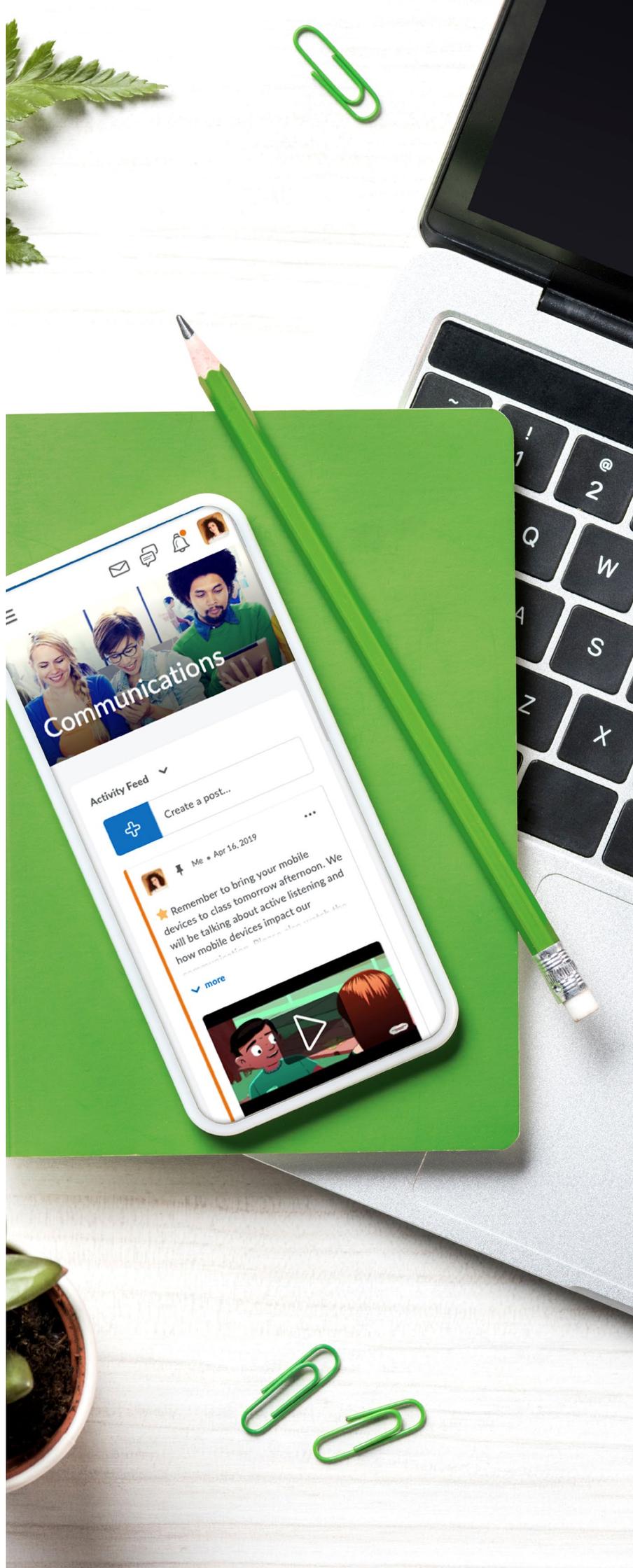
Cost flexibility is built in as well—students pay a standard fee based on the number of competencies they intend to learn rather than the normal standard of 'credit hours'. The province in which Sam lives has endorsed this networked model of postsecondary education and adjusted its financial assistance program to better support students. Grants and other non-repayable assistance take into consideration the number of courses the student is taking across all institutions when assessing financial need. Previously, Sam would have been required to be a full-time student at every institution to receive support.



Sam also has the option of starting with foundational courses or applying for **Prior Learning Assessment and Recognition (PLAR)** so her existing knowledge and skills can be tested and she can move on to more advanced topics.

