australasian journal of TECHNOLOGY EDUCATION

The Australasian Journal of Technology Education is a peer refereed journal and provides a forum for scholarly discussion on topics relating to technology education. Submissions are welcomed relating to the primary, secondary and higher education sectors, initial teacher education and continuous professional development, and general research about technology education. Contributions to the ongoing research debate are encouraged from any country. The expectation is that the Journal will publish articles at the leading edge of development of the subject area.

The Journal seeks to publish

- reports of research,
- articles based on action research by practitioners,
- literature reviews, and
- book reviews.

Publisher: The Technology, Environmental, Mathematics and Science (TEMS) Education Research Centre, which is part of the Division of Education, The University of Waikato, publishes the journal.

Contact details: The Editor, AJTE, wendy.fox-turnbull@waikato.ac.nz

Cover Design: Roger Joyce

ISSN: 2382-2007

australasian journal of TECHNOLOGY EDUCATION

Online addictions are real: What are technology educators doing about it?

Kerry Lee, Svetlana Kostrykina and Sarah Washbrooke
University of Auckland

New Zealand

Abstract

There are now five technological areas included in the New Zealand technology curriculum, two of which are based on digital technology. Like many other subjects, technology education encourages students to conduct research, consult with experts and design digital products. Increasingly, Generation-Z students use digital resources for learning, collaboration, and research, rather than face-to-face, phone, or letter communications, which are considered anachronistic. There is evidence that this improves the educational experience for most learners, but evidence for the impact on students and teachers who suffer from online and digital addictions is sparse. To ensure safe online practices for children, many countries have developed security guidelines and policies. Most of these efforts are aimed at keeping children safe from predatory interactions; preventing inappropriate content from reaching children; and minimising security breaches, such as viruses, phishing, or scams. The strategies vary, but commonly include reducing screen time, implementing web security processes, and providing guidelines for parents and teachers. Generally, this protection focuses on protecting the user from others but not on protecting learners and teachers from themselves—particularly from compulsive online behaviours. With the recent advent of COVID and increased exposure to working, teaching and learning remotely, online and digital addiction issues have been exacerbated. It is now timely to consider options for supporting people suffering from digital addictions and those at risk. This article discusses some current trends and issues related to online and digital addictions and their implications for technology education students and educators.

Keywords

Digital technology; addiction; technology; computer; school

Introduction

Adapting to change is challenging yet necessary for everyone's survival. Aotearoa New Zealand, a small archipelago in the South Pacific with a population of just over 5 million, was initially settled by Māori who travelled from Hawaiki. Later, it was colonised by Europeans and soon became home for newcomers from all over the world. Due to isolation and lack of traditional resources from their "homeland", these early settlers needed to be innovative to survive and flourish in this new environment. These were people who could solve a problem with the limited resources at hand, adapting or inventing solutions. They became a nation of people who are now often seen as "early adopters" of innovations (Davis, 2017; Eppel & Allen, 2020) in many areas, including technology. An example of this being New Zealand Māori Te Kura providing a full-time distance learning programme to K-12 students in the 1920s (Davis, 2017). But what happens when the modern solution is the problem? This paper will discuss the issue of how the prevalence and daily required use of devices and the internet have made life so difficult for those teachers and learners with online and digital addiction issues.

As technology teachers generally spend ever-increasing time using devices and being online, this exploratory paper provides a basic overview of the role and place of the digital technologies area and e-learning in the current New Zealand technology curriculum. This section is followed by an outline of the benefits and issues faced by learners and teachers when utilising digital tools and technologies. The paper further investigates current literature on digital and online addictions and problematic internet use (PIU) and highlights some strategies to support teachers and learners with digital addictions. The paper concludes by suggesting future directions for research.

