

Chapter 3

How to Become a Digital Citizen:

Using the Digital Economy and Digital Literacy to Understand Digital Citizenship

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ABSTRACT

The following chapter draws on qualitative data to look at two aspects of computing education: the digital economy and digital literacy. Finally, the chapter compares these to the concept of digital citizenship, considering how 'digital citizenship' can be used to draw the other two together and give young people a deeper understanding of having power and agency in the digital world. The data presented in this chapter is based on fieldwork conducted as part of the author's PhD. While the original fieldwork was conducted in 2016 in a discipline where relatively limited qualitative fieldwork is conducted, it adds valuable insight and perspective. The chapter consists of a brief review of the concept of digital economy and digital literacy before using the data to look at how young people viewed both concepts in the context of what they were being taught as part of 'computing'. The data from the field works followed by a discussion of the findings and takeaways from the data before giving a brief introduction to 'digital citizenship'.

Introduction

The following chapter uses qualitative data to examine two aspects of computing education: the digital economy and digital literacy. Finally, it compares these to the concept of digital citizenship, considering how digital citizenship can connect the other two and give young people a deeper understanding of having power and agency in the digital world.

The data presented in this chapter is based on fieldwork conducted as part of the author's PhD. While the original fieldwork was conducted in 2016 in a discipline where relatively limited qualitative fieldwork is conducted, it adds valuable insight and perspective.

Context of the Initial Research

The chapter consists of a brief review of the concept of digital economy and digital literacy before using the data to look at how young people viewed both concepts in the context of what they were being taught as part of 'computing'. The data from the field works followed by a discussion of the findings and takeaways from the data before giving a brief introduction to 'digital citizenship' and considering why it could be a way to prepare young people for their digital future better.

The original research was conducted in the summer and fall of 2016. In 2014, England introduced a new statutory curriculum which replaced the subject of ICT (which had mostly focused on using specific software word processing to graphic design) with the broader subject of 'Computing',

which encompassed a range of skills from digital literacy to computer science in the hope of preparing young people for the digital economy and a broader digital world. This followed a period of political debates and multiple reports ('Shut down or restart' in 2012 and 'Nexgen', in 2011) calling for reform in how computing was taught across England. There was a general feeling that the pre- 2014 ICT curriculum was not giving young people the skills they needed.

The doctoral research this chapter draws on examined three themes in English computing education: digital economy, digital literacy, and computational thinking. The initial research consisted of in- depth interviews with 56 young people, nine computing teachers, and three computing education experts to validate the findings.

While the original research, as a doctoral thesis, made a substantial contribution to the field of computing education, it is relatively inaccessible, and its impact is, therefore, limited.

The author intends to use this chapter to highlight key findings from that work and the contribution that qualitative research with young people can make.

Including the concept of 'digital citizenship' allows the research to be more forward- looking rather than just highlighting the historical challenges of teaching computing and digital citizenship. It also demonstrates how to build computing education into a subject that is engaging and relevant to young people. Based on the interviews in the pages ahead, digital citizenship sounds a lot like what young people would like to learn but don't have a term for.

The Digital Economy?

Defining the Digital Economy

Instead of thinking about a 'Digital Economy', it may be more useful to consider 'digital economies', reflecting on how the concept has evolved over time. The timeline below (fig 1) illustrates how the idea of the digital economy, rather than being merely descriptive, was employed as an anticipatory rhetorical term, aimed at making predictions about what might be on the horizon. The data in the figure, therefore, rather than being current, illustrates how assumptions were made about the future in the past.

Prior to the year 2000, there was little academic literature that refers specifically or attempts to define the digital economy. Literature from this period uses terms including "Knowledge Economy", "New Economy", "Innovation Economy", and "Information Economy" (Oxley et al., 2008; Singh, 2004), all of which align to the digital economy.

Carlsson (2004) referred to the internet as a general- purpose technology that could be compared to the steam engine or to electrification; in time, the term “digital economy” may seem as anachronistic as “steam economy” or “electric economy”. As such, when considering the impact on young people, it may be worth thinking of the concept as adapting and changing; the ‘digital economy’ young people in the early 2000s were preparing for is fundamentally different to the one young people today need to look forward to.

Defining the Digital Economy in Phases

There have been a number of technological developments (i.e. transistors, personal computers, networked computing, the World Wide Web, the mobile phone, big data, artificial intelligence), specifically in the area of computers and computing, which over time have had an effect on economic activity (Ayres & Williams, 2004; Brynjolfsson & McAfee, 2016; Carlsson, 2004; Friedman, 2017; Hamid & Khalid, 2016; Keen, 2015). The digital economy now impacts countries across the world, where the conduct of goods or services is in the form of numbers transferred over digital networks (Irkinovich, N. R., 2022). These developments have ranged from the first invention of the transistors in 1947 (Ayres & Williams, 2004) to more recent developments of artificial intelligence and its use in medicine, transportation, and other areas (Brynjolfsson & McAfee, 2016). This chapter does not aim to provide a comprehensive timeline of all developments related to the digital economy; rather, selected authors have indicated a number of pivotal points when it comes to how technology has impacted economics. Using these pivotal points as signposts of key changes, it is possible to divide conceptions of the digital economy into three periods.

This paper examines the digital economy historically and can be seen as three distinctive periods of time: 1) before 1994, 2) from 1994–2007, and 3) after 2007- 2020. Understanding the past digital economy in this way can explain why much of the digital economy literature can seem somewhat contradictory.