Sam completes her first three credentials in three years and uses her certifications to apply for a one-year work-integrated learning experience with the federal government in Germany where she can learn first-hand about the applications of artificial intelligence in government. When she returns home, she applies for PLAR to certify her learning on the machinery of government and is granted a degree acknowledging her four-part customized education.

The collaboration between universities, polytechnics, and colleges to create a networked approach to degree completion, and its endorsement by the provincial government, allowed Sam to graduate as an alumnus of multiple postsecondary education institutions. Her exposure to different thought spaces and networks was highly valuable for ensuring she was engaged throughout her education and set up for post-graduation success. In the rapidly evolving field she has chosen, she understands how important it is to continuously upskill, and is prepared to return to formal education for more stackable credentials as she continues throughout her career.





Fueling up: Upskilling to grow careers



Name: **Zaria**
Age: **27**

Policy prescriptions: Invest in a Learning-Integrated Life; Transform the learning of today with new partnerships; Accelerate the shift to skills-based learning and hiring

Zaria has five years of work experience and is ready to change jobs and enter a field that has high growth potential in her region. The national government has been investing in collecting better skills-based labour market information for years and has developed a public platform to offer individuals specialized tools to assess their skills against current market needs, and to locate employers that are currently hiring.

On the employer side, the human resources team is closely examining a recent internal skills audit done at their organization and determines that the organization needs additional digital marketing specialists. They initiate a search for individuals with the skills they will soon need and spot a strong candidate in Zaria who requires only light training on regulatory issues regarding the sale of electric vehicles, along with some formal skills development courses on social media marketing strategy. After a successful interview, Zaria is offered the job.

Upon joining, Zaria will receive an educational benefits stipend from the company, and access to a company-provided platform of curated programs for skills building from approved providers. Upon completion of a set of courses, Zaria will receive a credential from a company approved program verifying her technical knowledge and marking the end of her probationary period at the company. To ensure she continues to build her skills, she will move into a formal mentor program with one of her colleagues to receive continual peer-to-peer feedback on her demonstration of skills and knowledge.

This affordable and accessible learning through employer-funded training has enabled Zaria to begin working while also upskilling to ensure her long-term success in the company and growing industry. The employer is investing in its employees, and company leaders are thinking further into the future about the skills the company needs, and the types of job candidates who will succeed. This match, based on skills potential, was made possible because of government investment in high-quality labour market information and a national platform that matches job candidates with career opportunities based on the candidates' skills and the identified skill needs of a given job.

What policy decisions will help us maximize resilience?

So where do we go from here so that these four learners—and the millions they represent—can realize the educational opportunities that come from a truly Learning-Integrated Life? How do we take advantage of the opportunities that the COVID-19 pandemic has brought to the fore and come out stronger and more resilient than we were before it hit?

We believe that the changes of 2020 have only accelerated trends that were already reshaping the landscape of skills and work. Working individuals are changing jobs or vocations more frequently in their careers, by choice and out of necessity, due to technological advances. Employability is determined less by general credential attainment and more by the ability to demonstrate the necessary skills for a job.

However, our current model for skills attainment assumes we have a workforce in which job skills have a long shelf life and employers only need to make a limited investment in skills development programs. As the workforce requirements change, so too must the systems that students and employees rely on to learn and stay relevant—from primary and secondary schools to postsecondary education to workforce training, and beyond.

Between December 2020 and January 2021, D2L and Innovative Research Group surveyed more than 1,000 individuals over the age of 18 across the United States to better understand perceptions of ongoing education and training.^{iv} Our research shows:

- Lifelong learning, including online education, continues to be of interest to adults, provided certain barriers to access and affordability are addressed.
- Six in 10 survey respondents (59 percent) agreed that it was challenging to find the money to further their education or training.
- Survey respondents also agreed that it was challenging to understand how available education connects to jobs in demand, with 44 percent of respondents agreeing that microcredits or short courses are not given the same level of recognition by employers as formal degree programs.