Technology education in the New Zealand setting

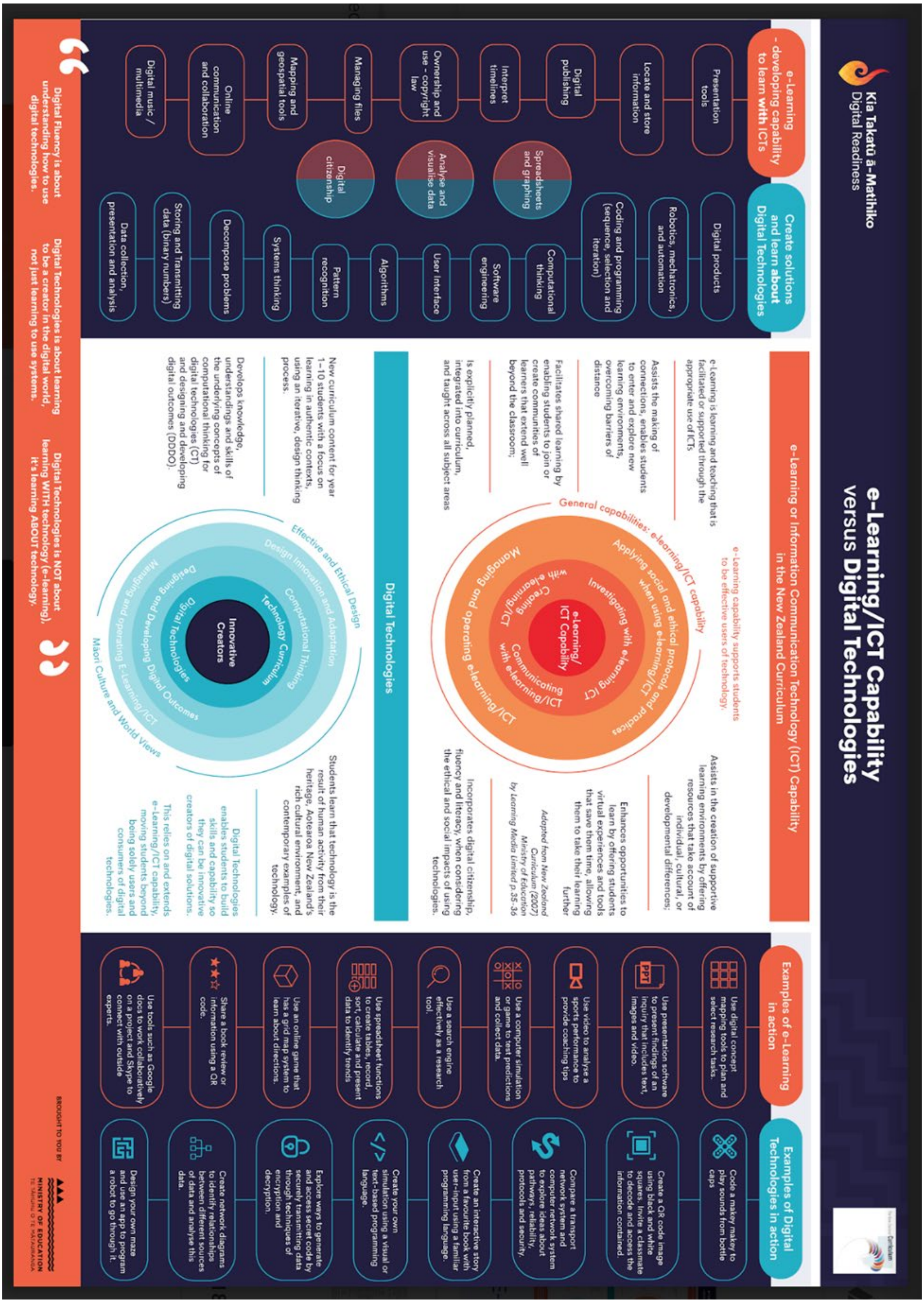
Technology is defined in the New Zealand Curriculum (NZC) as "intervention by design; the use of practical and intellectual resources to develop products and systems (technological outcomes) that expand human possibilities by addressing needs and realising opportunities" (Ministry of Education, 2017a, p. 1).

A compulsory subject in New Zealand for over 25 years, technology education has already seen several iterations. The first technology curriculum was published in 1995, held three strands (technological knowledge and understanding, technological capability, and technology and society) and eight achievement objectives (Ministry of Education, 1995). The second revised technology curriculum was published in 2007 and contained three new strands (nature of technology, technological knowledge, and technological practice) and eight components and achievement objectives (Ministry of Education, 2007). A third version was published in 2017, building on the 2007 curriculum, with the addition of five new technological areas, two of which have a digital focus (Ministry of Education, 2017b).

