SPOTLIGHT 5

Technology is changing the world of work: What does that mean for learning?

The nature of work is changing. Within countries, jobs have been shifting across sectors—sometimes on a massive scale. Some shifts have been out of agriculture. In what are now high-income countries, people have shifted out of agriculture dramatically over the last half-century. In the Republic of Korea, the share of workers in farm jobs fell from 80 percent in 1950 to less than 7 percent in 2009. In Chile, the share of farm workers fell from 30 percent to under 15 percent in the same period. Other shifts have been out of industrial production. In the United States, the share of workers in manufacturing halved between 1950 and 2009.[1] In low- and middle-income countries, the shift is ongoing. Across Sub-Saharan Africa, employment in agriculture is expected to drop nearly 10 percent this decade, with a large rise in the numbers of people running small household businesses.[2]

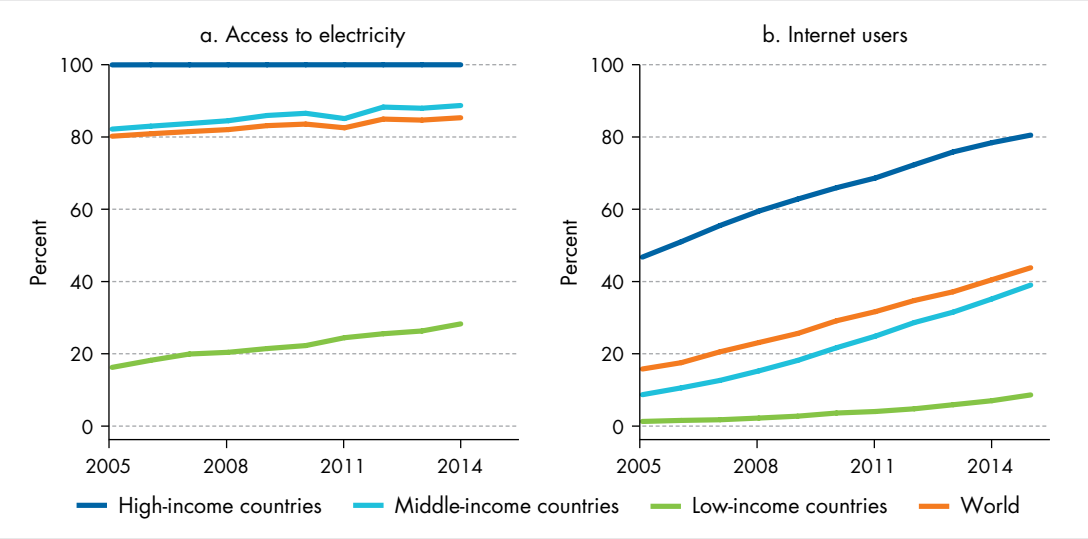
Technology—including digital technology—is central to these changes. Eighty-five percent of the population worldwide now has access to electricity. Digital technologies penetrate most corners of the world, with one mobile phone subscription per person globally, and 4 in 10 persons connected to the internet.[3] As the *World Development Report 2016* points out, "With rising computing power, combined with the connectivity and informational value of the internet, digital technologies are taking on more tasks."[4] This is particularly true for routine tasks that are easy to automate such as a cashier's job. But other jobs—such as a teacher's—are not easy to automate. Technology ultimately substitutes for some workers. For workers whose jobs are not replaced, such as hairdressers or surgeons, technology has varied effects. While it may leave the hairdresser relatively untouched, it can make the surgeon dramatically more productive—with digital imaging, for example. And, of course, technology creates new jobs as well. So technology eliminates some jobs, creates others, and increases the returns to yet others.[5]

The impact of technology on jobs varies dramatically across countries. For rich countries, predictions range from dire (in which "robot overlords" take over most jobs) to the much more modest estimate that 9 percent of jobs in rich countries could currently be automated.[6] For low-income countries, where technological penetration is much lower, the impact of technology on work will likely be more incremental (figure S5.1). Small-scale agriculture and household enterprises will not be automated in the near future, especially in countries such as Nicaragua, where less than 20 percent of households have access to the internet, or Liberia, where less than 10 percent of the population has access to electricity.[7] Those numbers will surely grow; greater access to technology will enable more poor nations and individuals to access those sectors that see high returns to technological growth. But in the short run, technology will change the demand for skills much more in countries that have the infrastructure to support automation.

