CHAPTER 11: EDUCATION, TRAINING AND EARNINGS DIFFERENTIALS

11.1 - STRUCTURAL CHANGES IN THE ECONOMY: THE GROWTH OF A KNOWLEDGE SOCIETY

The digital age

In a digital age, we are surrounded, indeed, immersed, in technology. Furthermore, the rate of technological change shows no sign of slowing down. Technology is leading to massive changes in the economy, in the way we communicate and relate to each other, and increasingly in the way we learn. Yet our educational institutions were built largely for another age, based around an industrial rather than a digital era.

Thus teachers and instructors are faced with a massive challenge of change. How can we ensure that we are developing the kinds of graduates from our courses and programs that are fit for an increasingly volatile, uncertain, complex and ambiguous future? What should we continue to protect in our teaching methods (and institutions), and what needs to change?

To answer these questions, this book:

- discusses the main changes that are leading to a re-examination of teaching and learning;
- identifies different understandings of knowledge and the different teaching methods associated with these understandings;
- analyses the key characteristics of technologies with regard to teaching and learning;
- recommends strategies for choosing between media and technologies;
- recommends strategies for high quality teaching in a digital age.

In this chapter I set out some of the main developments that are forcing a reconsideration of how we should be teaching.

The changing nature of work

Of the many challenges that institutions face, one is in essence a good one, and that is increased demand, particularly for post-secondary education. Figure 1.1.2 below represents the extent to which knowledge has become an increasingly important element of economic development, and above all in job creation.

