Training and Skills Development
Policy Options for the Changing World of Work
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Training and Skills Development Policy Options for the Changing World of Work
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Abstract

The literature on the changing world of work in the age of disruptive technologies is growing, demonstrating both the interest in and urgency of the issue. Drawing on an in-depth literature review, this article offers a critical assessment of the current state of empirical knowledge about what labour market training after disruption might look like. We also present results of a jurisdictional scan of current labour market training programs in Canada. We then examine the extent to which current policy practices regarding education and training are informed by existing research. We find that the “futurist” work has offered some predictions about expected macro changes in the workforce, including polarization of jobs, job destruction, and the scope and depth of disruption in both the global North and global South. Other research provides some insights into promising programs and policies. However, empirical analyses of these programs - with attention to the changing landscape of work - is limited. In addition, little is known empirically about the track record of success of current education, training, and social programs to adapt to and respond to the new world of work. Finally, alignment between the limited existing empirical research and programs that are currently being delivered to address the changing nature of work is tenuous at best. Thus, policy makers need to redouble efforts to invest in research as to who works and what works in this new technological era in order to respond effectively to anticipated labour force disruptions.

Introduction

Existing literature on work in the age of disruptive technologies is large and expanding almost by the day, demonstrating both the interest in and urgency of the topic. Since 2006, the year some researchers suggest marks the start of the “second machine age” (Brynjolfsson and McAfee 2014), at least eighty government, international organization, think tank and global consultancy reports have been written on disruptive technologies and their impacts on skills and work. Approximately half of these reports have been published since January 2017. This count does not even include the frequent news media coverage of the issue. In addition to this “grey” literature, a good deal of academic “futurist” work has been generated that offers some predictions about expected macro changes in the workforce, including polarization of jobs, job destruction and the scope and depth of disruption in both the global North and global South (Autor 2015a; Brynjolfsson and McAfee 2011; Frey and Osborne 2013; Schwab 2016; Susskind and Susskind 2015). Much of this futurist work focuses on analyzing what tasks can be automated and what percentage of the labour market faces disruption. Very little literature exists on the policy responses that have been taken to support training and skills development of workers, the track record of success of existing programs, or the social policy and employment policy implications of a new world of work.
Based on a literature review (Appendix 1) and jurisdictional scan (Appendix 2) of policy responses that focused on programs available in Canada, this article offers a critical assessment of the current state of empirical knowledge of responses to anticipated labour market disruptions. We also explore the extent to which those empirical insights are informing current practices, and what that reveals about how governments can anticipate and respond to disruptions likely to result from rapid advances in artificial intelligence and other technologies. Below, we first review some of the accumulated findings related to what has been labelled the “fourth industrial revolution.” Next, we explore the extent to which past research can help make predictions about the changing nature of work in the future. We then briefly summarize research about the skills that will be needed to succeed in the workforce of the future, and the delivery methods of training programs that have been shown to be most effective in the past. We conclude with a jurisdictional scan of programs that are currently in place to help Canadians acquire new skills and explore whether these programs are delivered in keeping with findings about what should be taught and how it should be delivered.

Background: The Rise of the “Fourth Industrial Revolution” and its Labour Market Impacts

The rate and characteristics of technological change in the twenty-first century are remarkable. While computing began to reshape work in the 1960s, advances in machine learning and mobile robotics mean that computers can now undertake much more complex and less routine tasks.

Many researchers and policy makers believe we are witnessing the “fourth industrial revolution,” on par with previous technological advances such as steam engines and other forms of mechanical production, the electric age and mass production, and the electronics and information technology age that led to automation of production (Schwab 2016). It is difficult to determine when this new age of artificial intelligence-based and other technological innovation began. One way to identify a specific “starting point” for these recent changes in technological capabilities is to focus on Moore’s Law: in 1965, Gerald Moore (of Intel) hypothesized that semiconductor capabilities would grow exponentially as the number of transistors in one chip would double every two years. Brynjolfsson and McAfee (2014: chapter 3) argue that if the beginning of computing’s effect on the economy is taken as 1958, the year that “information technology” was added to the US Bureau of Economic Affairs’ categories, then the technological tipping point (where computers became “staggeringly” powerful) occurred in 2006. After 2006, supercomputers, factory robots and self-driving cars began to appear. In 2007, the first iPhone appeared on the market. Many researchers support identifying the 2000s as the first decade of this shift: between 1999 and 2000, Internet usage in Canada jumped from just over 36 per cent to over 50 per cent. By 2009, over 80 per cent of Canadians used the Internet (World Bank 2018). Technology started to be able to take on non-routine tasks from roughly the year 2007. In 2010, Google successfully piloted a completely autonomous vehicle and, in January 2011, IBM announced it had succeeded in achieving automated translation. In 2011, people began referring to the reconfiguration of manufacturing as “Industry 4.0,” where
production occurs in “smart factories” in which virtual and physical systems cooperate (Schwab 2016: 11).

While we know that the rate of technological change has increased and that this has produced significant advances in certain types of technologies, predicting what will occur in an era where machines can complete non-routine tasks is by no means a straightforward undertaking. Scholars including Autor (2015b) have acknowledged that studies of the impact of basic computing in the twentieth century are unlikely to facilitate useful predictions about the impact of machine learning and mobile robotics because these advances allow machines to be used for a much wider range of tasks and so will reshape work in fundamentally different ways.

This era of technological change is also having effects globally. While job disruption as a result of automation has been underway for at least two decades, advances in machine learning, microchip technology and platform innovation are occurring on a daily basis. The previous wave of global factory job displacements as a result of automation was massive: an estimated 31 million factory jobs disappeared between 1995 and 2002 in the twenty largest economies (Rifkin 2004). The anticipated future job displacement globally is much larger.

Digitization, artificial intelligence, big data, automation and the rise of disruptive information and communication technologies are created and implemented at a rapid rate. As McAfee and Brynjolfsson (2017; 98) note, some technologies that were only available to military and industry a decade ago may now be purchased cheaply at a local electronics store. They write that “the combination of cheap raw materials, mass global markets, intense competition, and large manufacturing scale economies is essentially a guarantee of sustained cheap price declines and performance improvements (98)” in technologies such as robots, drones and autonomous vehicles and attendant software and algorithms. Those inventions then generate waves of new data that become inputs to help systems learn.