Understanding the importance of online learning, affordability, and employer recognition, we have identified four key areas where governments at sub-national and national levels can focus their attention today to create a system that enables the Learning-Integrated Life necessary for individual and collective success:

PRIMARY AND SECONDARY EDUCATION



Invest in preparing teachers for their own lifelong learning journeys

1. Empower teachers with pre-service and professional learning focused on the learning modes and models of tomorrow
2. Offer teachers holistic professional development that supports individualized learning pathways

POSTSECONDARY EDUCATION



Transform the learning of today with new partnerships

1. Create the policy infrastructure needed to scale new learner-centric models of education
2. Incentivize postsecondary institutions to form networks at the state, provincial, and national levels to provide students with more flexibility

WORKFORCE DEVELOPMENT



Invest in a Learning Integrated Life

1. Invest in the development of nationally in-demand skills training led by industry
2. Provide financial support for individuals to meet their ongoing and future training needs

Accelerate the shift to skills-based learning and hiring

1. Develop a common skills language
2. Improve the quality, timeliness, and accuracy of labour market information (LMI)
3. Improve the dissemination of LMI to the public

Recommendation #1:

INVEST IN PREPARING TEACHERS FOR THEIR OWN LIFELONG LEARNING JOURNEYS

A recent D2L survey found that 76 percent of parents want schools to make more use of digital learning tools than they did before COVID-19.^v Teachers are

expected to enable the Learning-Integrated Life of their students, delivering more personalized, engaging, blended, and competency-based instruction. Pre-service teacher training needs to provide teachers with a solid foundation of skills so they can use technology in the classroom effectively, identify students' skills gaps, and remediate learning for students experiencing gaps in their learning. Teachers also need access to professional development programming that addresses their own skills needs—whether the programming is related to content, pedagogy, or ongoing technological learning.^{vi}

1.1 | EMPOWER TEACHERS WITH PRE-SERVICE AND PROFESSIONAL LEARNING FOCUSED ON THE LEARNING MODES AND MODELS OF TOMORROW

- Ensure all pre-service teacher training programs include courses on delivering online education and adapting teaching styles to keep students engaged (see In practice above). Certification bodies should ensure all newly graduating teachers are able to effectively implement digital tools and resources in the learning environment in order to improve learning and close achievement gaps.^{vii}
- Ensure current teachers also have access to professional development in hybrid, blended, and online pedagogies, recognizing that simply providing access to an online platform will not automatically enable teachers to conquer any instructional need, or ensure accessibility for students with learning disabilities.^{viii} Professional development programs should be co-created by school districts and teachers to ensure teachers have the training they need in innovative learning models, pedagogical practices, personalized learning, and systems of authentic assessments in a competency-based education system.

IN PRACTICE

Singapore has pursued a systematic approach to introducing Information and Communications Technology (ICT) for learning into schools, beginning over 20 years ago with training teachers to use technology to now focusing on improving the capabilities and skillsets of teachers in delivering effective training using technology.^{ix} Each year, Singapore also hosts ExCEL Fest, an event showcasing the latest education technology developments in schools to teachers, parents, and members of the public.