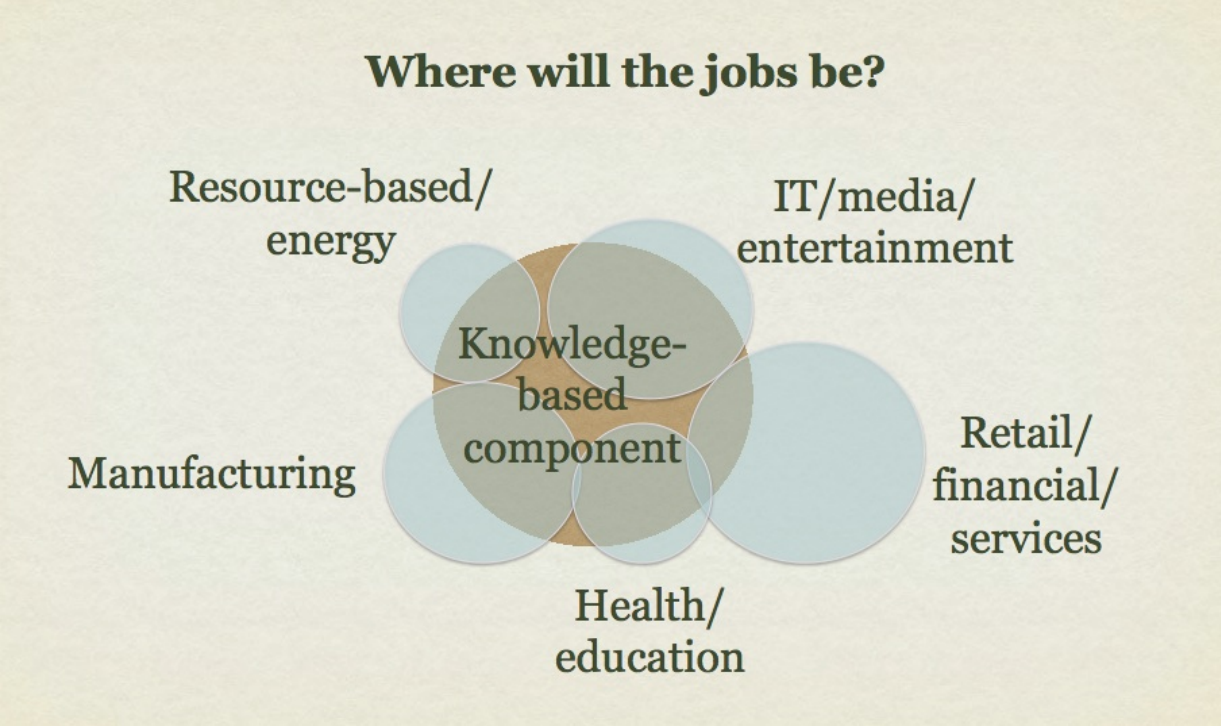

Figure 11.1a. The knowledge component in the workforce. Jobs: where will they be (https://pressbooks.bccampus.ca/teachinginadigitalagev2/chapter/structural-changes-in-the-economy-the-growth-of-a-knowledge-society/) by Anthony William (Tony) Bates licensed under CC BY-NC-4.0 International.

The **Figure 11.1a** is symbolic rather than literal. The pale blue circles representing the whole work force in each employment sector may be larger or smaller, depending on the country, as too will be the proportion of knowledge workers in that industry, but at least in developed countries and also increasingly in economically emerging countries, the knowledge component is growing rapidly: more brains and less brawn are required (see OECD, (https://www.oecd.org/skills/piaac/Skills%20volume%201%20(eng)--full%20v12--eBook%20(04%2011%202013).pdf)2013a). Economically, competitive advantage goes increasingly to those companies and industries that can leverage gains in knowledge (OECD, 2013b (https://www.oecd.org/competition/competitionpolicyandknowledge-basedcapital-2013.htm)). Indeed, knowledge workers often create their own jobs, starting up companies to provide new services or products that did not exist before they graduated.

From a teaching perspective the biggest impact is likely to be on technical and vocational instructors and students, where the knowledge component of formerly mainly manual skills is expanding rapidly. Particularly in the trades areas, plumbers, welders, electricians, car mechanics and other trade-related workers are needing to be problem-solvers, IT specialists and increasingly self-employed business people, as well as having the manual skills associated with their profession.

Artificial intelligence (AI) is another development that is already affecting the workforce. Routine work,

whether clerical or manual, is being increasingly replaced by automation. Although all kinds of jobs are likely to be affected by increased automation and applications of AI, those in the workforce with lower levels of education are likely to be the most impacted. Those with higher levels of education are likely to have a better chance of finding work that machines cannot do as well – or even creating new work for themselves.

Knowledge-based workers

There are certain common features of knowledge-based workers in a digital age:

- they usually work in small companies (less than 10 people);
- they sometimes own their own business, or are their own boss; sometimes they have created their own job, which didn't exist until they worked out there was a need and they could meet that need;
- they often work on contract or are self-employed, so they move around from one job to another fairly frequently (the gig economy);
- the nature of their work tends to change over time, in response to market and technological developments and thus the knowledge base of their work tends to change rapidly;
- they are digitally smart or at least competent digitally; digital technology is often a key component of their work;
- because they often work for themselves or in small companies, they play many roles: marketer, designer, salesperson, accountant/business manager, technical support, for example;
- they depend heavily on informal social networks to bring in business and to keep up to date with current trends in their area of work;
- they need to keep on learning to stay on top in their work, and they need to manage that learning for themselves;
- above all, they need to be flexible, to adapt to rapidly changing conditions around them.

It can be seen then that it is difficult to predict with any accuracy what many graduates will actually be doing ten or so years after graduation, except in very broad terms. Even in areas where there are clear professional tracks, such as medicine, nursing or engineering, the knowledge base and even the working conditions are likely to undergo rapid change and transformation over that period of time.

This is good news for the higher or post-secondary education sector overall (universities and colleges) as the knowledge and skill levels needed in the workforce increases. It has resulted in a major expansion of post-secondary education to meet the demand for knowledge-based work and higher levels of skill. The post-secondary enrolment rate of 19-year-olds across all Canadian provinces increased steadily from 53% in 2001 to 64% in 2014, equivalent to a 21% rise over the 13-year period (Frenette, 2017 (https://www150.statcan.gc.ca/

n1/pub/11-626-x/11-626-x2017070-eng.htm)). This means more students for universities and colleges, even where population trends are flat or even declining.