In addition, technological advances have opened up new platforms that enable direct communication between clients and service providers. The appearance of Uber and Airbnb has quickly created what has been described as the “gig economy,” which has far reaching implications for the state of employment. Work is performed on an on-demand basis and is, depending on jurisdiction, considered only loosely connected to the firms that produce the algorithms that match workers with consumers of their services. Thus, technological developments are shaping the labour market in fundamental ways (Kenney and Zysman 2016; Zysman and Kenney 2017).

Researchers at the OECD recently forecast that 9 per cent of jobs on average are automatable across OECD countries (Arntz, Gregory and Zierahn 2016). A 2017 McKinsey study estimates that “as many as 375 million workers globally (14 per cent of the global workforce) will likely need to transition to new occupational categories and learn new skills, in the event of rapid automation adoption” (Manyika et al.
2017: 1). Other estimates run much higher (Frey and Osborne 2013). These global job trends are mirrored to some extent in Canada where the number of standard full-time jobs declined significantly in the 1990s and the proportion of standard full-time jobs has fluctuated between just under 0.5 and 0.625 percent since (Green and Townsend 2013: 69-70).

While it is difficult to provide accurate estimates of future job loss, it is clear that these disruptions are recent, broad in scope, and massive. Together, these factors call for action in the form of evidence-based interventions that can support workers and their families in the future.

What Do We Know about Potential Implications for Employment and What Don’t We Know?

Three lines of thinking and research are being pursued on what all this technological change means for workers and for anticipated job disruption. One is the exploration of historical trends to guide predictions about the future. A related line is provided by the “futurists” who use those historical labour market patterns to make predictions about the potential of current and future technologies for the future of work. Finally, some argue that future labour market trends are driven primarily by factors other than disruptive technologies. We describe each of these lines of research below.

Historical Trends

This literature draws on historical labour market trends and experience of past technological disruptions to help analyze and contextualize the breadth and depth of change currently underway. Wartzman (2017), for example, traces the labour market histories of four giant companies in the US—General Electric, General Motors, Kodak and Coca-Cola. This literature generally begins to track trends from the 1950s onward and the shocks labour has experienced over time as a result of globalization and competition from low-wage economies, the decline of unionization and union influence, and technological innovation that led to overall job loss and a decline in manufacturing jobs (Wartzman 2017: 6). Brynjolfsson and McAfee (2014: 4-16) contextualize recent cases of technological change by arguing that a number of past technologies have reshaped the organization of human society. Bessen (2015: 110) similarly argues that technologies alter but do not simply destroy work, using the example of ATMs: the number of bank tellers increased with the introduction of ATMs, but the tasks they completed shifted.

The Futurists

A second body of literature comprises a range of expert forecasts regarding the possible effects of recent technological disruption. One subset of this literature focuses on resulting changes in the supply of and demand for workers. While no consensus exists, the more optimistic labour market researchers argue that technological advancement leads to *skill-biased technological change* (SBTC), which has the long-run effect of improving job quality in areas such as cloud computing, big data and so on (Autor,
In the short term, however, labour market researchers are concerned that technological change will lead to upticks in unemployment (Feldmann 2013). As technology continues to replace low-skilled human labour, wages for jobs with these skills will also be driven lower (Brynjolfsson and McAfee 2014). At the same time, technological change is anticipated to increase demand for high-skilled workers because it creates demand for “more abstract and data-driven reasoning” (Brynjolfsson and McAfee 2014: chapter 9)—what is known as the complementarity of human and artificial intelligence. Complementarity is the idea that new technologies are complemented by certain forms of human labour rather than completely superseding the need for human inputs to production. Workers will then interact with machines and will take on the tasks that machines cannot automate in ways that enhance total productivity.

If technological substitution occurs quickly, technological unemployment will result (Frey and Osborne 2013). In order to keep up, then, workers need to be able to quickly adapt to new demands; their ability to do so depends on a worker’s skill level and wage level at the time at which automation affects their job (Autor 2015a), as well as firms’ willingness to pay for retraining for new jobs. Workers’ ability to access training is, therefore, key. Whether training will be provided by employers or governments, or whether workers themselves will need to invest in retraining, is an important question.

Other forecasters focus on the relationship between the introduction of new technologies and skills polarization which fuels both income inequality (within the workforce) and wealth inequality. Autor and Dorn (2013) argue that US employment and wages have polarized between 1980 and 2005 because of both consumer preferences and the falling cost of automating routine jobs. The same pattern applies to other countries (Goos, Manning and Salomons 2014). That said, Autor (2015a) acknowledges that these trends are specific to both the type of technological disruption that occurred and to the broader political-economic context in which they occur. Elsewhere, Autor (2015b) argues that technological advances are increasing the share of productivity gains that go to capital, because of the need for less labour in high-growth production. While it is unclear which model best predicts the ways in which technology will alter the demand for skills, significant disruption to the labour market seems likely.

Frey and Osborne (2013) also give some support to the polarization thesis. They argue that the (thus far) limited ability of machines to do fine-grained manual work means that technological change has in fact led to an “increasingly polarised labour market, with growing employment in high-income cognitive jobs and low-income manual occupations, accompanied by a hollowing-out of middle-income routine jobs (12).” Their work could be taken to suggest that continued polarization, rather than shifts toward high-skilled work, will occur.

A third argument is that technological change is at least partially responsible for degradations to the quality of work. Aronowitz and DiFazio (2010) argue that growth from technological improvements to production has not been shared with workers; instead, the private sector has turned to temporary and contracted work to fill its needs for human labour (Weil 2014). Wajcman (2017) argues that casualized
workforces themselves are supporting the development of new technology through the platform economy, which allows labour to be purchased on a task basis.

Another group of analysts forecasts a complete reorganization of work and knowledge beyond just the altering of the mix of technology, labour and capital. Susskind and Susskind (2015), for example, argue that digitization is already affecting law and medicine. With advances in algorithmic learning, they predict that professional advice will be at least somewhat automated, resulting in a total reorganization of professions.

The reconfiguration of work can also be seen in the rise of labour-market platforms and micro-work. Zysman and Kenney (2017: 1) argue that these platforms are “fundamental features of the present phase of the digital revolution.” Digital platforms use algorithms and an abundance of data to match products or services with consumers (Kenney and Zysman 2016: 5). Platforms that match human labour with consumption, such as Uber, UpWork and Mechanical Turk, effectively create micro-contracts between workers and consumers for agreed-upon services. These platforms raise a host of questions regarding both consumer protection, labour regulation and growing inequality, or rather, policies that affect the distribution of gains from productivity (Kenney and Zysman 2016; Zysman and Kenney 2017: 3-7). For example, those who sell labour through labour market platforms tend not to be considered standard employees (Stanford 2017).