The Pre-Digital Economy: Before 1994

The pre- digital economy refers to the period during which much of the foundation and infrastructure essential for the later stages of the digital economy developed. This can be traced back to when the US Census Bureau first utilised computing technology for non- military purposes around 1951 (Ayres & Williams, 2004). With the advent of the desktop computer in the early 1990s, computers gradually became commonplace in businesses and homes. Before 1994, technology had already significantly impacted economic activity, although this influence was primarily focused on enhancing efficiency rather than transforming the paradigm of business operations. For instance, early applications included replacing paper filing systems with digitised databases and substituting filing clerks with computers (Ayers & Williams, 2004, p. 319).

Digital Economy 1.0: Console-Based Digital Economy 1994 – 2007

Circa 1994, several major companies were established, including the online retailer Amazon, the first widely adopted search engine, Yahoo, and the first web browser, Netscape (Keen, 2015). By the time access to the Internet became broadly and easily available to everyone, the nature of the economy began to change fundamentally (Carlsson, 2004). The Internet browser Netscape allowed consumers and businesses to access information from across the globe, search engines like Yahoo enabled users to explore this vast amount of data, and the online retailer Amazon facilitated online purchases (initially restricted to Books). Ayres and Williams (2004) identify the period from the 1990s onward as the start of the convergence of computing technology and communications technology, paving the way for the companies that emerged in 1994.

The Internet has permeated every office, home, and school, bringing about a significant shift. The distinction between consumers and producers began to blur. Non- market transactions, merely the movement of information from one place to another (such as a web search), have created genuine economic value. This transition was not only vastly different from the ways value had been generated in the past, but it was also quite difficult to measure and, therefore, not often studied (Brynjolfsson & Saunders, 2010).

Digital Economy 2.0: The Mobile Digital Economy.

The next stage of the digital economy can be referred to as “digital economy 2.0” and began in 2007. This year marked a pivotal moment when several technological events occurred, including the launch of the Apple iPhone, the Android operating system, Amazon’s Kindle, and the emergence of the first “big- data” analytics companies (Friedman, 2017). These companies fundamentally transformed the perception of technology's impact. For instance, the introduction of the iPhone and other brands of ‘smart’ phones meant that the Internet was no longer something accessed solely through a console with a screen and keyboard; it could now be reached from anywhere with a mobile phone connection. Mobile web technology, when combined with big- data analytics, meant that the Internet was not just about connecting people and facilitating information exchange but also about linking devices that transmit and receive vast amounts of data. The widespread usage of both the iPhone and the Android operating system led to the development of online services where software applications could be purchased and downloaded through application marketplaces, making the sale of digital ‘apps’ possible in ways that had previously been unimaginable.

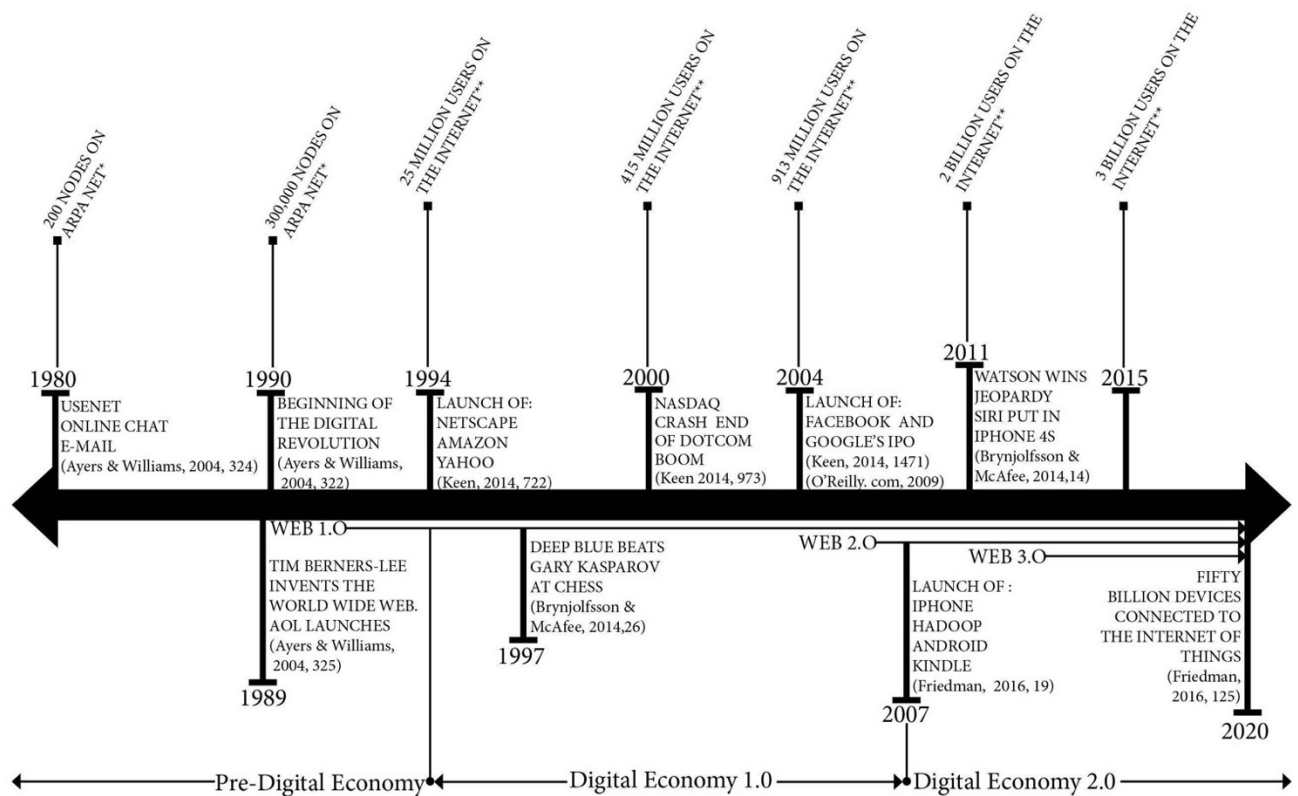


Figure 1: Timeline of the Three Phases of the Digital Economy

*<http://www.americanscientist.org/issues/pub/2000/5/the-nerds-have-won/3>. Viewed 29/4/2017