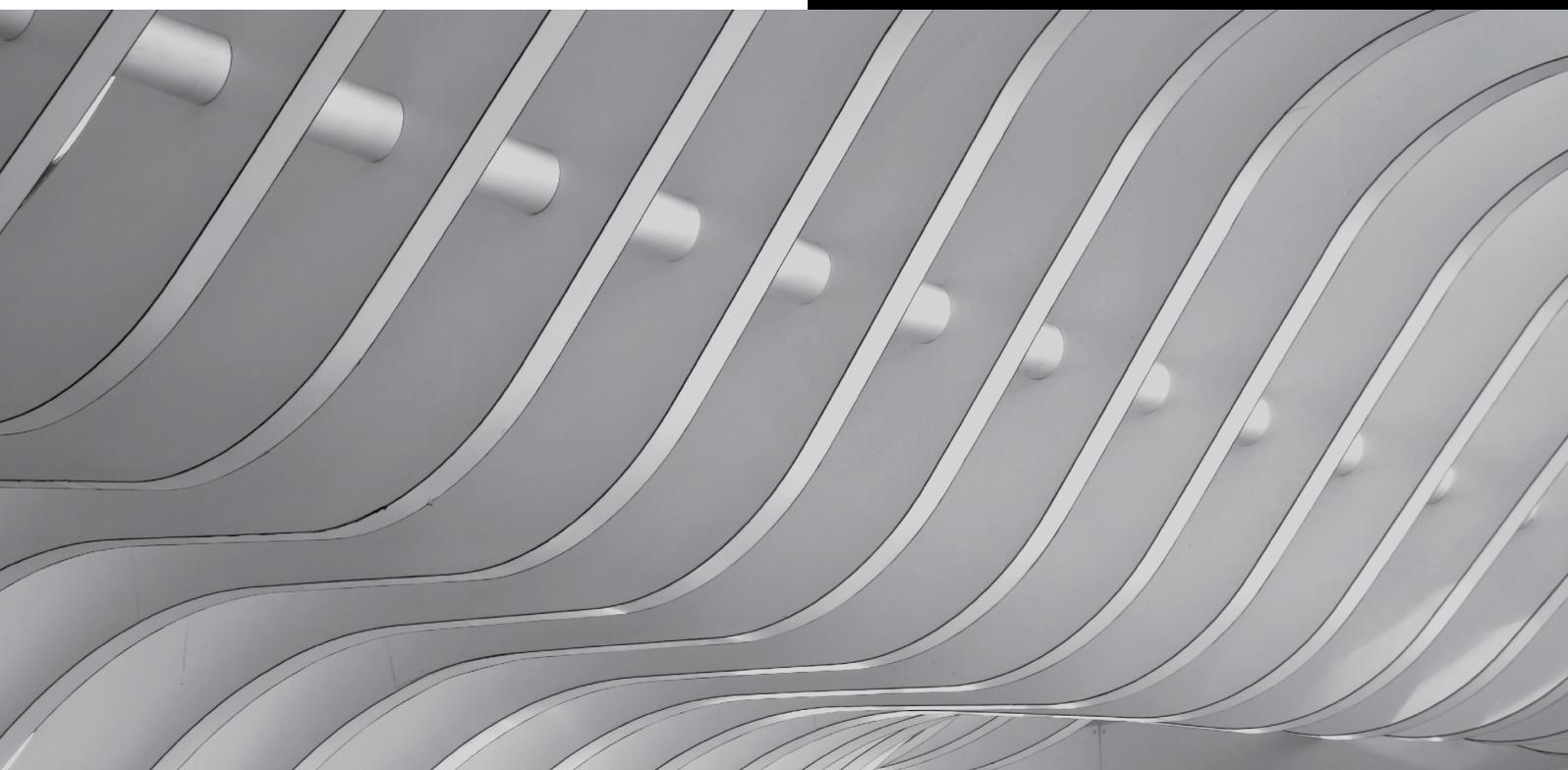


1.2 | OFFER TEACHERS HOLISTIC PROFESSIONAL DEVELOPMENT THAT SUPPORTS INDIVIDUALIZED LEARNING PATHWAYS

- Ensure professional development requirements reflect a holistic view of teachers' skills needs, and offer teachers creativity and autonomy in developing their own individualized learning pathways.^x
- Implement a state- or province-wide online professional learning system to enable professional development programming for teachers at scale, allowing for shared content, community building, and rapid upskilling of teachers and administrators.^{xi}
- Develop mentor-based continuing education programs to allow teachers to benefit from the experiences of their peers, and provide another avenue to supporting them in refreshing, developing, and broadening their knowledge, skills, and practices (See In practice to the right).