Activity 1.1 Thinking about skills

1. What kind of jobs are graduates in your subject discipline likely to get? Can you describe the kinds of skills they are likely to need in such a job? To what extent has the knowledge and skills component of such work changed over the last 20 years?

2. Look at the family members and friends outside your academic or educational field. What kind of knowledge and skills do they need now that they didn't need when they left school or college? (You may need to ask them this!)

3. Exactly how are you assisting your students develop such skills through your teaching? Is this centre or peripheral to your work? Is this part of your job – or someone else's?

There is no feedback on this activity.

Attribution

References from original Teaching in a Digital Age: guidelines from designing teaching and learning (2nd ed.) (https://pressbooks.bccampus.ca/teachinginadigitalagev2/)

References

OECD (2013a) *OECD Skills Outlook: First Results from the Survey of Adult Skills* (https://read.oecd-ilibrary.org/education/oecd-skills-outlook-2013_9789264204256-en#page1) Paris: OECD

OECD (2013b) *Competition Policy and Knowledge-Based Capital* (https://www.oecd.org/competition/competitionpolicyandknowledge-basedcapital-2013.htm) Paris: OECD

Frenette, M. (2017) *Postsecondary Enrolment by Parental Income: Recent National and Provincial Trends* (https://www150.statcan.gc.ca/n1/pub/11-626-x/11-626-x2017070-eng.htm) Ottawa: Statistics Canada

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11.2 - PRODUCTIVITY AND EDUCATION

Human capital is the result of past investment that raises future incomes. A critical choice for individuals is to decide upon exactly how much additional human capital to accumulate. The cost of investing in another year of school is the *direct cost*, such as school fees, plus the *indirect*, or *opportunity*, *cost*, which can be measured by the foregone earnings during that extra year. The benefit of the additional investment is that the future flow of earnings is augmented. Consequently, wage differentials should reflect different degrees of education-dependent productivity.

Age-earnings profiles

Figure 11.2a illustrates two typical age-earnings profiles for individuals with different levels of education. These profiles define the typical pattern of earnings over time, and are usually derived by examining averages across individuals in surveys. Two aspects are clear: People with more education not only earn more, but the spread tends to grow with time. Less educated, healthy young individuals who work hard may earn a living wage but, unlike their more educated counterparts, they cannot look forward to a wage that rises substantially over time. More highly-educated individuals go into jobs and occupations that take a longer time to master: Lawyers, doctors and most professionals not only undertake more schooling than truck drivers, they also spend many years learning on the job, building up a clientele and accumulating expertise.

Age-earnings profiles define the pattern of earnings over time for individuals with different characteristics.