**<http://www.internetlivestats.com/internet-users/>. Viewed 29/4/2017. Rounded to the nearest million/billion

Three Phases of the Digital Economy

Figure 1 presents an indicative timeline of the digital economy, with the terms “pre- digital economy,” “digital economy 1.0,” and “digital economy 2.0” serving as imposed classifications to refer to the evolution of literature and how perspectives on the digital economy have shifted over time. The points marked in 1994 and 2007 do not imply that significant technological advancements did not occur prior to these dates. Instead, they signify symbolic commercial or economic events that illustrate the technological progress reaching a broader consumer base.

The underlying purpose of using these three terms is not to undermine or invalidate any literature concerning the digital economy but rather to make it easier to understand this literature within the context it was written. The field of the digital economy suffers from being both a young field as an academic discourse and a fast- moving field as technology advances. This timeline makes it possible to provide a brief overview of the most relevant literature while at the same time not dwelling on literature which was written within in a different period of the digital economy.

The Digital Economy and Education

Understanding the phases of the digital economy can be very useful in computing education. It allows the question to be asked, “What sort of digital economy are young people being prepared for?”

Digital Economy 1.0

In the 1998 ICT curriculum, young people learned to use software and computers as business tools but received little instruction on utilising the Internet or programming. These skills reflected the efficiencies of the pre- digital economy without leveraging the potential of digital networks, doing little to equip young people to fully capitalise on the Internet, the World Wide Web, or interconnected businesses.

Digital Economy 2.0.

This is the era of the digital economy when access to the Internet became possible almost anywhere and at any time for individuals using mobile devices. New types of products have started to emerge, and nearly all aspects of business and various sectors now rely on digital devices in some way. Once the digital economy 2.0 commenced, it is understandable that young people found it challenging to engage with what they were learning in ICT, as it represented a technological state that felt very distant from the world they experienced.

What Does it Mean to be Digitally Literate?

The widespread use of the term “digital literacy” began in 1997 with a publication by Paul Gilster. This term is closely related to several other forms of “literacy” in the 21st century, including information literacy, computer literacy, network literacy, and Internet literacy.

The phrase “digital literacy” essentially refers to the ability to access and comprehend information using computers, mastering skills that go beyond just keystrokes. (Glistler, 1997) (Bawden, 2008). The nature of information evolves in the digital age; to be digitally literate, one must navigate this new landscape effectively (Lanham, 1995). Digital literacy constitutes a new set of skills that encompass not only understanding but also attitudes towards information and technology (Bawden, 2001).

Digital literacy has changed what it means to be literate and, therefore, also designates a moral framework and a set of attitudes that sit alongside skills and knowledge (Bawden, 2008; Buckingham, 2008). It has become the underpinning ability to engage successfully in a digital environment (Martin, 2005).

Digital literacy is seen as a combination of what Aviram and Eshet- Akalai (2006) call “technical-procedural, cognitive and emotional social skills” —how one uses technological tools, how one thinks about those tools, and how one uses those tools to connect with other individuals specifically on an emotional level (Aviram & Eshet- Akalai, 2006).

When discussing digital literacy in the context of computing education, the Royal Society (2012) defined it as “the general ability to use computers.” Chase and Laufenberg (2011) acknowledge that educators’ understanding of digital literacy must constantly develop, just as their understanding of the future is also constantly developing.

Research across several studies involving younger students shows that, irrespective of their ability to use technology or their backgrounds, all students lack skills in “evaluation” and “critical literacy”

relating to digital literacy. Students must be explicitly taught how to understand, evaluate, and interpret information from digital sources (Eshet- Alkali & Amichai- Hamburger, 2004; Gui & Argentin, 2011; Ng, 2012).

The conundrum facing educators and students is that the term “digital literacy” is presented as the essential skill for navigating a digital environment. However, as the technology shaping this landscape evolves, must our understanding of digital literacy also be continuously developed, or are there key concepts that remain foundational?

Calls for more Digital Literacy

Several reports over the years (Royal Society, 2017; Donoso et al., 2021; CECE, 2017) have highlighted the necessity of teaching digital literacy alongside computing. However, “there are rarely stand-alone curricula for teacher training in digital literacy. Thus, there is a risk that the subject is taught by teachers who lack the appropriate subject-matter knowledge.” In other words, teachers are not receiving specific and dedicated training in digital literacy (CECE, 2017).

As the academic literature demonstrates, digital literacy should extend beyond young people being merely digitally skilled and should encompass a range of cognitive and social abilities: “Besides technical skills, experts attach great importance to non-technical skills such as critical thinking, information processing, the ethical use of digital technologies, protecting personal data and privacy, and managing one’s digital identity” (Donoso et al. 2021). The evidence gathered by the Royal Society suggests that teachers and young people in England (at least) view computing as “difficult” and only appropriate for the highest- achieving students (Royal Society, 2017). Furthermore, the subject is under pressure due to its limited allocation of time in school timetables and a lack of qualified teaching staff (Royal Society, 2017).

There remains a compelling argument that digital education encompasses both technical and non-technical elements, as young people will require both to participate in modern society (Donoso et al., 2021). Furthermore, to engage young people effectively, curricula must align with the realities of their lives (Donoso et al., 2021).