IN PRACTICE

New Zealand's Manaiakalani Digital Teaching Academy is a partnership between the University of Auckland, Google, and Manaiakalani Education Trust that brings together newly qualified teachers and experienced teacher mentors to accelerate the skills development of new teachers, with mentors coaching them in how to use technology for the benefit of student learning.^{xii} Teachers gain from learning from their peers and applying lessons in their classrooms.



Recommendation #2:

TRANSFORM THE LEARNING OF TODAY WITH NEW PARTNERSHIPS

Traditional postsecondary education has offered degree or diploma programs requiring years of commitment to complete, or continuing education programs that may not always prove relevant or beneficial to the workplace.

49 percent of adults D2L surveyed who have recent online learning experience say that the ongoing education and career training courses available to them do not provide them with the skills needed to advance in their careers.

44 percent of adults D2L surveyed agreed that courses available to continue education or training took too long. Institutions are beginning to adapt but need incentives and regulatory flexibilities to accelerate innovation in program offerings, and partnerships with other institutions.

2.1 | CREATE THE POLICY INFRASTRUCTURE NEEDED TO SCALE NEW LEARNER-CENTRIC MODELS OF EDUCATION

- Invest in research on the relative effectiveness of new educational models including competency-based education for postsecondary education, credit for prior learning, stackable credentials, work-integrated learning, and embedding of industry certifications into postsecondary education programs to offer more options for quickly training talent and addressing skills shortages as they emerge.
- Identify ways for sub-national and national education authorities and new learning providers (e.g., employers, third-party companies) to work together and allow for experimentation with new models, while at the same time protecting consumers from potentially fraudulent actors.^{xiii}
- Coordinate between governments and postsecondary institutions to rapidly scale up proven and promising practices—like embedding industry certifications into degree-based programs—to benefit both employers and students.^{xiv}



2.2 | INCENTIVIZE POSTSECONDARY INSTITUTIONS TO FORM NETWORKS AT THE STATE, PROVINCIAL, AND NATIONAL LEVEL TO PROVIDE STUDENTS WITH MORE CHOICE

- Enable a system that supports pathways for the recognition of prior learning and portability outside the institution where it was achieved.^{xv}Digital credentials offer one avenue to allow portability across teaching and credential awarding institutions, including non-traditional education providers like developers of Massive Open Online Courses (MOOCs) and bootcamp providers (see In practice).
- To ensure success, support multi-stakeholder cooperation across institutions, and with employers, to ensure transparency and consistency in the provision of credentials.

IN PRACTICE

In December 2020, the Association of Registrars of the Universities and colleges of Canada launched a new national learner credential wallet in which students can access, view, and share their verified and official transcripts, credentials, badges, micro-credentials, and documents in a digitized format anytime and anywhere.^{xvi} This new platform is an important step in postsecondary collaboration and can be taken further by institutions collaborating to standardize prior learning assessment and recognition across institutions to grant credentials.



Recommendation #3:

INVEST IN A LEARNING-INTEGRATED LIFE

A successful lifelong learning system must be responsive, offering learning opportunities that adapt as learner demands, employer needs, and workforce trends continue to rapidly evolve. Governments can look at a variety of tools to incentivize individuals to take on training, and not penalize those taking time off work to further their education.

3.1 | INVEST IN THE DEVELOPMENT OF NATIONALLY IN-DEMAND SKILLS TRAINING LED BY INDUSTRY

- Provide incentives to consortia of training partners from industry, education, and sector organizations to develop foundational training for nationally in-demand skillsets that can be easily adapted or remain evergreen for workers.
- Make these programs available for free to jobseekers in need of rapid upskilling, to small- and medium-sized enterprises that would otherwise face a cost barrier, and/or to the public to stimulate interest and encourage further training in more complex skills requiring foundational knowledge (see In practice).

Financial constraints are also a large barrier for unemployed and displaced workers, who are trying to fund continuing education and ensure a return on investment by linking courses to labour market trends.

Six in 10 of the adults (59 percent) D2L surveyed agreed that it is a challenge to find the money they need to further their education, or career training.