Over the last decade, there has been a push to move from digital literacy to digital fluency. Digital fluency supports teachers, kaiako, ākonga and students to confidently and effectively use digital technologies to enhance teaching and learning outcomes (Ministry of Education, 2022c). In recent years, there has been much development and support for teaching and learning in digital fluency. Current Ministry of Education professional learning development (PLD) priorities include digital fluency (Ministry of Education, 2022c) and there are now 206 accredited Ministry of Education facilitators providing government-funded professional learning (Ministry of Education, 2022c). Within digital fluency, there are distinct categories: digital technologies and e-learning (digital technology/information & communication technology). E-learning is learning and teaching facilitated by or supported through the use of smart information and communication technologies (Ministry of Education, 2006), whereas digital technologies comprises "learning about technology. It involves learning to be a creator in the digital world, not just learning to use systems" (Ministry of Education, n.d.-b, p. 1). By following a technological design process, students learn how to think logically and computationally to design and create digital solutions for authentic needs and contexts.

Teachers are encouraged to integrate digital fluency into their teaching practice, as Wright stated, it is the "role of the teacher to harness these tools purposefully and to teach students to benefit from using these ubiquitous tools for learning" (Wright, 2010, p. 46).

From 2018 to 2020, Kia Takatū ā-Matihiko, the digital readiness programme, was created to support teachers and schools to develop strategic planning for teaching and learning in digital fluency, in particular digital technologies, based on the revision of the 2017 technology curriculum (Ministry of Education, 2017a). Essentially, e-learning is the use of digital tools to communicate, collaborate, and use resources, and digital technologies is the creation with and of tools to solve authentic needs and problems in society. Figure 1 demonstrates some of the differences between e-learning and digital technologies.



Kia Takatū ā-Matihiko
Digital Readiness
e-Learning/ICT Capability
versus Digital Technologies
e-Learning - developing capability to learn with ICTs
Presentation tools
Locate and store information
Digital publishing
Interpret timelines
Ownership and use - copyright law
Managing files
Mapping and geospatial tools
Online communication and collaboration
Digital music / multimedia
Spreadsheets and graphing
Analyse and visualise data
Digital citizenship
Create solutions and learn about Digital Technologies
Digital products
Robotics, mechatronics, and automation
Coding and programming (sequence, selection and iteration)
Computational thinking
Software engineering
User Interface
Algorithms
Pattern recognition
Systems thinking
Decompose problems
Storing and Transmitting data (binary numbers)
Data collection, presentation and analysis
e-Learning or Information Communication Technology (ICT) Capability in the New Zealand Curriculum
e-Learning capability supports students to be effective users of technology.
e-Learning is learning and teaching that is facilitated or supported through the appropriate use of ICTs
Assists the making of connections, enables students to enter and explore new learning environments, overcoming barriers of distance
Facilitates shared learning by enabling students to join or create communities of learners that extend well beyond the classroom;
Is explicitly planned, integrated into curriculum, and taught across all subject areas
General capabilities: e-learning/ICT capability
Applying social and ethical protocols and practices when using e-learning/ICT
Investigating with e-learning ICT
e-Learning/ ICT Capability
Creating with e-learning/ICT
Communicating with e-learning/ICT
Managing and operating e-learning/ICT
Assists in the creation of supportive learning environments by offering resources that take account of individual, cultural, or developmental differences;
Enhances opportunities to learn by offering students virtual experiences and tools that save them time, allowing them to take their learning further
Adapted from New Zealand Curriculum (2007) Ministry of Education by Learning Media Limited p.35-36
Incorporates digital citizenship, fluency and literacy, when considering the ethical and social impacts of using technologies.
Digital Technologies
New curriculum content for year 1–10 students with a focus on learning in authentic contexts, using an iterative, design thinking process.
Develops knowledge, understandings and skills of the underlying concepts of computational thinking for digital technologies (CT) and designing and developing digital outcomes (DDDO).
Effective and Ethical Design
Design Innovation and Adaptation
Computational Thinking
Technology Curriculum
Innovative Creators
Digital Technologies
Designing and Developing Digital Outcomes
Managing and operating E-Learning/ICT
Māori Culture and World Views
Students learn that technology is the result of human activity from their heritage, Aotearoa New Zealand's rich cultural environment, and contemporary examples of technology.
Digital Technologies enables students to build skills and capability so they can be innovative creators of digital solutions.
This relies on and extends e-Learning/ICT capability, moving students beyond being solely users and consumers of digital technologies.
Examples of e-Learning in action
Use digital concept mapping tools to plan and select research tasks.
Use presentation software to present findings of an inquiry that includes text, images and video.
Use video to analyse a sports performance to provide coaching tips
Use a computer simulation or game to test predictions and collect data.
Use a search engine effectively as a research tool.
Use spreadsheet functions to create tables, record, sort, calculate and present data to identify trends
Use an online game that has a grid map system to learn about directions.
Share a book review or information using a QR code.
Use tools such as Google docs to work collaboratively on a project and Skype to connect with outside experts.
Examples of Digital Technologies in action
Code a makey makey to play sounds from bottle caps
Create a QR code image using black and white squares. Invite a classmate to decode and access the information contained.
Compare a transport network system and computer network system to explore ideas about pathways, reliability, protocols and security.
Create an interactive story from a favourite book with user-input using a familiar programming language.
Create your own simulation using a visual or text-based programming language.
Explore ways to generate and access secret code by securely transmitting data through techniques of encryption and decryption.
Create network diagrams to identify relationships between different sources of data and analyse this data.
Design your own maze and use an app to program a robot to go through it.
Digital Fluency is about understanding how to use digital technologies.
Digital Technologies is about learning to be a creator in the digital world, not just learning to use systems.
Digital Technologies is NOT about learning WITH technology (e-learning), it's learning ABOUT technology.
BROUGHT TO YOU BY
MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA

Figure 1. Kia Takatū ā-Matihiko:the digital readiness programme e-learning/ICT capabilities versus Digital Technologies in New Zealand Education (Source: Ministry of Education, n.d.-b).

With the 2017 revision to the technology curriculum, there is greater consideration of digital technologies—two of the five technological areas focus on developing students' capability to create technological outcomes for specific purposes (Ministry of Education, 2017b). Within the digital technologies, there are now two foci, computational thinking (CT) and designing and developing digital outcomes (DDDO), each with its own set of progressive learning requirements, known as progress outcomes, that are separate to the three main strands of the technology curriculum. The technology curriculum is compulsory for all students in Years 1 to 10, and optional for Years 11 to 13.

Students develop knowledge and skills in CT and DDDO, as the intention of the digital technologies' curriculum content is to "significantly contribute to students developing the knowledge and skill they need as digital citizens and as users of digital technologies across the curriculum" (Ministry of Education, 2017a, p. 3).

New Zealand has a second curriculum (Te Marautanga o Aotearoa), which supports the learning of Māori students in *kura* (schools). As part of the *Hangarau Matihiko* (digital technologies) technological area, there are two branches of specialisation: *Te Whakaaro Rorohiko* (computational thinking), which includes using te reo Māori to express problems, formulate solutions, and solve them using algorithms, program and data representation, and *Tangata me te Rorohiko* (people and computers) which involves designing and developing digital outcomes while considering their role and responsibility as digital citizens (Ministry of Education, 2017b).

Technology education is taught in many ways in schools across New Zealand. Schools are encouraged to develop student graduate profiles or strategic planning incorporating progressive digital learning in a variety of curriculum areas including technology (Ministry of Education, n.d.-a).

In the primary sector, Year 1 to Year 6, most technology lessons are taught by a "general" classroom practitioner who needs to teach every curriculum subject in one classroom space. Some primary level educators focus on the digital technologies area as a "siloed" subject, teaching it on its own, whereas others use an integrated curriculum approach through play-based methodologies, inquiry/project-based learning, or STEM/STEAM (science, technology, engineering, arts, mathematics) to provide opportunities to deepen digital technologies and develop digital fluency. In middle schools (Year 7 to 10), the primary classroom model can continue; however, here we see the introduction of technology specialists who either teach pure digital technologies or integrate digital technologies and e-learning into their own technological learning space. At secondary level, the technology aspect of digital technologies is specialised with classrooms comprising computer suites dedicated to this learning. However, there is still the expectation that digital fluency is incorporated across curriculum subjects.