Factors beyond Disruptive Technologies

Another body of literature casts doubt on whether technology is even the main driver of changes to work and whether other political-economic features might take precedence, or at least affect how change proceeds (Watson 2013). A rich literature in political science and sociology examines the impact of institutions and political partisanship which have created distinct labour market regimes in European and North American welfare states (Hall and Soskice 2001; Häusermann, Kurer and Schwander, 2015; Iversen and Soskice 2009; Iversen and Stephens 2008; Rueda 2007). This literature has noted a concerning trend of dualization of labour markets between those workers in protected, stable and full-time employment, covered by social insurance and other benefits, and those subject to increasing precarity and risk as a result of previous rounds of disruptive innovation such as automation (Emmenegger et al. 2011; Ibsen and Thelen 2017; Iversen and Soskice 2015). But empirical analysis of how much those trends interact with new disruptive technologies is lacking, as is systematic analysis of the factors that drive policy responses. Others have argued that the effects of technology on work cannot be separated from the impacts of globalization—specifically, offshoring and the reorganization of services and production (Breznitz and Zysman 2013). In other words, even if the technology is available, macro-political factors will shape the ways in which firms and governments adopt or adapt to new technologies.
This literature highlights the complexities involved in attempting to make predictions about the future of the labour market at a time of such massive change. Nonetheless, it is imperative that researchers engage in as accurate forecasting as possible as governments and other organizations need to prepare for this uncertain future. The questions we address in this review of the literature are: what skills will workers need to complement these technological changes? And what policy responses are necessary to support the acquisition of skills needed to navigate the changing world of work, on the one hand, and on the other hand provide supports for those who will be displaced? To answer these questions, we conducted an extensive review of the literature as well as a jurisdictional scan of programs being implemented in Canada to support workers who need to acquire new skills due to the changing labour market landscape. The keywords and data sources used in these searches are provided in Appendix 1.

What Skills Will Workers Need to have in the Future?

We focus specifically on the literature on education and labour policy responses to the changing nature of work. Before discussing specific policy responses, though, we review what skills workers will need to have in the future—often referred to as twenty-first century skills. The literature on this topic is primarily speculative and, if it is based on quantitative evidence, it is mostly based on older data. In a separate article, we thoroughly examine the existing empirical literature that addresses these skills questions (Dhuey, Perlman and White 2018). Given the rapid pace and unique nature of change associated with the fourth industrial revolution, however, it is difficult to extrapolate from that research. In this paper, we briefly describe the skills that researchers predict will be needed to complement technological changes. We then discuss responses to the impact of technological disruption on workforce displacement and draw on some existing research that identifies aspects of programs that have been found to be effective in the past in providing workers with the skills they need to succeed.

The notion of twenty-first century skills, namely those needed to be successful in the future world of work, has been widely discussed in both the media and the grey literature for many years. A committee from the National Academy of Sciences found, after reviewing the literature on twenty-first century skills, that these are skills that have been valued traditionally and generally are not unique in their importance for the future (National Research Council 2012). The committee concluded that the important difference for the future is that individuals will be expected to master many areas of skill and knowledge to be successful. The National Research Council (2012) provided a classification scheme for the various twenty-first century skills and included the following categories: Cognitive Domain (cognitive processes and strategies, knowledge and creativity); Intrapersonal Domain (intellectual openness, work ethic and conscientiousness); and Interpersonal Domain (teamwork and collaboration and leadership). They also noted that the research knowledge regarding the importance of these skills to adult labour market outcomes is sparse and generally not demonstrated causally.

Autor, Levy, and Murnane (2001) use data from the period of computerization, from 1960 to 1998, and find that there is less use of routine manual and routine cognitive tasks in the labour market and greater use of non-routine cognitive tasks. Routine manual tasks include repetitive assembly and routine
cognitive tasks include record-keeping and repetitive customer service. The non-routine cognitive tasks are forming/testing hypotheses, making medical diagnoses, managing others and so on. Levy and Murnane (2013) update these data in recent years (until 2009) and break their analysis into five broad types of workplace tasks: (1) solving unstructured problems (tackling problems that lack rules-based solutions); (2) working with new information; (3) completing routine cognitive tasks (mental tasks that are well described by deductive or inductive rules); (4) completing routine manual tasks (physical tasks that can be described using deductive or inductive rules; and (5) completing non-routine manual tasks. They find that the nature of work is changing such that computers are increasingly performing the two types of routine tasks while the other three types of tasks have been left for human workers (Levy and Murnane 2013). Understanding the remaining tasks is paramount to understanding what skills will be needed.

A paper by Deming (2017) complements that work by showing that jobs requiring social interaction grew considerably between 1980 and 2012. Deming (2017) demonstrates that in part this is because workers use communication to undertake task-trading to work together more efficiently. Other researchers (e.g. Neuberger-Fernandez and Barton 2017) have stressed that adaptability is a crucial human skill in a time of technological change, not only because of the need to be able to work with new technologies but also because more people are likely going to need to manage multiple jobs—both at the time and throughout their working lives.

We are of course also likely to see increasing demand for technological skills including engineering, data processing, coding and other skills related to the rising use of machine learning and mobile robotics (Manyika et al. 2017; World Economic Forum and Manpower Group 2017). Bughin et al. (2018) find that the strongest growth in demand, across the six countries they studied, is likely to be for technological skills. Such skills are underpinned by strong reasoning capabilities which, of course, predate these new technologies, suggesting the need to focus on the fundamentals of pattern recognition and logical reasoning in K-12 education (Levy and Murnane 2013; Pellegrino and Hilton 2012—the same skills highlighted by the National Research Council (2012).