Governments can address these issues by offering increased financial assistance for individuals to pay for their own learning and incentivizing increased employer investment in training.

IN PRACTICE

In 2018, Finnish technology firm Reaktor and the University of Helsinki joined forces to develop an online course to teach the basics of artificial intelligence (AI) to the public and to encourage organizations to train their staff on AI. In the first four months of the program over 200 organizations had pledged to do so—including banks, telecommunications companies, and healthcare organizations.^{xvii} The course provided a low-risk, cost-effective way for companies to quickly train a large subset of their staff in the technology, and prepare them to actively look for new business opportunities and innovations made possible through AI.

3.2 | PROVIDE FINANCIAL SUPPORT FOR INDIVIDUALS TO MEET THEIR ONGOING AND FUTURE TRAINING NEEDS

- Create new models of portable, personal learning credits or training accounts to support individuals in defining and pursuing their own learning paths, regardless of their employment status (e.g., employed, gig worker, or unemployed) (see In practice).
- Use progressive tax incentives to establish these education and training accounts, similar to those that already exist for retirement, education, and health savings accounts, to which employers, workers, and other funders could contribute to pay for eligible training expenses.^{xviii} Tax incentives could be designed in such a way as to focus on individuals in low-wage, entry level positions, those most at risk for elimination due to changing economic needs and technology, and those in precarious work circumstances.
- One model is for state or provincial governments to certify employer backed partnerships with education, training, and credentialing partners. This would allow employers to recover the cost of training by having a portion or all of an employee's state income tax deferred to the employer or a training fund managed by an employer collaborative.^{xix} This model can also help reduce the state or provincial government's role in grant making, empowering those closest to the challenges to identify the best solutions.

IN PRACTICE

France's Compte Personnel de Formation (CPF) is an individualized financing scheme for professional training implemented in 2015.^{xx} A person's individual account can be topped up by the account holder, their employer, sector-level collective agreements, or public employment services. Courses on the official list include training programs awarding a professional qualification, accreditation of prior experiential learning and training courses dedicated to business creation—all designed to ensure that individuals using the accounts have market-ready skills. The CPF is the only example of a national individual learning account in which training rights are accumulated over time. When employees change jobs, their accumulated entitlement to paid time off moves with them.

Recommendation #4:

ACCELERATE THE SHIFT TO SKILLS-BASED LEARNING AND HIRING

Rapid transformation of jobs and work requirements in the context of the pandemic has only further highlighted the urgent need to establish a common language around skills and associated indicators to measure them. **46 percent of adults D2L surveyed agreed that it is a challenge to understand which jobs are in demand, and which skills are needed to fill them.**

Countries looking to prepare their workers for the future need to improve the collection and dissemination of labour market information (LMI) to shift from a focus on occupations, tasks, and credentials to a more comprehensive focus that includes the skills required to be successful as jobs continue to change.

4.1 | DEVELOP A COMMON SKILLS LANGUAGE

- Measure the demand for certain skills by employers, the current supply of those skills from workers, and the potential supply based on courses offered by education providers and employers in a common skills language or taxonomy (see In practice).^{xxi}
- For this to be successful, skills need to be linked to real-time jobs data to ensure ease of updating. Ideally, data will be machine readable to easily automate updates.

IN PRACTICE

Nesta, a think tank in the United Kingdom, has scanned job advertisements from Burning Glass Technologies to identify common skills, including: specific tasks (e.g., insurance underwriting), knowledge (e.g., biology), software programs (e.g., Microsoft Excel), and personal attributes (e.g., positive disposition).^{xxii} Machine learning was used to hierarchically cluster skills into a taxonomy based on job title that a user can easily search to find information about common skills requirements, changes in demand for specialists in recent years, and expected salaries. By using job advertisement data, Nesta can also update the taxonomy in real time to provide to job seekers relevant information that is based on the dynamic language used by UK employers, instead of the static language defined by academics or policymakers.