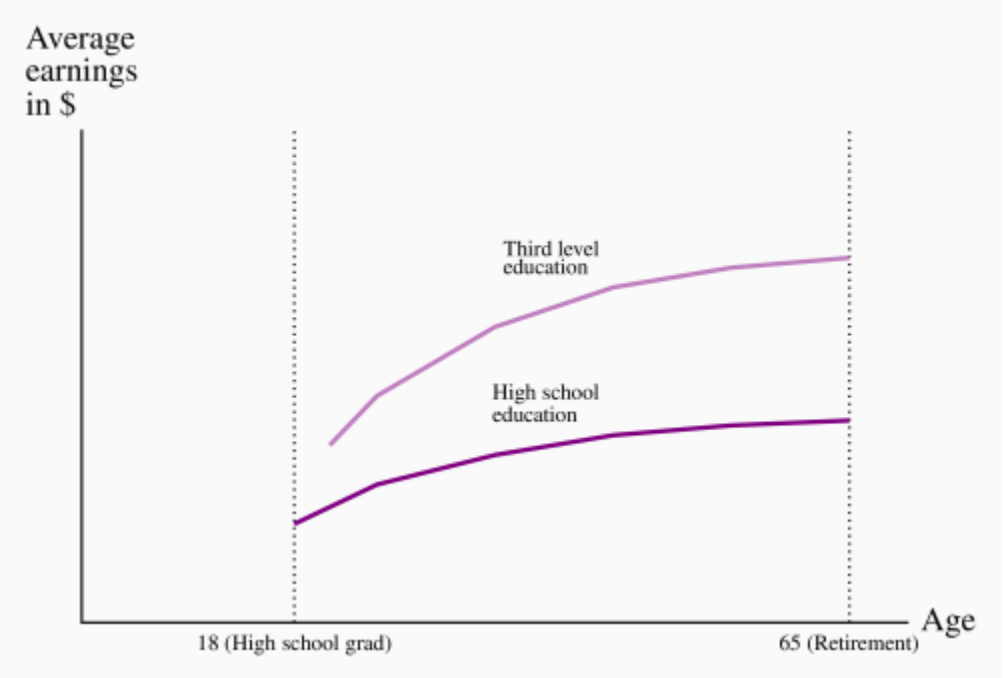

Figure 11.2a Age-Earnings profiles by education level: Individuals with a higher level of education earn more than individuals with a 'standard' level of education. In addition, the differential grows over time. Age-Earnings profiles by education level (https://socialsci.libretexts.org/Bookshelves/Economics/Principles_of_Microeconomics_(Curtis_and_Irvine)/05%3A_The_Factors_of_Production/13%3A_Human_capital_and_the_income_distribution/13.02%3A_Productivity_and_education) by Douglas Curtis and Ian Irvine under a CC BY-NC-SA 4.0.

The education premium

Individuals with different education levels earn different wages. The education premium is the difference in earnings between the more and less highly educated. Quantitatively, Professors Kelly Foley and David Green have recently proposed that the completion of a college or trade certification adds about 15% to one's income, relative to an individual who has completed high school. A Bachelor's degree brings a premium of 20-25%, and a graduate degree several percentage points more1. The failure to complete high school penalizes individuals to the extent of about 10%. These are average numbers, and they vary depending upon the province of residence, time period and gender. Nonetheless the findings underline that more human capital is associated with higher earnings. The earnings premium depends upon both the supply and demand of high HK individuals. *Ceteris paribus*, if high-skill workers are heavily in demand by employers, then the premium should be greater than if lower-skill workers are more in demand.

Education premium: the difference in earnings between the more and less highly educated.

The distribution of earnings has become more unequal in Canada and the US in recent decades, and one

reason that has been proposed for this development is that the modern economy demands more high-skill workers; in particular that technological change has a bigger impact on productivity when combined with high-skill workers than with low-skill workers. Consider Figure 11.2b which contains supply and demand functions with a twist. We imagine that there are two types of labour: One with a high level of human capital, the other with a lower level. The vertical axis measures the wage *premium* of the high-education group (which can be measured in dollars or percentage terms), and the horizontal axis measures the *fraction of the total labour force that is of the high-skill type*. *D* is the *relative* demand for the high skill workers, in this example for the economy as a whole. There is some degree of substitution between high and low-skill workers in the modern economy. We do not propose that several low-skill workers can perform the work of one neuro-surgeon; but several individual households (low-skill) could complete their income tax submissions in the same time as one skilled tax specialist. In this example there is a degree of substitutability. In a production environment, a high-skill manager, equipped with technology and capital, can perform the tasks of several line workers.