Digital Literacy and Preparing for the Digital Economy and the Digital World

While this chapter may appear to clearly distinguish between Digital Literacy and the Digital Economy, much of the more recent literature has brought these two themes together, specifically examining how digital literacy skills are key to preparing for a future in the Digital Economy—this is what can be referred to as something more akin to ‘digital citizenship’.

The research found that young people had little sense of what being part of the digital economy might entail. It specifically noted that young people had little sense of how what they are learning is related to the world ahead of them.

This is echoed by Dinner and Polovinko (2018), who examined how young people were being prepared for the “fourth industrial revolution,” and Brinda et al. (2018), who investigated the words high school students in Germany associate with the concept of the “Digital World.” Their conclusion was that these associations related as much, if not more, to the media consumption of young people. Young people's understanding of the digital world is shaped by their experiences beyond the classroom. However, it can be challenging for schools to keep up with the ever- changing landscape, as the ‘digital world’ and ‘digital economy’ are constantly evolving.

However, there is no doubt that the digital economy affects all aspects of life, as stated in the OECD report from 2016, “Skills for a Digital World” (OECDa 2016). The report emphasises the critical importance of digital literacy skills, which are essential for “life- long learning” (OECDa 2016, 12). Integrating ICT across the curriculum can be one of the most effective means for young people to appreciate the relevance of digital skills. The OECD’s findings indicate that while education must ensure all pupils possess “basic ICT skills”, as these are essential for nearly all workplaces, they also assert that in terms of specialist skills, “Basic programming is no longer sufficient” (OECDb, 2016, 3).

There is a widening skills- based digital divide that is not immediately apparent, where those who engage successfully possess a high level of skills and access to resources, along with knowledge that many young people lack (Lombana- Bermudez et al. 2020). Although young people believe they understand how to interact online, they may miss the bigger picture. They are not always fully aware of the impact of sharing their data. While they recognise ‘digital reputation’ and the importance of not sharing personal information, they are less aware of how personal data is crucial to the business models of social media companies (Lombana- Bermudez et al. 2020, 13).

Methodology

The data presented in this chapter is based on in- depth group interviews conducted in 2016 with young people from three schools in the Northwest of England. The research included five group interviews at an initial school (School A) and a smaller number of interviews at two other schools (three in School B and one in School C). The group setting and open- ended questions elicit the best responses from young individuals (Maxwell, 2010; Cohen et al., 2011). The interviews were recorded, transcribed, and then analysed using a grounded theory- based approach to coding that involved open, axial, and selective coding to identify themes and key points from the data. The transcripts were checked against the recordings for accuracy and meaning (Bryman, 2004). The project was approved by the Lancaster University Ethics Committee, which oversaw the research during its execution.

For this project, pupils were typically interviewed in groups of six with the groups being chosen by the teacher. A total of 54 pupils took part in the interviews for this project, with about seven total hours of interviews with pupils.

School A: Total pupils interviewed 30, length of interview 20-50 minutes, all pupils in year 9.

- Interview 1: Year Nine, 6 pupils: 3 male, 3 female (43 minutes)
- Interview 2: Year Nine, 6 pupils: 3 male, 3 female (38 minutes)
- Interview 3: Year Nine, 6 pupils: 3 male, 3 female (20 minutes)
- Interview 4: Year Nine, 6 pupils: 3 male, 3 female (29 minutes)
- Interview 5: Year Nine, 6 pupils: 3 male, 3 female (54 minutes)

School B: Total pupils interviewed 18, length of interview 42-57 minutes, year 7 & 9 pupils.

- Interview 1: Year Nine, 6 pupils: 2 males, 3 females, (45 minutes)
- Interview 2: Year Nine, 5 pupils: 3 males, 2 females (42 minutes)
- Interview 3: Year Seven, 7 pupils: 4 males, 3 females (57 minutes)

School C: Total pupils interviewed 6, length of interview 25 minutes, year 10 pupils.

- Interview 1: Year Ten, 6 pupils: 3 male, 3 females. (25 minutes)

Data

Data Regarding Digital Economy

This chapter presents the idea that the digital economy can be understood in three phases: the pre-Internet digital economy, digital economy 1.0, and digital economy 2.0, alongside a developing understanding of the potential nature of future digital economies.

While the students interviewed in 2016 were not considering the economy or their economic future in these terms, aspects of their experience closely follow this progression. They were aware of their grandparents' discomfort with Internet technology, as they belonged to a generation that grew up in the pre-digital economy. They observed their parents and teachers using tools, such as office-type software, which would be associated with digital economy 1.0, and they encountered daily the technologies of digital economy 2.0. Pupils expressed questions and concerns about the technologies linked to a future digital economy, alongside an ever-changing set of technologies. They felt they did not fully understand these new devices and had numerous concerns stemming from this lack of knowledge.

5.2.1 The People and Things of the Digital Economy: What is a Computer Scientist?

The young people displayed considerable confusion regarding what (or who) a computer scientist may be. While individuals like Bill Gates and Steve Jobs have undeniably had a profound impact on computing, many others from diverse backgrounds have also influenced the field. Most of the names mentioned by the young people were white men—ranging from the British TV presenter Dara O'Briain to the character Sheldon Cooper from "The Big Bang Theory." Several young individuals referred to physicists Stephen Hawking and Brian Cox; some confused Stephen Hawking with Steve Jobs. The young people appeared to have little understanding of what being a computer scientist involves, what type of person a computer scientist may be, or of role models who do not conform to the prevailing stereotype of a computer scientist.