4.2 | IMPROVE THE QUALITY, TIMELINESS, AND ACCURACY OF LABOUR MARKET INFORMATION (LMI)

- LMI needs to bring together datasets from early childhood education, primary and secondary education, postsecondary education and the workforce. This longitudinal view provides a longer, more meaningful view of education outcomes, helps identify changes needed to better support current labour market needs, and can be accomplished while protecting learner confidentiality (see In practice).
- This includes data from postsecondary institutions and non-traditional education providers on completion rates for credentials, employment outcomes, job titles, and earnings of graduates; data from the private sector on employment and job openings; and the required skills and credentials, wages, and career opportunities associated with openings.
- To be effective, the data system needs to address the influence of demographic change on the labour market, current and future occupations and demand, the skills profiles most suitable for these jobs, and prospective fields of retraining.^{xxiii} Also important is the timeliness of this information as well as its availability at the local or regional level, where it can be most relevant to an individual's locally driven decision making.

IN PRACTICE

Denmark's national skills anticipation system combines intricate labour market data and skills in demand for over 850 occupations across the country.^{xxiv}

Through a collaborative model involving employers, government, and other relevant stakeholders, this national skills anticipation system participates in activities such as skills forecasting, skills assessment, and employer surveys, and disseminates the information to regional and municipal stakeholders.

4.3 | IMPROVE THE DISSEMINATION OF LABOUR MARKET INFORMATION TO THE PUBLIC

- Invest in translating labour market information into open, readable formats for consumers, educational institutions, and employers in order to support informed decision-making. This includes developing digital platforms to help individuals understand recent and expected future trends in employment, earning levels and trends, links to vacancies and training opportunities, and information on the key competencies required for specific occupations.^{xxv}

IN PRACTICE

The European Union (EU) has been a leader in competency-based job matching through its public sector job mobility platform, EURES. In 2020, the EU launched Europass, a new, multilingual online e-portfolio where people can record information on their skills, qualifications and experiences, receive tailored suggestions for jobs and training, and find tools to help them prepare and track job applications.^{xxvi} This skills-first approach is an example of the type of LMI-powered and technology-enabled solutions that can support jobseekers in finding employment and employers in filling skills gaps.



Conclusion

The events of 2020 accelerated many of the trends that were already reshaping the landscape of education, skills, and work. Our traditional systems of education that see learning as a once and done exercise to prepare for one's career, never to be revisited, have been turned on their heads.

To support learners of all ages, governments urgently need to make investments and enact policy changes that enable ongoing learner-centric education, and to do so in a manner that ensures it is accessible, affordable, and inclusive for all.

Investing in supporting teachers for their own lifelong learning journeys will allow more students like Marama to experience personalized learning pathways in secondary school, and cultivate the skills needed to continue their independent education throughout their lives. It will also support teachers like ZheYuan in entering the classroom with existing knowledge of how to use digital technologies to support and assess students, and in having access to ongoing professional development opportunities to continuously upskill themselves.

Increasing partnerships among universities, colleges, polytechnic institutions, non-traditional educational providers, and employers will offer students like Sam more choices in how they pursue postsecondary and continuing education. This learning system reimaged for a Learning-Integrated Life will require new models of skills training, such as shorter-term or modular programs, stackable credentials or badges, and modified and adaptable curricula, and greater use of self-directed and online learning. These flexible and agile learning options will serve to rapidly train talent and address skills shortages as they emerge, regardless of how long it has been since these students were studying full-time.

Workers like Zaria will have access to information about the jobs that are in demand, and what skills they require through improved labour market information that is locally and regionally specific, relevant, and accurate. They can then understand what opportunities are available to them, and apply for funding for shorter-term programming with improved financial aid.

The vignettes identified in this paper are attainable with public policy changes. These stories offer inspiration for a future of education and training that is inclusive, accessible, and affordable for all—and one that acknowledges that learning can take place anytime, anywhere, and for everyone.

Endnotes

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