Scholarship supports the need for workplace training when firms undergo technological change and reorganization. In an examination of why firms decide to invest in training in Italy, Neirotti and Paolucci (2013: 109) find that training is commonly deployed when firms are trying to assist with the adoption of and adaptation to new innovations. The same conclusion is drawn from a study of UK employers (Gashi, Pugh and Adnett 2010). Training can both improve workers’ knowledge of newly introduced technologies and increase the likelihood that employees will push for or introduce innovations and new technologies (Neirotti and Paolucci 2013: 95, 106; Piva and Vivarelli 2009). Neirotti and Paolucci identify three main types of training: managerial training; training on soft skills; and technical or operational training (2013: 101). They find that while most firms undertook some training, workers received an annual average of 22 hours of training and only 42 per cent of workers within each firm on average were offered training (103). High-tech firms were the most likely to invest in managerial training, while
traditional manufacturing firms and firms that produce consumer products such as cars favoured technical and operational training (103).

News media stories have also documented some interesting firm-level responses. For example, companies such as BitSource in Kentucky and not-for-profit enterprises such as Mined Mines in Pennsylvania are training an (albeit) small number of displaced workers from the coal industry to code in order to design and develop websites, and software such as games and apps (Patel 2017). But rigorous empirical analyses of the success of these programs are few.

Some literature has emerged to document some of the responses at the college and university level to changing workplace needs, especially in fields such as engineering—including adjusting training and professional curricula (Barger, Gilbert and Boyette 2014; Harris and Cullen 2009; Helyer 2011). Small-scale studies have produced a series of findings that suggest partnerships between educational institutions and firms help to ensure graduates have the skills that are appropriate to present-day technology demands in workplaces (for example, see Barger et al. [2014] on Florida’s associate degree programs in science and technology and Helyer [2011] on the UK model of work-based learning). Other work speculates on the need to apply “learner-centric” models of education in order to ensure students are prepared to undertake learning throughout their careers (Cobo 2013; Harris and Cullen 2009).

A series of studies also considers the use of new technologies and their impact on educational outcomes. Evans, Baker and Dee’s (2016) study of massive open online courses (or MOOCs) finds that while participation in MOOCs generally decreases rapidly after the first week, drop-out rates then level off. They find that those who interact with online material are more likely to complete a course and gain certification. McPherson and Bacow (2015) suggest that MOOCs are less likely to disrupt education, in part because they represent only a small portion of all online forms of education. Echoing Evans et al., they argue that models of online education that have high degrees of participation are more useful. Technology can also be applied within the traditional classroom: Merchant et al.’s (2014) meta-analysis of the use of virtual reality in classrooms finds that games are more effective in producing learning outcomes than simulations. Technological use can also be blended with problem-based learning to assist in training teachers to use technology more effectively in their teaching (Evans et al. 2016).

In general, a degree of despair runs through the literature regarding trends in post-secondary education. Ansell and Gingrich (2017) note that especially in countries that have not fully recovered from the global financial crisis, new graduates are often “under-employed and underpaid.” In the US particularly, the relationship between university education and increasing one’s chances of securing a “good job”—defined by Kalleberg (2011) as those that provide a living wage, have a pathway for career progression and offer benefits—has been unravelling since the 1980s (Cottom 2014: 42; Kalleberg 2011).
What are the Responses to Workforce Displacements caused by Technological Disruption?

A body of research has emerged which examines the implications of technological disruption on workforce displacement. Much of this literature focuses on retraining methods to assist displaced workers. But, given that workforce disruption is a long-standing concern, literature that provides empirical discussions of retraining methods for these new displacements is harder to find, or uses data from earlier decades that are less relevant to current labour market conditions (e.g. Behaghel, Caroli and Roger 2014).

Most empirical analyses have been conducted using data and examining time periods well before the most recent changes in the workforce. Training and retraining programs have been around for decades. Only recently, though, have findings of the long-term causal impacts of these programs been available to policy makers (Lalonde 2003). Most of the empirical literature revolves around estimating the effect of “active labour market policies” (ALMPs). ALMPs are government policies and programs to help combat unemployment and have been used across the world. Card, Kluve, and Weber (2017) provide the most comprehensive meta-analysis of ALMPs and conclude that the average impacts of these programs are close to zero in the short run but often become more positive in the medium run (two to three years post-program). They find that there are significant differences in impact by type of program: programs that emphasize the accumulation of human capital have the largest effect. There is also significant heterogeneity found among participants with respect to the effect of these programs, e.g., women and individuals who have recently been in a long spell of unemployment benefit the most. Finally, ALMPs have the greatest impact during times of economic hardship such as during a recession. As noted by Heckman, Lalonde and Smith (1999), however, many ALMPs do not pass a cost-benefit test. Even when they are cost effective, they are rarely associated with a large-scale improvement of skills.

Jacobson, Lalonde and Sullivan (2005) studied one program that emphasizes human capital. They developed a dataset of more than 65,000 displaced workers in the state of Washington, based on administrative data that include unemployment insurance claims records from 1990 to 1994; quarterly wage records covering 1987 to 2000; and community college transcript records from 1989 to 1996. They were interested in the impact on individuals who experienced job loss of voluntarily completing at least one community college course at the time of unemployment. Half were aged 35 or older. They found that older displaced workers tended to experience similar effects of training as younger workers; the retraining effects for older workers were not larger than for younger workers, as they had initially expected. The retraining also raised older workers’ earnings, especially if they concentrated on “quantitatively oriented vocational or academic subjects”.

Interestingly, of the large number of studies (207 impact evaluations) included in Card, Kluve and Weber (2017), only one study from Canada met their criteria for inclusion. The inclusion criteria were that the focus of the study needed to be on an ALMP, the manuscript had to be well documented, it needed to include individual level micro-data, and it needed to incorporate a counterfactual/control group design or a form of selection correction. The one study examining Canada—Connolly and Gottschalk (2009)—
evaluated the Canadian Self-Sufficiency Project earnings subsidy. This subsidy was a demonstration project in the provinces of New Brunswick and British Columbia from 1993 to 1995 in which a random sample of single parents who had been on long-term income assistance were able to collect monetary supplements. No newer studies on Canada were included in the meta-analysis (Card, Kluve and Weber, 2017). This highlights the lack of academic research related in ALMP in the Canadian context. However, the Social Research and Demonstration Corporation (SRDC), a non-profit Canadian research group, works in partnership with federal and provincial governments as well as other for-profit and non-profit organizations to create, pilot, inform and assess ALMPs (SRDC 2013). For example, SRDC has evaluated Job Entry Manitoba (JEM), a former training-to-employment program delivered by the province, and were able to identify the key ways in which JEM impacted training provider practices (SRDC 2018). Thus, there is some work in the non-academic world that has evaluated ALMPs in Canada.