With an increase in BYOD (Bring Your Own Device), distance learning due to COVID-lockdown situations, and new teaching approaches (such as blended learning and hybrid learning), general classroom teachers and specialist technology teachers have experienced a marked increase in learning time with devices and online learning. To aid continuity of learning for students, either in class or when isolating at home, there is a greater expectation for teachers to set up a school presence in a digital form (Ministry of Education, 2022a).

Technology education itself is partially responsible for the growing use of digital tools and devices in New Zealand schools. Not only does it have the subject specialism of digital technologies, but it encourages the use of digital hardware, such as 3D printers, laser cutters, robotics, and software (e.g., graphic design packages, CAD [computer-aided design] and programming), in all other technological areas.

The technological strands support students to work through a design/thinking process in which they are expected to use e-learning to communicate with clients/stakeholders, research by collecting data and

analysing results; contacting industry experts to support their study; design, develop, and test ideas (and show evidence of this process); plan the process; and write evaluative reports. Technology develops the key skills of collaboration and communication and uses many different types of software to aid and guide learners in these tasks. The effects of the increasing use of e-learning and digital technologies in education may vary; while holding a promise for better learning outcomes, in some cases, they may also cause challenges and issues.

Positive and negative outcomes for learners

Equitable access to devices and access to the internet at home have been identified as ways of reducing the achievement divide. A few of the countries that have supported home internet access include Singapore (Lim, 2009), Israel (Zilka, 2017), Norway (Brand, 2018), the United Kingdom (Home Access, 2010), and many states in the United States of America (for example, Digital Promise, 2014). Children who are competent users and creators conversant with digital technologies have been shown to achieve greater educational outcomes (Brandtzaeg, 2016), higher engagement in classroom learning (Newton, 2018), and have higher cultural and social capital (Hargittai & Hinnant, 2008) than those who have less access, time, support, and ability. In a recent New Zealand study investigating the education value (learning, psychological, and social domains) of home internet access, 68 studies reported a positive learning outcome, four reported neutral outcomes, and six reported negative outcomes (Starkey et al., 2018).

However, the use of devices per se, is far from being the panacea for all educational ills. For instance, Beland and Murphy (2016) warn against distractions and the loss of productivity caused by devices and report an increase in student performance after banning mobile phones in schools. Specifically designed to be addictive, many online games, social media, and online shopping platforms are constantly enhanced to captivate the users' attention and maximise the time users spend using these services (Abbasi et al., 2021; Marengo et al., 2022; Rigby & Ryan, 2011). Gecikli (2020) concluded that "[y]oungsters and adults feel incomplete during the hours they aren't using their phones" (p. 1), and that younger users with free and unlimited internet access tend to be more exposed to the risks associated with devices and the internet (Kuss et al., 2013; Tang et al., 2017). Romania developed a voucher system to increase home computer use amongst disadvantaged families. Some children reported increased computer skills; however, the majority reported a surge in playing computer games daily. The research also suggested that less time was spent doing homework and reading (Malamud & Pop-Eleches, 2011). Hence, having access to devices and the internet does not necessarily equate to improvement in academic grades (Fairlie & Robinson, 2013).

The effects of internet expansion permeate all spheres of human life, including education, work, social interactions, consumption, entertainment, and privacy. Unlike traditional television, smartphones allow access to an unlimited range of content at any time, and any place (Jung, 2014). Most people are inseparable from their phones (Turkle, 2011), which results in co-present interactions, where one or more people are physically present, but the conversation occurs via mobile media (Burchell, 2017). Young people especially tend to continually check their digital devices for fear of missing out (FoMO) (Klimmt et al., 2018); some studies linked FoMO to smartphone addiction (Davey & Davey, 2014, Kwon et al., 2013, Salehan & Negahban, 2013) and problematic mobile phone use (Cheever et al., 2014; Lepp et al., 2014). The coinage of the term "phubbing", where a person you are speaking to is snubbed for a smartphone (Schneider & Hitzfeld, 2019), marks a rapid shift in communication etiquette and an increasing acceptance of such behaviour as a current social norm (Chotpitayasunondh & Douglas, 2016). Phubbing, the dynamics between phubbers and phubbees, and related changes in social norms are now commonly researched (Cahir & Lloyd, 2015; Rainie & Zickuhr, 2015; Schneider & Hitzfeld, 2019; Vorderer et al., 2016); however, this remains outside the scope of this paper but indicates a growing awareness of issues related to mobile phone use.