5.2.3 Thinking about their own future and future employment

Young people identified a wide range of careers that they were interested in pursuing. While some of these were related to using computers, such as starting an online business (School A, Interview 1), many careers seemed far less related to technology (like becoming a foster carer (School A, Interview 5). However, the discussion about future jobs prompted the young people to consider how computers would affect a wider range of jobs, from being a veterinarian (School A, Interview 5) to being a beautician (School A, Interview 4). For example, the pupils who wanted to be beauticians thought they would use a computer to order products and communicate with clients (School A, Interview 4). Many of the pupils saw how IT/ICT skills could be used in a wide range of careers and that taking ICT at a higher level could be relevant for a range of careers (School A, Interview 4; School B, Interview 2; School B, Interview 3).

Making Choices About the Future

This research suggests that computing education in the UK is impacting young people's choices. However, this does not necessarily mean that they feel they are more likely to choose a career in the digital economy. Instead, they are reflecting the skills they might need (in terms of computing) for a wide range of careers.

The young people seemed unsure if what they were learning about computing was either giving them skills for the future or introducing them to possibilities for the future (School A, Interview 5; School B, Interview 2; School C, Interview 1). However, when discussing computing broadly, they seemed to feel that it was important to their futures.

The workplaces these young people envisioned involved computers in various forms. For instance, some young individuals described the use of robots in manufacturing (School B, Interview 2). In Interview 1 at School C, the students mentioned the necessity of knowing the "basics," whether this knowledge applied to "most things in life" or to a specific career such as being a professional 'video gamer' (School A, Interview 2; School A, Interview 5; School C, Interview 1). However, they believed that the rapid advancement of technology meant that the computing classes could provide only basic skills (School A, Interview 5). In two of the interviews, the young people found it difficult to think of any activity that did not involve the use of computers (School A, Interview 4; School C, Interview 1).

While some felt that the curriculum was generally for life (School A, Interview 1), others felt that the main purpose of computing was specifically about having a future in computing (School A, Interview

2). For these young people, there was a question about computing: are the skills they are learning 'general skills' needed for a wide range of careers and life more widely in the same way that every child needs to learn maths, English, and science—or are the skills they are learning in computing for a specific future direction in the way skills they might be learning in design and technology or business studies.

Skills Needed in Future Employment

The pupils did have a sense that the purpose of learning computing was the national skills shortage [in computer science] (School B, Interview 2). They were able to see the need to learn programming as not being connected to their needs as individuals but to the needs of the country. This argument left the pupils who were not interested in becoming programmers feeling less inclined to be engaged in the computing sessions as the purpose of the sessions was to prepare for a career which they had no intention of pursuing (School A, Interview 1). While they felt they needed some skills for life, there were other aspects of computing that were more about preparing specifically for future employment (School A, Interview 5).

The feeling was that having a broad knowledge of computing would give them a wider range of options in the future (School B, Interview 3, School C, Interview 1). The young people could see that by learning computing from an early age, they would have more opportunities but could also see that it could change the nature of certain fields by increasing the amount of specifically gender diversity in STEM subjects, which tend to be male dominated. Specifically, for a number of young women interviewed, learning about computing had introduced them to new possibilities for their futures (School A, Interview 2; School B, Interview 1, School C, Interview).

Conclusion of data regarding the digital economy

Not all of the young people had thought about what career they wanted to pursue, and many of the perceptions they had about what skills they thought they would need were influenced more by the skills they saw in their parents than by what they thought the future digital world would be like. From the data, it seemed that they saw the need for skills like using specific software (such as office- type software). Where they thought that their careers would have a specific technical demand, they could see the connection to the skills they were learning in their computing lessons. For the students who saw themselves in a career that did not directly involve computers, they would rather be learning the general

ICT skills rather than learning the more specific computing or Computer Science skills that have dominated much of the computing curriculum.

In the interviews, the young people were not thinking of the skills they were learning in terms of the digital economy. Though they were thinking about the skills they would need for the broader digital world, they did not feel that they were being prepared for this and were left with many questions about how technology is changing society. Their sense of who is involved in the digital economy is limited, and this may be affecting the extent to which they feel this is an industry that they might see themselves within.

In terms of the phases of the digital economy proposed earlier, the young people seem to be thinking about the skills they will need in terms of the skills that would be associated with digital economy 1.0. These are the skills that would be used on a computer at a fixed location but not leveraging newer developments such as big data, open data, or the Internet of Things.

While the young people appear to be aware, through their personal experiences, of the technologies associated with digital economy 2.0, this is the area where they have the most specific concerns and questions. Based on the data, the computing curriculum appears to be more rooted in digital economy 1.0, while the young people experience technology that is more like digital economy 2.0.

Data Regarding Digital Literacy

Digital Knowledge and Digital Skills—Cognitive, Critical, and Technical Skills

Digital Literacy

One of the consistent themes across several interviews was that much of what young people valued learning, and desired to learn more about, relates to skills classified as office software, such as word processing, spreadsheets, and databases (School A, Interview 1; School A, Interview 2; School A, Interview 3; School A, Interview 4; School A, Interview 5; School B, Interview 1; School B, Interview 2).

While these skills are often regarded as less of a priority in computing education, the findings suggest that young people focus much more on concrete, applicable skills rather than broader concepts.

Thinking About Using Digital Tools.

The young people felt that they were learning computing to help them in future employment (School A, Interview 1; School A, Interview 5); however, others felt quite strongly that they were mainly learning it to explore a specific computing- based career (School A, Interview 2; School B, Interview 3).

There was a common opinion that if they learn about “this stuff” now, they will have the skills to keep up with technology; this is especially important as they observe their parents and grandparents “falling behind” (School A, Interview 5).

The pupils were aware of the ICT skills the adults in their lives are using every day, such as email, graphic design, and using the Internet (School A, Interview 2). This helps them imagine how they might use computing in the future. Similarly, because they use the Internet every day, they can see the value in learning how to make a webpage or an online CV (School A, Interview 1).