The findings in the ALMP literature are relevant to the current economic climate as they highlight that policy makers generally do not have a clear picture on how to mitigate unemployment and other labour market failures. Regardless, governments have developed a significant number of these programs, among other measures, to try to respond to disruption and labour market displacement.

In summary, existing research points to a number of skills as being central in helping workers succeed in the workforce of the future. However, inconsistencies in what is recommended are common and there is surprisingly little empirical research to support many of the declarations made in the literature. Nonetheless, this research provides some suggestions as to what should be targeted in programs that aim to support workers in gaining the skills they need to be successful in the workforce. The programs available and degree to which they are aligned with the research presented above is discussed next.

**What Training and Skills Development Policy Options are Currently Available in Canada?**

Given the sheer number of policies and programs, we chose to focus on policies and programs that have been undertaken in Canada. Our jurisdictional scan includes 191 different programs offered within Canada. The majority of these programs are government led versus programs provided by for-profit or not-for-profit organizations. Federal and provincial governments often work in partnership to fund and deliver these services.

Once the programs were identified we categorized them into the following themes based on a review of their stated goals: education and training programs; grants or direct payments for education and training; initiatives that support the development of education or training programs; apprenticeship education and training; youth training and education; and job-related transition assistance for employees or dislocated workers or recent graduates. It is important to note, however, that it is difficult to clearly identify how some of these programs aim to achieve their goals. For example, programs that provide cash transfers for the provision of skills training in a variety of settings may not provide
information about the specifics of the different programs they support. As such, an in-depth analysis of each of these programs is beyond the scope of this jurisdictional scan.

Direct Education and Training

Education and training programs include both those that are developed and those implemented by a single institution or organization (federal or provincial government, or for-profit or not-for-profit organization). They do not include regular post-secondary education programs.

Some provinces have introduced training programs to help support and incentivize workforce development. Through this strategy, provinces provide employers with a variety of face-to-face skill development and career services that help employees adapt to changing work environments. For example, the Alberta Workplace Essential Skills Society offers to conduct employee skill assessments for organizations looking to improve retention, productivity and employee performance. Assessments are used to determine and develop customized training programs (Government of Alberta 2013). Newfoundland and Labrador have developed the Human Resources Manager, an online repository of resources, tips and tools to help employers retain existing employees through skill development and training (Government of Newfoundland and Labrador 2018).

Some local governments and organizations have developed education and training programs such as technology-based workshops led by employment centres, local libraries or not-for-profit organizations. These programs are free to the public and include introductory and intermediate-level computer skills. The Calgary Public Library, for example, delivers monthly workshops for applications such as Microsoft Word, Microsoft Excel and Cloud-based storage (Calgary Public Library 2018). Other examples include New Media Manitoba, a not-for-profit organization that recruits industry experts to lead free monthly workshops for more advanced technology applications (New Media Manitoba 2018).

The jurisdictional scan also sought to track how the private sector has responded to technological displacement; however, it yielded only limited information. One of the reasons for this could be that private businesses choose not to make their intervention tactics public, or they lack the appropriate medium in which to do so. Among the training/education initiatives that have been publicized, the United Steelworkers Local’s Northern Skills Training (NST) program is particularly noteworthy. Through the program, skill assessments are administered to determine gaps in knowledge relating to new technologies. Subsequently, employees are assigned to training or education programs, through a third-party provider, to obtain the skills necessary to maintain employment and to advance within their industry (Everitt 2013). Other private-sector strategies include retraining workers who would otherwise be displaced in different occupational roles. For example, Telus Canada transitioned workers in customer calls to sales after implementing a new automated voice directory (Brethour 2006).
Grants or Payments for Education and Training

Federal and provincial governments are primarily responsible for the development and allocation of grants or direct payments made available for education and training initiatives in support of technological skill development or in order to prevent displacement caused by technology. A small amount of that grant funding is available through not-for-profit organizations such as the Columbia Basin Trust, which makes funding available to individuals in need of short-term training and/or skills upgrading (Columbia Basin Trust 2018). Other incentives include tax credits or direct payments to sectors significantly disrupted by technological change.

The Canada Job Funds (CJF) agreement is one key funding and policy framework in Canada. Through this arrangement, federal cash is allocated to each province to develop and implement training programs and other initiatives to incentivize private-sector investment in training, increase labour force participation and improve skill development among working and future working citizens. CJF has three separate program streams (Government of Canada 2016a). The Canada Jobs Grant subsidizes two-thirds of employee-sponsored training costs. Employer Sponsored Training offers eligible employers financial aid to retrain employees who would otherwise be displaced. And Employment Services and Supports provides a range of career development services to unemployed workers who do not qualify for employment insurance benefits and to low-skilled employed workers.

Quebec has agreed to a training delivery model separate from the Canada Jobs Funds which requires employers to invest at minimum one per cent of their annual payroll into training or pay an equivalent levy. The Labour Market Partners Commission of Quebec is tasked with fostering employer and government relations to improve the design and implementation of training programs (Government of Canada 2016a). In addition to the CJF, federal tax incentives promote investment in employee training by increasing the after-tax return to employees for such expenditures (Canada, Department of Finance 2018). Provinces may also choose to provide grant funding for training and education; however, these strategies vary according to jurisdiction. As one example, British Columbia has developed the Tech Co-op Grants Program which provides financial assistance to businesses in the technology sector to support hiring, maintaining employees and skill development (Government of British Columbia 2018).

Initiatives that Support the Development of Education or Training Programs

These initiatives consist of government and not-for-profit or for-profit interventions that may lead to the development of future education or training programs. This type of intervention largely involves partnerships between sectoral leaders and government, or a cluster of industry stakeholders which convene to address sector-related concerns.

The Innovation Supercluster Initiative (ISI) is one leading federal program. Industry-led consortia (large firms, innovative small- and medium-sized enterprises, industry-relevant research institutions and business leaders) are encouraged to partner on projects that may stimulate regional innovation
ecosystems. Outcomes include retraining programs (for example, in digital skills development) for the existing workforce; assessment of an industry's current or anticipated workforce needs; and building awareness of industry demand for skilled talent across stakeholder groups (such as students, workers, firms, universities and vocational colleges and policymakers) (Government of Canada 2017a). In addition, the federal government has created the Sectoral Initiative Program which is designed to aggregate and distribute labour market information to address current and emerging skills shortages (Government of Canada 2017b).