Individuals who enter the workforce with better technological skills will see benefits. Because technology affects different workers in different ways, those who emerge from the education system with technological skills are more likely to be able to enter those professions (high-skilled, high-paying) that are gaining from technology.[8] Around the world, the rise of information technology is increasing the demand for high-skilled graduates who can use that technology effectively.[9] That rising demand translates into higher wages.[10] Because this dynamic can widen

Figure S5.1 Technology use has increased dramatically over the past decade—but remains low in many countries

Percentage of population who have access to electricity (2005–14) and who use the internet (2005–15), by country income group



Source: WDR 2018 team, using data from World Bank (2017a) for electricity access and ITU (2016a) for internet users. Data at http://bit.do/WDR2018-Fig_S5-1.

inequality, ensuring that much of the population has access to these skills is essential. Globally, 85 percent of countries include computer skills in their curriculums for upper secondary school. But some regions lag, with Sub-Saharan Africa at only 50 percent, and much lower at lower levels of schooling.[11] Beyond the benefits to individuals, a population with strong technical skills is more likely to attract international industries that require those skills, such as modern manufacturing.

In environments with extremely limited access to computing technology, simple exposure can make a difference, but the skills that students gain are not the skills they need. Replacing traditional textbooks with laptops equipped with electronic textbooks neither helped nor harmed reading ability in Honduras, but in an environment where only 7 percent of students normally use the internet at school, the laptops allowed many more of them to develop the ability to search for content online and do basic word processing.[12] In Romania, vouchers to purchase standard home computers improved very basic general computing skills.[13] But such skills that are gained from mere exposure may not be the skills needed to succeed in the marketplace. Distributing simple laptops for home use in Peru made learners more competent on those laptops, but that did not translate to better skills on other, general-use operating systems (such as Microsoft Windows).[14] Among high school students in Chile, more than 90 percent used computers at school and two-thirds had access to computers at home. Although two-thirds of them were able to search for information online, only half could organize information (such as arranging folders on the computer). Less than one-third could produce information (such as writing an email with adequate content).[15] Individuals need structured training in computing skills if they are to reap the returns of the technological revolution.

Students entering the workforce need better critical thinking and socioemotional skills. The ability to use technology is one way for them to take advantage of technological advancement. But another is to excel at those skills that technology carries out less well. Those include higher-order cognitive skills and interpersonal, socioemotional skills.[16] In the United States, jobs that require high socioemotional skills (such as nurses or social workers) are growing and jobs that require high socioemotional skills along with high cognitive ability (such as financial managers) are growing the fastest.[17] Education systems are beginning to learn how to cultivate socioemotional skills in learners: Recent efforts in Peru and Turkey have resulted not only in better socioemotional ability but also in better academic performance.[18] It is not enough to train learners to use computers: to navigate a rapidly changing world, they have to interact effectively with others, think creatively, and solve problems.

All of those skills that help individuals succeed in rapidly changing economies are built on the same foundations of literacy and numeracy. It may be tempting to divert resources from the development of foundational skills into the technological skills, higher-order cognitive skills, and socioemotional skills needed in the 21st century, which seem more novel and exciting. But these are complements to foundational skills, not substitutes for them—they can only be built on a solid foundation. Workers can search effectively for digital information or create digital content only if they have strong literacy skills. They can program new online applications only if they have confident numeracy skills. Socioemotional skills like grit, which are most malleable in childhood, can be practiced and strengthened in the service of gaining strong foundational skills. Higher-order cognitive skills involve consuming information using literacy and numeracy skills and combining it in new ways. Innovations in developing 21st-century skills are much needed, but these skills work best in conjunction with strong foundational abilities.

Notes

1. Handel (2012).
2. Fox and others (2013).
3. ITU (2016b); World Bank (2017a).
4. World Bank (2016, 120).
5. World Bank (2016).
6. Arntz, Gregory, and Zierahn (2016); Drum (2013).
7. ITU (2016b); World Bank (2017a).
8. World Bank (2016).
9. Autor, Katz, and Krueger (1998); Michaels, Natraj, and Van Reenen (2014).
10. Falck, Heimisch, and Wiederhold (2016).
11. UIS (2017).
12. Bando and others (2017).
13. Malamud and Pop-Eleches (2011).
14. Beuermann and others (2015).
15. Claro and others (2012).
16. World Bank (2016).
17. Deming (forthcoming).
18. Alan, Boneva, and Ertac (2015); World Bank (2017b).

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