Learning Digital literacy - Value What They Have Learned in Regard to ICT.

When asked to think about the impact aspect of what they were learning, many of the young people focused on technical skills associated with using computers. Many of the things that the young people valued learning (and feel they would remember and use in the future) related to using office- type software, such as Microsoft (MS) Word, MS Excel, and using databases (School A, Interview 1; School A, Interview 2; School A, Interview 3; School A, Interview 4; School A, Interview 5; School B, Interview 1; School B, Interview 2). Many of the young people reported having learned this in primary [elementary] school (School A, Interview 1; School A, Interview 5; School B, Interview 1). The young people were aware of their parents using these skills; they could see the value in using these skills and felt they would remember and use them in the future.

The young people valued learning aspects of computing that related to their everyday lives, such as how search engines or computers in general worked, and even saw how the logic of computation was transferable (School C, Interview 1, School B, Interview 1).

Thinking Critically about Content and Information

Although critical thinking was not explicitly mentioned, the data highlights that young people engage with a variety of information sources (such as YouTube) but do not feel equipped to assess the validity of this content. These students recognised some of the threats that could pose problems for their computers at

home, including viruses, malware, and hackers, yet felt they were not learning how to protect their devices (School A, Interviews 2; School A, Interviews 4). Several pupils disclosed during the interviews that they did not comprehend how viruses operate (School A, Interview 2) and were uncertain about how to prevent issues with their computers or how to address them once a problem arises.

They can find advice online from a range of sources but would like to hear that advice reinforced by what they are learning in school (School A, Interviews 4, 5). While the advice they find on sources like YouTube may not be wrong, it raises a number of questions and concerns about cyber security. The pupils seemed to have no forum in which to ask those questions.

Social-Emotional Literacy

One of the key aspects of digital literacy centres on the social- emotional skills that young people need to navigate their digital social lives and interact with others online. While the students did not use the term 'social- emotional literacy', the interviews revealed that many of these young individuals lead rich digital lives. Although they did not report learning how to navigate these environments in school, they had given considerable thought to how and why people behave the way they do online.

This section looks at data relating to how young people interact with others online, making friends online, how these young people engage with larger communities online, and putting their digital social lives in context.

Interacting with Others Online

All group interviews with young people included discussions of online behaviour, both concerning others and the participants' own behaviour. There was an acceptance of some reasons why an online presentation may not fully align with an offline identity (School A, Interview 5; School B, Interview 3). The young people emphasised that there is significant pressure to look or behave in a certain way, and while it may not be easy to conform to this pressure in the physical world, in the digital realm, it is relatively simple to present oneself differently.

There was significant concern about being picked on. There was almost an allowance and acceptance of mean, trolling behaviour online (School A, Interview 5; School B, Interview 2; School B, Interview 3). Generally, people would say things online that they would not say in person, as there would be few or no consequences (School A, Interview 5; School B, Interview 1). However, while most young

people believed there were few consequences for online behaviour, a smaller number actually thought that the potential consequences affecting online conduct the most were either social or through formal authority. Whereas, in face- to- face interactions, people might forget what was said, in an online context, “they can scroll back in conversation online” (School A, Interview 5; School B, Interview 1), providing proof that one had said what they did. There was a sense that it was not so much that people online intended to deceive each other; instead, it was more that the nature of the online environment altered someone’s behaviour (School A, Interview 5).

Making Friends Online

Several young people reported using the internet to maintain connections with friends and family worldwide, or with friends they had met in other contexts, such as a previous school (School A, Interview 2).

The pupils reported having connections with people in San Francisco, the Philippines, southern England, France, and Portugal (School A, Interview 1; School B, Interview 1). In some cases, these relationships involved maintaining contact with family, while in other cases, they were individuals whom the students had met through online activities. Similarly, other pupils mentioned using social media to engage with peers from the same school with whom they would not typically interact (School A, Interview 3). The pupils indicated that they benefited from these relationships, ranging from close friendships to practising language skills and maintaining family ties. They did not feel at risk from these connections; in fact, they believed they understood the precautions necessary and were very conscious of potential dangers (School A, Interview 2; School A, Interview 5).

Part of Something Bigger

In addition to connecting with people around the globe, young individuals are also utilising digital networks to feel part of a larger community. While many young people did not indicate being part of any online groups, one interview revealed that they belonged to a “guild” or group within a game (School B, Interview 1). In a subsequent interview, it was noted that these groups were sufficient for young people to explore their interests and cultivate a sense of belonging.

For example, one young woman had discovered a way to pursue a relatively niche ambition of becoming an air traffic controller by taking part in an online simulation. She felt secure due to the

infrastructure of the simulation, but she also sensed she was part of a greater task. It could be quite challenging for a teenage girl to connect with others who share her passion for aeroplanes, particularly control tower operations; however, this activity enables her to explore a potential career, hobby, and passion.

By contrast, another young woman who spoke of wanting to be politically active in later life highlighted that while being an observer may be her best way of engaging in online political activity, she may want to engage in a more interactive way as she gets older.

Digital Social Lives in Context

These young people were also aware of the impact of social media and its history on other adults. They do not view social media as merely a sharing platform; instead, they see it as a means to create profiles and communicate with peers. The chat environment can be quite informal, serving as an extension of their face-to-face networks. They recognise that more public online performances may not necessarily reflect offline reality, as many digital networks provide opportunities to explore hobbies and make new friends.