Similar to ISI, some provinces have developed Labour Market Partnership (LMP) programs to promote future education/training opportunities. LMPs offer financial assistance to businesses in order to encourage and facilitate tactics and activities that help address local labour market or human resources concerns (Ontario, Ministry of Advanced Education and Skill Development 2010). Other provincial strategies include the development of skill task forces which are responsible for identifying future skills and workers' ability to attain these skills, and strategizing on solutions to industry-related problems (Government of Newfoundland and Labrador 2009).

Apprenticeship Education and Training

Apprenticeships are another form of technological skills investment in Canada. These are employment and education/training programs that allow job seekers to earn a wage while learning a skilled profession in a specific field. Apprenticeships often target emerging industries and allow participants to pair classroom studies with on-the-job training supervised by a skilled sector employee.

The provinces are predominantly responsible for funding and delivering these programs, although a small amount of grant funding is available through the federal Apprenticeship and Completion Grant (Government of Canada 2016b). Primarily targeted toward young workers, these programs allow participants to earn a wage while engaged in employment and education/training opportunities. Moreover, they connect employers with skilled technology workers, which in turn leads to improved employment rates for recent graduates. Some of the current apprenticeship programs are applicable to technology-inclusive sectors such as information technology and industrial manufacturing (Government of Canada 2016b).

Other common apprenticeships target students at the secondary school level. Provincial youth apprenticeships allow students, generally 16–19 years of age, to work in a skilled trade while earning a wage and receiving credits toward their high school diploma. These programs also help facilitate smoother transitions into post-secondary-level education (Saskatchewan Apprenticeship and Trades Certification Commission 2016). Summer Youth Apprenticeship programs target high school students in grades ten and eleven, and allow students to participate in paid, five- to seven-week apprenticeships over the summer (Nova Scotia Apprenticeship Agency 2018).
Youth Training and Education

These programs focus on K-12 students to help to develop skills or support hands-on experiences through internships or co-ops in technology-related fields. These services thus provide young people an opportunity to acquire the skills necessary to compete in technology- and other future-oriented work.

The Youth Employment Strategy (YES) is the primary federal policy framework guiding training and education initiatives for youth aged 15–30. The YES has two program streams relating to technological skill development. Career Focus provides financial assistance to employers who create professional development opportunities that promote the skills and knowledge necessary to participate in current and future modes of work (Government of Canada 2016c). Canada Summer Jobs provides funding to employers who create youth job opportunities. Preference is given to employers that support STEM-related work, particularly for women (Government of Canada 2016d). Provincial strategies consist primarily of transitional support for secondary and post-secondary graduates as they further their education or enter the workforce, and summer employment opportunities for high school students. Some provincially delivered programming, such as Nova Scotia’s Student Summer Skills Initiative (Nova Scotia Department of Labour and Advanced Education 2011) and Prince Edward Island’s Youth Internship Program—Technology in the Trades program, directly mention technology as a focused skill set (Government of Prince Edward Island 2018).

In addition to programming, some provinces are choosing to modernize curriculum and teaching practices. Ontario’s Technology and Learning Fund is used to incorporate new technologies into the classroom, support teacher professional development in technology, and incentivize new didactic and pedagogical methods of teaching in technology inclusive-environments (Council of Ontario Directors of Education 2015).

Job-related Transition Assistance for Employees or Displaced Workers

This type of intervention focuses strictly on programming that helps workers transition into different occupational roles within their existing company or enter a new career path. The dominant forms of this assistance are government-operated employment centres which offer a range of job loss and displacement services; and skills assessment, which allows workers to quantify their current skill set through an accredited service and then leverage their assessment for work in a related or different occupation. Other forms of transitional programming look to support high school and post-secondary students as they move toward further education or the labour market.

Labour adjustment and transitional services are a form of intervention whereby provincial governments support workers at risk of dislocation to either attain different occupational roles within their existing company or begin a new career path. The following sections highlight the two dominant types of service under this theme.
Recognition of prior learning (RPL) is a popular transitional service. RPL takes inventory of workers’ current skill set using an accredited assessment tool. Workers can then leverage their assessment for work in a related or different occupation or identify gaps in knowledge for further training needs. Some provinces highlight RPL as an effective approach for workers who are displaced by new technologies, particularly in the forestry and manufacturing sectors (e.g. Nova Scotia Department of Labour and Workforce Development 2009).

Labour Adjustment Services are a provincial form of assistance which provides displaced workers with a variety of human resource services that would help them re-enter or transition within the labour force. Assistance could include employment and career consultations, presentations, information and publications regarding layoffs, and connecting employees with potential employers (Government of Manitoba 2018).

Overall, we see a large range of programs with an enormous breadth of targets. Nonetheless, we see gaps between what the research on future skills suggests and what many of these programs target. Furthermore, many do not draw on the limited research findings about best practice in terms of program delivery. Finally, discussion of evaluation of the effectiveness of these programs is limited at best, raising questions about the effectiveness of the support they provide at a time when it is badly needed.

Discussion and Conclusion

As the literature review reveals, research has begun to tackle the question of what is to be done in an era of large-scale technological disruption and, in particular, how technology is leading to employment displacement; what skills are necessary to complement technological change; and what kinds of policy responses can support workers who are affected by displacement. Beyond the general “futurist” literature and the increasing number of policy and consulting reports, however, the amount of empirical analysis of these trends remains small. Academic researchers from a number of disciplines, including economists and labour historians, political scientists and political economists, sociologists, and other researchers, have not yet started talking to each other in a systematic way in order to comprehensively examine the phenomenon under study. This research would thus benefit from a much wider multidisciplinary scholarly lens and empirically grounded research on the experiences of workers and the kinds of education and training that complement these technological changes.

The next question is whether policy makers are acting on the basis of what has been identified in the literature as effective. Much of the literature calls for increased state involvement in coordinating markets and training, but the predominant state response appears to take the form of active labour market policies, without knowing fully whether those traditional ALMPs work in existing labour markets, much less in a massively disrupted labour market, and without thinking about the entire basket of
policies and programs that are necessary to support workers. Much more research on what works and, in particular, what works in the new context of the disrupted economy is crucial.