While enjoying the benefits and convenience brought by Web 2.0, the public is aware of the risks linked to the use of devices and the internet, especially for young users. These risks are often associated with

external threats, such as data harvesting or hacker attacks. With cyber-security now at an all-time high, many countries have developed security guidelines and policies to ensure safe online practices for children (International Telecommunication Union, 2020; UNICEF, 2015). New Zealand has developed several strategies and support structures for the safe use of devices and the internet (Ministry of Education, 2022b). These safeguards mostly focus on protecting children from bullying and harassment; reducing their possible exposure to inappropriate content; preventing or minimising security breaches, such as viruses, phishing, or scams. These strategies may vary, but commonly include web security processes, reducing screen time, and providing guidelines for parents and teachers to ensure "safe online practices" (Ministry of Education, 2022b; UNICEF, 2015).

However, these recommendations attribute little importance to the mental health and well-being issues triggered by the excessive use of devices, in particular, in situations when study, work, shopping, entertainment, and social life suddenly moved online, especially for those who already have a large element of their working hours online (Gurvich et al., 2021). Before the COVID-19 pandemic, over 26% of students reported spending more than six hours per day online during the weekends, and 16% reported a similar amount during weekdays; these students were more likely to feel lonely, have low expectations of their future education, and arrive later at school (OECD, 2017). Many parents feel their children are becoming obsessed, addicted, or dependent on their smartphones or tablets (Bergert et al., 2020). A Korean study of five year olds found negative developmental effects of using the devices, specifically, that higher habitual computer use was associated with lower socio-emotional development (Hyun et al., 2011). The recent research by Smith and colleagues (2020) highlighted an increase in screen time during the pandemic and the consequent physical and mental health risks related to excessive (yet often unavoidable) use of devices and the internet. The most significant physical health issues include the risk of myopia and eye strain, disrupted sleep cycles (Singh & Balhara, 2021; Wong et al., 2021), and a decrease in physical and outdoor activities (Bahkir & Grandee, 2020). Physical symptoms, such as muscle pains, obesity, or carpal tunnel syndrome, are often accompanied by mental health issues, ranging from irritability and difficulties in concentration to mental illnesses, such as anxiety, depression, and attention-deficit hyperactivity disorder (Király et al., 2020; Meyer et al., 2020; Oberle et al., 2020; Stavridou et al., 2021). Other mental health impacts manifest in attention-deficit symptoms, impaired emotional and social intelligence, social isolation, phantom vibration syndrome, and technology addiction, e.g., gaming disorder (King et al., 2020; Lodha & De Sousa, 2020; Oswald et al., 2020). Nevertheless, recognition, classification, diagnostics, and treatment of internet addictions remain contested terrain (Kuss et al., 2017). The issue of compulsive behaviours online is rarely discussed in the technology education literature; however, the implications of digital and internet addictions on teaching and learning require further investigation.

Digital and online addiction issues

Over the last decade the divide between those with and without access to devices and the internet has reduced (OECD, 2015). Globally, internet use has surged by 1,332% between 2000 and 2021 and, as of March 2021, the number of active internet users exceeded 5 billion. Facilitated by the increasing accessibility of devices, apps, and technologies, the average internet penetration rate reached 66% worldwide with a high of 94% in North America and a low of 43% in Africa (Internet World Stats, 2021). Whilst more people have gained access to the internet and routinely engage with devices and the internet, internet addiction (Lopez-Fernandez & Kuss, 2020) has now become a serious threat to users' mental health and wellbeing (Kuss & Griffiths, 2012).

The global pandemic of 2020–2022 added a new dimension to the discussion of digital technologies in education, and in technology education, in particular. During the prolonged periods of nationwide lockdowns, online learning became an acceptable and often the only accessible education mode (Dhawan, 2020). As a result of COVID, the physical and metaphorical walls, which traditionally separated a school from its community, have become more permeable, and online/virtual learning has become mainstream (Core Ed, 2020). Whilst the research has shown that the use of devices generally

delivers positive outcomes for most learners (Starkey et al., 2018), the efficiency and implications of the pandemic "emergency" delivery mode for a wide range of learners and educators is yet to be assessed from both educational and mental health perspectives.