Discussion of the data collected

Digital economy

While computing education aims to prepare young people for direct entry into the digital economy as programmers, web developers, computer scientists, or network administrators, an important question arises regarding how well they are supported. Does computing education effectively enhance young people's understanding of the digital economy, enabling them to make informed decisions about their future? Previous research indicates that pupils' perceptions of how they will use computing and ICT skills are largely shaped by their school environments and the courses they undertake (Bradshaw, 2018).

What is the Digital Economy We Are Aiming For?

The young people involved in this research had little insight into how they would use technology in their future careers and a limited understanding of the individuals who have shaped the digital economy. This restricts the number of young people who can envision themselves as part of the digital economy in the future.

The young people involved in this study did not see computing as a particularly creative discipline. While some did express the desire to work in the games industry, this seemed to stem from their interest in computer games (as players) rather than any influence of education.

Understanding the Digital World Around Them

New technology is profoundly linked to society, and Lyon (1991) questions whether the social effects of Information Technologies in our 'new kind of society' are generally benign. Furthermore, if, as Carlson (2004, p. 262) suggests, the Internet and networked computer systems are "General Purpose Technologies" comparable to electricity or the steam engine, then society is potentially undergoing a significant transformation. The assumption, however, is that young people will adapt to technological developments with ease. However, the data indicates that the young individuals involved in this study do not feel they understand or can readily keep pace with the technological advancements they have witnessed even in their own lifetimes.

The young people are aware of the arguments about the changes in society but do not feel like they have influence over these changes.

If young people (as reported in this chapter) feel anxious, overwhelmed, and uninformed about new technology, they will struggle to apply it or use it as responsible, competent, confident, and creative users.

Computing education, if it is to engage and inform young people about the digital economy, must be engaged in emerging and new technologies, giving young people the tools they need to evaluate and make decisions about what technologies they use and how they use them. For example, young people should have an accurate understanding of privacy concerns with regard to new technologies such as smart homes, smart speaker technologies, or driverless cars (and other data gathering and 'smart' technologies).

It is important that this statement leaves room for young people to investigate and understand the affordances (Woollard, 2018) of different technologies. For example, are some technologies inherently unsafe? As a user of technologies, do you need to consider how those technologies could be abused or misused?

Understanding the Choices They Are Making

The choices these young people were making are rooted in their understanding of both the broad digital economy (the impact of digitisation across all sectors) and the narrow digital economy (sectors specifically dependent on digital technology). As Brynjolfsson and McAfee (2014) highlighted, while jobs like gardeners and cooks may not be directly at threat of digital replacements, many jobs will start to be complemented by digital technology (2014). Kids who want to become nurses may work alongside an artificial intelligence system to help with diagnoses (Brynjolfsson and McAfee, 2014). While nursing as a profession is not at risk of being replaced by automation, it requires a high level of technical skill and knowledge.

Current approaches to computing education tend to be more focused on the narrow needs of the digital economy rather than informing young people about the wide range of ways digital technology is used in a wide range of careers and job roles. In the same way that mathematics and science are not only relevant to those who will pursue careers in these fields, the premise of computing education could be (but is not currently) to prepare young people to live successful lives with a broad understanding of a digitised economy. In addition, the digital economy the young people are being prepared for is no longer the most relevant or current.

Computing Education and the Digital Economy

The young people involved in this study had a mixed understanding of the digital economy. While the computing curriculum has the potential to help young people better understand the digital economy, this does not seem to be happening currently. Computing lessons are more focused on specific concepts or skills rather than how those concepts or skills may be more broadly applied.

Digital literacy

The world in which these young people live, work, and play has been radically transformed by the advent of ubiquitous digital networks (Livingston & Sefton- Green, 2016). From the interviews examined in this thesis, the young people do not necessarily feel they possess or can demonstrate the skills required to navigate this altered world. Digital literacy can be regarded as an essential skill for fostering digital resilience and being equipped to navigate an online environment (Vissenberg, J., d'Haenens, L., &

Livingstone, S. 2022).

The young people interviewed valued the ICT skills they had learned; they could see how using office- type software was key to success in the world of work. The subject content for computing leaves a wide scope in terms of the usage of specific software or skills.

With limited time given to a single subject that is intended to include such a wide range of topics, a degree of prioritisation must be made. From the general perspective of many of the students involved in this study, that prioritisation is not correct.

Critical Thinking and Media Literacy

Many of the young people involved in this study did not see how computing could be an avenue for creative endeavours. They could not see the creative aspects of their computing lessons and did not feel that computing was a particularly creative subject. Using the three- fold nature of digital literacy presented in this thesis, media literacy and critical thinking are essential parts of being digitally literate.

The students reported consuming a wide range of digital content and even raised questions about this content in the interviews. This is consistent with the findings of Livingstone and Sefton- Green (2016). Glistler (1997), in one of the first works on digital literacy, raised questions about the need to be able to contextualise content, warning that one of the problems of hypertext is that it is not always possible to judge the validity or usefulness of every link clicked. Based on the data collected, these very skills of contextualisation are missing from the current delivery of computing.

However, there seems to be relatively little support for the critical thinking, cognitive, and creative content creation aspects of digital literacy.

Complex Digital Social Lives, Require Digital Social Skills

The young people involved in this study reported having rich digital social lives, consistent with the findings of Livingstone and Sefton- Green (2016). While they were aware of and, in some instances, had negative experiences online, they also acknowledged the positive aspects of living digital lives. Whether it involved having friends and contacts around the globe, participating in events (such as flight simulations), or deepening their engagement in politics, these young individuals were capitalising on the social potential of interacting with others online. Although less visible diversity was overtly apparent in the

lives of those who took part in this study, their digital social worlds extended globally, including locations like San Francisco, the Philippines, France, Portugal, and southern England. While digital socialising allowed young people to establish connections across the globe, this does not imply a sharp distinction between their online and offline relationships. Based on the interviews conducted, it appears that some young people have learned to harness the benefits of the rich social environment of the online world, while others are less aware of these advantages.