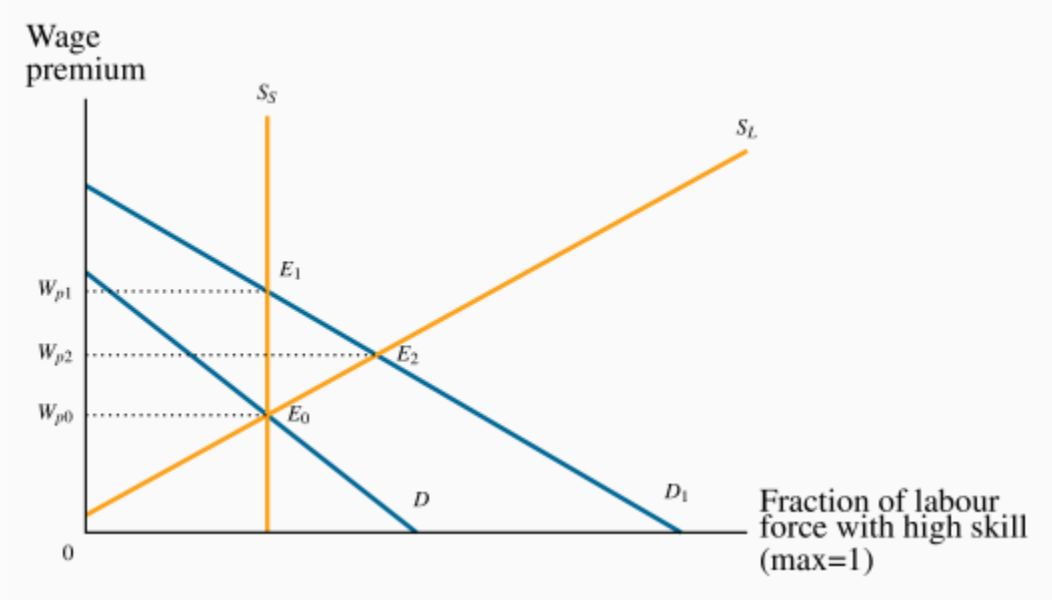

Figure 11.2b The education/skill premium: A shift in demand increases the wage premium in the short run (from E_0 to E_1) by more than in the long run (to E_2). In the short run, the percentage of the labour force (S_S) that is highly skilled is fixed. In the long run it (S_L) is variable and responds to the wage premium. The education/skill premium by Douglas Curtis and Ian Irvine licensed under CC BY-NC-SA.

The demand curve *D* defines the premium that employers (demanders) are willing to pay to the higher skill group. The negative slope indicates that if demanders were to employ a high proportion of skilled workers, the premium they would be willing to pay would be less than if they demanded a smaller share of high-skilled workers, and a larger share of lower-skilled workers. The wage premium for high HK individuals at any given time is determined by the intersection of supply and demand.

In the short run the make-up of the labour force is fixed, and this is reflected in the vertical supply curve S_s. The equilibrium is at E_0, and W_p^0 is the premium, or excess, paid to the higher-skill worker over the lower-skill worker. In the long run it is possible for the economy to change the composition of its labour supply: If the wage premium increases, more individuals will find it profitable to train as high-skill workers. That is to say, the fraction of the total that is high-skill increases. It follows that the long-run supply curve slopes upwards.

So what happens when there is an increase in the demand for high-skill workers relative to low-skill workers? The demand curve shifts upward to D_1 , and the new equilibrium is at E_1. The supply mix is fixed in the short run, so there is an increase in the wage premium. But over time, some individuals who might have been just indifferent between educating themselves more and going into the workplace with lower skill levels now find it worthwhile to pursue further education. Their higher anticipated returns to the additional human capital they invest in now exceed the additional costs of more schooling, whereas before the premium increase these additional costs and benefits were in balance. In Figure 13.2 the new short-run equilibrium at E_1 has a corresponding wage premium of W_p^1 . In the long run, after additional supply has reached the market, the increased premium is moderated to W_p^2 at the equilibrium E_2 .

This figure displays what many economists believe has happened in North America in recent decades: The demand for high HK individuals has increased, and the additional supply has not been as great. Consequently the wage premium for the high-skill workers has increased. As we describe later in this chapter, that is not the only perspective on what has happened.

Are students credit-constrained or culture-constrained?

The foregoing analysis assumes that students and potential students make rational decisions on the costs and benefits of further education and act accordingly. It also assumes implicitly that individuals can borrow the funds necessary to build their human capital: If the additional returns to further education are worthwhile, individuals should borrow the money to make the investment, just as entrepreneurs do with physical capital.