It is important to remember that policy conversations about how to respond to the changing world of work need to take into account the constraints of existing institutions and existing policy practices. Insights from historical institutional scholarship emphasize the challenges governments face in significantly veering from path dependent approaches to policy (Thelen 2004). So far, policy responses in Canada have been characterized by incremental changes that largely deepen the social investment approach to social policy. This approach posits that improving the stock and flow of human capital in a labour market will decrease unemployment and generally increase incomes (Gingrich and Ansell 2015; Hemerijck 2015). To date, in Canada, there has been no paradigmatic shift in response to rising concerns about technological disruption of the workforce (Jansen and Robbins 2018). While some changes have been made to education and skills training, so far workers’ entitlements to Employment Insurance, supplementary forms of health insurance, sick leave and maternity leave do not appear to be part of the discussion about responding to technological disruption—despite acknowledgement that technological disruption will deepen the current trend toward contract work over employment. The bifurcation in support offered to contractors compared with employers has been noted, but not resolved (Johal and Thirgood 2016). Instead, the gap in access to state support between people who can access employment insurance and those who cannot remains in place. Contractors on low incomes (and especially micro-contractors—see Bajwa et al. 2018) lack access to employer-sponsored training and to a swathe of active labour market programs for which access depends on having employment insurance. These anticipated labour market disruptions are thus being layered onto existing systems of social and economic stratification. Added to the policy making challenges is the fact that these technological changes are occurring in the context of widening income and wealth inequality, particularly in liberal market economies such as the United States, Great Britain and Canada (Corak 2013). Some literature notes the link between technological change and the reorganization of productive value to rising inequality. A number of reports and scholarly accounts argue that technological change has and will increase demand for highly skilled workers especially (Brynjolfsson and McAfee 2011, 2014; Manyika et al. 2017). Brynjolfsson and McAfee (2011, 2014) argue that digitization has been contributing to the concentration of wealth and income. Those who can alter technology (by way of skill or intellectual property) have a large market from which to draw profit, but many whose skills were previously needed will experience reduced incomes. This is evident in the declining demand for human labour to complete routine tasks, which can be seen in the changing language used in job ads between 1960 and 2000 (Atalay et al. 2017). Income polarization has also been tied to technological change, although other factors such as labour and financial regulation play a role in shaping these trends (Atkinson 2015; Autor 2015a; Cowen 2013).

One notable consideration is the changing relationship between skills and job quality. The social policy implications of a new world of work where more and more people are responsible not only for their own employment but also for the attendant risks such as sickness, job loss and underemployment are
considerable (Hacker 2004; see also Bajwa et al. 2018). Exposure to these risks also varies by gender, race and migration status—at least in Canada and likely elsewhere as well (Vosko and Clark 2009). How does the social safety net need to respond to a “fissured workplace” (Weil 2014) where employers and firms are shedding responsibility for providing workplace benefits? As employees morph into individual ‘entrepreneurs,’ and firms take less responsibility for providing employee benefits, who should take on the responsibility for providing those benefits? To put it more bluntly, in an era of TaskRabbit, who is responsible for social policy benefits? Such a concern applies to any state in which some benefits are tied to employment status.

Of course, it is not guaranteed that technologies will mostly be used to replace humans undertaking tasks considered “low-skill,” as not all these tasks are routine and the decision to replace human labour with technology depends on the elasticity of the labour supply along with firm propensity to invest in switching to higher rates of capital in production (Autor 2015a). Indeed, in general, skill requirements of jobs have increased since the late 1970s (Spitz-Oener 2006).

Furthermore, managing the demand for highly skilled workers may pose issues associated with pace. Meier and Schiopu (2015) argue that skill-biased technological change may have triggered over-enrollment in higher education. We may already have an oversupply of workers with well-developed skills that apply both to specific careers and general skills. In the US, at least, there are some concerns about the supply of non-white collar workers. Another concern is whether the global financial crisis and other trends in wage inequality have hindered the abilities of younger workers to invest in their own training. Such a process is likely to have intergenerational effects, as each generation’s ability to invest in education is diminished (Sachs and Kotlikoff 2012). Thus, policy makers need to redouble efforts to invest in research as to who works and what works in this new technological era.
References


Piva, M., & Vivarelli, M. 2009. The Role of Skills as a Major Driver of Corporate R&D. International Journal of Manpower; Bradford, 30(8), 835–852. http://dx.doi.org.m yaccess.library.utoronto.ca/10.1108/01437720911004452


Appendix 1: Literature Review

This literature review includes the results of our search for literature that discusses education or training responses to technological disruption. Our research questions for this work were: what is the state of knowledge regarding technological disruption and its implications for skills and training across the lifespan of a worker? What are the main trends in speculation regarding the future of education and skills training given developing technological disruptions?

The review contains sources published during or after 2006. We first entered key words based on recommendations from librarians and academic experts on automation and political economy, and completed Google scholar searches using different combinations of these keywords. The keywords used in these searches are provided in the table below. Combinations of the terms in the table below were included. Additional terms in blue were added for the jurisdictional scan which will be described below.

<table>
<thead>
<tr>
<th>Worker Force</th>
<th>Technological change</th>
<th>Education</th>
<th>Policy or program change</th>
<th>Displaced</th>
<th>Jurisdiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employ*</td>
<td>Technolog*</td>
<td>Training</td>
<td>Policy change</td>
<td>Displac*</td>
<td>Canada</td>
</tr>
<tr>
<td>Work*</td>
<td>Technological change</td>
<td>Vocational</td>
<td>Policy innovation</td>
<td>Disrupt*</td>
<td>Province (individually)</td>
</tr>
<tr>
<td>Labour force</td>
<td>SBTC</td>
<td>Occupational</td>
<td>Innovation</td>
<td>Unemploy*</td>
<td></td>
</tr>
<tr>
<td>Trends</td>
<td>Education</td>
<td>Change</td>
<td>Technological unemployment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change</td>
<td>Retraining</td>
<td>Curriculum</td>
<td>Dislocated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response</td>
<td>Apprentice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sources were selected based on manual abstract scans and grouped into three categories: social/political disruption; education; and policy levers. This stage served to generate an impression of the existing literature and inform the process of narrowing the scope of the project.
We also undertook systematic database searches. Four databases were selected based on their relevance and on the interdisciplinary commitment of this project: ProQuest, EbscoHost (which includes Business Source Premier, Child Development and Adolescent Studies, EconLit, Education Source, Left Index), JStor and EconPapers. These databases were searched using the same set of search terms outlined in the table above. Abstract or Boolean only searches were used when available. Searches were limited to full text, English-only texts published between January 2006 and 2018. Works that did not primarily focus on either education or technological change were excluded, in line with the focus of the research questions set out.