Even taking the most limited definition of digital literacy, there is little evidence from the interviews conducted that the young people felt they were learning anything that ensured that they were digitally literate, but rather having to build these skills independently.

Overarching discussion of the data collected

It is evident that all young people will be affected by the digital economy, and all students will require core digital literacy skills. The young people involved in this study already inhabit a 'digital world', so they do not perceive the computing curriculum as equipping them for an uncertain future. Instead, they acknowledge that their lives (and future careers) are being influenced by a broad array of digital tools. This does not imply that they lack questions regarding evolving technology; it appears their questions and concerns are both specific and informed. They understand that they need particular skills and knowledge to succeed. However, for reasons that merit further investigation in future research, the pupils seem to expect computing education to prepare them for utilising a wide variety of technologies; they wish to learn to be digitally literate but do not seem to feel they are acquiring these skills. More urgently, young people are leading rich digital social lives. Based on the literature reviewed in this chapter, these digital social skills are a critical component of digital literacy.

Digital Citizenship

While the study described in this chapter primarily focused on the digital economy and digital literacy, Digital Citizenship runs parallel to these concepts and has become increasingly prominent in the discussion of technology and education. The term has attracted increasing interest in the academic literature (Chen et al., 2021), but at the same time, it seems to have declined in teaching (Öztürk, 2021).

However, as this chapter has shown, young people are leading lives that are increasingly online and mediated by digital technology. They require a broad range of skills to navigate the complex landscape of

both digital technologies and digital lives. The COVID- 19 pandemic in 2020 specifically demonstrated that the use of digital tools is essential for all citizens to participate in education and work (Öztürk, 2021). While young people had been engaging in online socialisation long before the COVID- 19 pandemic, the pandemic made it clear that there is now an expectation for social, educational, and even civic engagement to be conducted via digital platforms. Like the digital economy and digital literacy, this is an evolving field that demands greater attention from researchers, policymakers, and educators (Chen et al., 2021). Chen et al. (2021) go so far as to call for rigorous methodologies for defining and measuring digital citizenship.

With the increase in attention to computing education, there is a need to attend to how digital citizenship connects to related terms (as this chapter has highlighted), re- examining and defining how it relates to similar terms. Going beyond digital economy and digital literacy digital citizenship can include areas such as 'critical awareness' and 'digital activism' (Fernández- Prados, et al 2021). While these concepts came up in this study regarding digital literacy, areas such as 'activism' or even 'civic engagement' seem to stretch the term 'digital literacy' but do not quite fall under 'digital economy'.

Where digital citizenship has value is in its broadness of scope compared to the more 'skills' based understanding of 'digital literacy', which tends to be limited to a very specific and defined set of skills that are more difficult to update to the needs of young people (Jones and Mitchell, 2016). Equally, this allows for areas such as digital safety to go beyond focusing on negative behaviours such as bullying and rather evoke the opportunity to discuss positive behaviours online (Jones and Mitchell, 2016).

Citizenship refers to civic power and decision- making, engaging with a broader society beyond merely a set of skills or economic benefits, but rather focusing on social good and participation in social decision- making (Simsek and Simsek, 2013). While one may possess digital literacy skills or knowledge of the digital economy without the capacity to engage in a digital society (Simsek and Simsek, 2013), an emphasis on digital citizenship can encompass these concepts while empowering young people to harness the opportunities available to influence society, to be part of the digital community, and to fully embrace their roles as digital citizens.

Conclusion

Over the past decade, there has been an increased focus on computing education due to a sense that the needs of young people and the requirements of an emerging 'digital economy' have not been adequately addressed by what young people are learning in school.

While concerns have been raised about various industries struggling to find both the required skills and diversity, there is also a view that a range of digital literacies has become an increasingly essential skill set for optimally utilising the available technology. Young people exist in a world where digital technologies permeate their daily lives. Once they enter the workforce, regardless of the profession, computers (at the very least) will be crucial tools for success. The educational challenge has been how to equip young people for this reality.

Beyond economic activities, digital skills have become an essential part of civic engagement. From filing taxes, registering to vote, and participating in local government meetings. Something the COVID- 19 pandemic made abundantly clear.

The research reviewed in this chapter highlights the challenge that young people have not felt engaged with computing. The ideas surrounding the 'digital economy' are too abstract, and young people have little sense of what this might be. On the other hand, their digital literacy skills do not reflect their everyday lives, leaving them feeling unprepared for this ill- defined future.

Using the lens of Digital Citizenship, it becomes possible to go beyond what is covered in most computing classes but has the advantage of being forward- looking. Where digital literacy can be overly skills- focused, and the digital economy is overly abstract. This chapter suggests using the broader term 'digital citizenship' to help young people consider how they have agency and power in a digital world. Rather than focus on skills or careers, a focus on digital citizenship can focus on a set of behaviours and attitudes, under which skills can be taught with context and a range of futures can be imagined.

The key purpose of this study, however, is to highlight the role qualitative research can play in understanding young people's experiences. Computing education is just one area where research and policy- making greatly impact young people's lives. Yet, the challenges of conducting qualitative research with young people often limit the degree to which their voices are taken into account. This project demonstrates that by creating space for young people's voices in research, a deeper and more nuanced understanding of their experiences can be achieved.

Computing education, whether in the guise of a digital economy, digital literacy or digital citizenship,

has the potential to be the blueprint onto which young people can map their future lives, seeing how they can use digital tools to be empowered. Over all, the purpose of teaching computing should be to prepare young people for their future and, at the same time, give them tools to make that future a better place.

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