However, there is a key difference in the credit markets. If an entrepreneur fails in her business venture the lender will have a claim on the physical capital. But a bank cannot repossess a human being who drops out of school without having accumulated the intended human capital. Accordingly, the traditional lending institutions are frequently reluctant to lend the amount that students might like to borrow—students are credit constrained. The sons and daughters of affluent families therefore find it easier to attend university, because they are more likely to have a supply of funds domestically. Governments customarily step into the breach and supply loans and bursaries to students who have limited resources. While funding frequently presents an obstacle to attending a third-level institution, a stronger determinant of attendance is the education of the parents, as detailed in Application Box 13.1.

Application Box 13.1 Parental education and university attendance in Canada

The biggest single determinant of university attendance in the modern era is parental education. A recent study* of who goes to university examined the level of parental education of young people 'in transition' – at the end of their high school – for the years 1991 and 2000.

For the year 2000 they found that, if a parent had not completed high school, there was just a 12% chance that their son would attend university and an 18% chance that a daughter would attend. In contrast, for parents who themselves had completed a university degree, the probability that a son would also attend university was 53% and for a daughter 62%. Hence, the probability of a child attending university was roughly four times higher if the parent came from the top educational category rather than the bottom category! Furthermore the authors found that this probability gap opened wider between 1991 and 2000.

In the United States, Professor Sear Reardon of Stanford University has followed the performance of children from low-income households and compared their achievement with children from high-income households. He has found that the achievement gap between these groups of children has increased substantially over the last three decades. The reason for this growing separation is not because children from low-income households are performing worse in school, it is because high-income parents invest much more of their time and resources in educating their children, both formally in the school environment, and also in extra-school activities.

*Finnie, R., C. Laporte and E. Lascelles. "Family Background and Access to Post-Secondary Education: What Happened in the Nineties?" Statistics Canada Research Paper, Catalogue number 11F0019MIE-226, 2004

Reardon, Sean, "The Great Divide", New York Times, April 8, 2015.

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11.3 - PUTTING IT TOGETHER: LABOUR MARKETS

In this module, we learned about labour markets, wages, and other factors affecting employment, such as discrimination. Teachers and nurses are paid less than professional athletes because the market values the former less than the latter. In other words, our actions say that we are willing to pay professional athletes more than teachers and nurses. This may be because athletes are employed through the private sector while most teachers and nurses are employed by the public sector where the lack of market forces makes it harder for workers to be paid what they're worth. Either way, it's a statement about social values.

Urban sanitation engineers (i.e. garbage truck workers) get paid a decent wage, not because of the skills required for the job, but rather because of the difficult working conditions in summer and winter. Less "desirable" jobs have to pay more to attract workers.

Unionized workers earn more than non-union workers because unions are able to take advantage of monopoly power in the labour market. Just as a monopoly in the output market can charge a higher price than would be charged if the market were competitive, so unions can charge a higher wage.

Increasing Value of a College Degree

At the beginning of the module, we discussed how the cost of college has increased dramatically in recent decades, causing many college students to take student loans to afford it. Despite this, the value of a college degree has never been higher. How can we explain this?

We can estimate the value of a bachelor's degree as the difference in lifetime earnings between the average holder of a bachelor's degree and the average high school graduate. This difference can be nearly $1 million. College graduates also have a significantly lower unemployment rate than those with lower educational attainments.

While a college degree holder's wages have increased somewhat, the major reason for the increase in value of a bachelor's degree has been the plummeting value of a high school diploma. In the twenty-first century, the majority of jobs require at least some post-secondary education. This includes manufacturing jobs that in the past would have afforded workers a middle class income with only a high school diploma. Those jobs are increasingly scarce. This phenomenon has also no doubt contributed to the increasing inequality of income that we observe in the U.S. today.

Attribution

11.4 - READING LIST

1. The critical role of workforce training in the labor market recovery [New Tab] (https://www.brookings.edu/blog/up-front/2021/02/04/the-critical-role-of-workforce-training-in-the-labor-market-recovery/)

Reading List compiled by Norm Smith.