The literature review categorizes each entry under one of the following headings, based on the main theme in the literature. Note that there is significant thematic overlap between some of these folders. In this case, entries were categorized based on the entry’s main focus.

**Education and training:** One strand of literature focuses on the relationship between education and skills needed in the workforce. This literature has three main aspects. First, it discusses the role of different levels of education in training people to utilize new technologies in the workplace. Second, it sets out how education systems have responded to changing labour market demands driven by technological change. Finally, it analyzes the use of new technologies such as MOOCs and virtual reality as educational tools.

**Technology and displacement:** A second strand of literature debates the impact of technology on changing demand for skills. Scholars debate whether automation is destroying low-, middle- or high-skilled work. The literature uses various estimation techniques to provide estimates of the impact of machine learning and mobile robotics that use task-based approaches. It also includes some discussions of the impact of technology on broader social phenomena, including redistribution.

**Skills needed to complement technological changes:** While there is some overlap with the previous two categories, literature in this area explicitly debates what skills are needed. Three main themes emerge: the need for “socio-emotional” and managerial skills to organize human labour to work with technology; the need for specialized knowledge of emerging technologies; and the need to “learn how to learn” in order to remain adaptable.

**Responses to the changing workforce within Canada:** Sources that specifically discuss the impact of changing technology on employment and education in Canada explicitly are separated out from the other areas.

**Workforce displacement:** Literature in this area discusses the implications of workforce displacement more broadly.
Retraining after displacement: Given that workforce disruption is a wider phenomenon, literature that provides empirical discussions of retraining methods for displacement not necessarily caused by technological change is included in this category.

Politics, public policy and disruption: Literature in this area outlines political and public policy-related responses and dynamics with respect to technological disruption that do not focus on education and training.

Displacement general: This literature surveys the more wide-ranging economic effects of work displacement.

Sources are cited in line with the APA guidelines. Please note that some sources may be behind a paywall and were accessed using the University of Toronto’s library access.

Research questions and theses were drawn from scans of the sources included and have been provided to assist researchers with selecting relevant material for their own projects. Jurisdictions analyzed in the source material vary between the local, state/provincial and national level and include many cross-country comparisons. The main country of focus is noted in the jurisdiction column.
Appendix 2: Jurisdictional Scan

The jurisdictional scan was conducted in two phases. Phase one consisted of a systematic search of media sources and government literature to locate government interventions or corporate initiatives to mitigate worker displacement caused by technological change. Two databases were selected based on their relevance to this project: EbscoHost and Proquest database (specifically Global Newsstream and Canadian Major Dailies). Database thesauruses were also used to narrow term selection. Searches were further limited to full text, newspaper articles, reports, academic articles, government or official documents, news releases, reference documents, statistics/data reports, all after 1 January 2006. Databases were searched using the set of search terms highlighted in blue above. The exploded search term option was selected when available. Searches were revised when over 400 results were returned to maximize efficiency.

The first stage of the scan helped to delineate the broad policy frameworks at both federal and provincial/state levels of government that support workers affected by technological change. This stage also helped us to understand how for-profit and not-for-profit entities respond to disruption. The second phase of the jurisdictional scan was conducted by combing through online government resources. Policies and initiatives were aggregated from federal and provincial websites and were selected based on their applicability to the categories listed above and their relevance to the project. Provincial websites were reviewed individually to differentiate the inter-domestic response to technological disruption.

Search results were reviewed for relevance, entered into the search database, and organized according to relevance, from most relevant, where the article explicitly reported on changes to policy, education or training as a result of technological change, to least relevant where displacement or technological change are discussed but without linking to education, training or other policy.

Guide to Using the Jurisdictional Scan

Each initiative identified in the jurisdictional scan is divided into one of seven broad categories and then further organized at the individual program level.

Policies and programs are categorized as follows:

- *Education and training*: this category highlights education or training programs that are both developed and implemented by a single institutional body (federal or provincial/state government, or for-profit or not-for-profit organizations).
- *Grants or direct payments for education and training*: federal or provincial/state governments are primarily responsible for the development and allocation of grants for education and training.
initiatives. Grant funding is also available through not-for-profit organizations. Other incentives include tax credits or direct payments to sectors significantly disrupted by technological change.

- **Apprenticeship education and training**: an employment and education/training program that allows job seekers to earn a wage while learning a skilled profession in a specific field. Apprenticeships often target emerging industries and allow participants to pair classroom studies with on-the-job training supervised by a skilled sector employee.

- **Initiatives that support the development of education or training programs**: government and not-for-profit/for-profit strategies that may lead to the development of future education or training programs. This type of intervention largely involves partnerships between sectoral leaders and government or a cluster of industry stakeholders who convene to address sector-related concerns.

- **Job-related transition assistance for employees or dislocated workers or recent graduates**: this type of intervention focuses strictly on transitional programming that would help workers attain different occupational roles within their existing company, or enter a new career path. The dominant forms of this assistance are government-operated employment centres which offer a range of job loss/displacement services; and skills assessment, which allows workers to quantify their current skill set through an accredited service and then leverage their assessment for work in a related or different occupation. Other forms of transitional programming looks to support high school and post-secondary students as they move toward further education or the labour market.

- **Youth training and education**: K-12 programs that help to develop skills or support hands-on experiences through internships or co-ops in technology-related fields. These services provide youth an opportunity to acquire the skills necessary to compete for and in future modes of work.

<table>
<thead>
<tr>
<th>Policy Intervention</th>
<th>Number of Programs in Jurisdictional Scan of Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education/training</td>
<td>67</td>
</tr>
<tr>
<td>Grants/direct payments for education and training</td>
<td>15</td>
</tr>
<tr>
<td>Initiatives that support the development of education/training programs</td>
<td>55</td>
</tr>
<tr>
<td>Apprenticeship education and training</td>
<td>18</td>
</tr>
<tr>
<td>Youth training/education</td>
<td>22</td>
</tr>
<tr>
<td>Job-related transition assistance for employees or dislocated workers or recent graduates</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>191</strong></td>
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</table>