A saviour for many, digital devices and the internet have also been a significant contributor to raised internet addiction levels (Gupta et al., 2020). The research of internet addictions has originated and saturated in the fields of clinical psychology and psychiatry (Cash et al., 2012; Kuss & Griffiths, 2012; Kuss & Lopez-Fernandez, 2016) with minimal literature highlighting internet addiction issues in education. Over two decades ago, researchers identified that social pathologies existed in cyberspace in the form of technological addictions (Griffiths, 1999; Marks, 1990). These compulsive behaviours contained the core components of addiction: salience (dominates the person's life), mood modification (reaction when engaging in the activity), tolerance (increasing amounts of the activity are required to achieve the same effect), withdrawal (effects when the activity is discontinued), conflict (conflicts involving the activity), and relapse (tendency to revert to earlier behaviour patterns) (Griffiths, 1999).

The notion of internet addiction disorder (IAD) (Goldberg, 1995) precedes the more holistic term, problematic internet use (PIU) (Shapira et al., 2000), which is also sometimes referred to as high internet dependency (Hur, 2006), pathological internet use (Davis, 2001), excessive internet use (Hansen, 2002), and compulsive internet use (Widyanto & Griffiths, 2006).Various forms of IAD and PIU, including hacking (Shotton, 1991), computing addictions (Turkle, 1995), cyberspace addictions (Suler, 2004), and virtual relational addictions were also investigated in the literature. The research on internet gaming addictions (Salicetia, 2015) has gained significant traction (Kuss & Griffiths, 2012; Wang et al., 2014; Young, 2009). In 2013, the American Psychiatric Association included internet gaming disorder (IGD) in the *Diagnostic and Statistical Manual of Mental Disorders* (commonly referred to as the DSM-5). The World Health Organisation (WHO) officially recognised gaming disorder (GD) as a diagnosis in the *International Classification of Diseases* (ICD-11) (WHO, 2018). The official recognition of IGD and GD opens a pathway for discussions on whether these disorders constitute a learning problem and should be accommodated accordingly by education providers.

Implications for technology education students and educators

Even in the pre-smartphone era (prior to 2007), excessive internet use was regarded as "a real addiction and of genuine concern" (Griffiths, 1999, p. 250). Whilst more recently, several digital addictions have been classed as diagnosable mental health conditions. China is one of many countries concerned about these disorders with up to 13.7% of Chinese adolescent internet users meeting internet addiction diagnostic criteria, equating to approximately 10 million teenagers (Block, 2008). Whilst research into childhood, teenage, and university student addiction is common (Lodha & De Sousa, 2020; Oswald et al., 2020), there is a dearth of research focusing on addiction levels of teachers. As the number of internet users increased tenfold from 1999 to 2013, to the current level of over five billion users (Internet World Stats, 2021), one must presume that teachers would represent a proportion of these statistics.

Knowing that a proportion of our teaching population will have digital addiction issues and mandating them to work totally online, to deliver online teaching, online engagement with students and parents, online planning, and online reporting is a concern. It would be unconscionable to mandate that a person with a gambling addiction work in a casino or an alcoholic work in a bar, yet this is what many teachers were forced to endure. Previously, teachers could divide and limit their time online; however, as soon as learning moved to online these support structures were removed. When COVID arrived, many professional activities moved online; however, the ramifications for the teachers and learners with internet and digital addictions were unprecedented.

With technology education in New Zealand demonstrating many facets that encourage and expect the use of digital technologies, teachers and students need to be made much more aware of the implications and risks of more frequent and regular online and digital use. Teachers need to be cognisant and able to provide strategies in teaching and learning that reduce addictive tendencies in students. During class

time, evidence suggests that supplementing standard teaching rather than replacing it with technology interventions can have the most positive impact on student achievement (Higgins et al., 2012; Lewin et al., 2019). Teachers need to think carefully about the benefits of using a digital tool and the impact of learning by utilising digital technologies or e-learning. Can the activity be taught without the need to be online or using a digital device? As MacCallum and Brown (2021) stated, devices should clearly add value or improve teaching and learning, not simply replace traditional practices. Other strategies for technology students who need to be online for their learning could include regular breaks from the screen, the use of unplugged activities to teach computational thinking and the setting up of learning tasks that can take place away from a digital device or reduce time physically using digital tools, for example, create a mindmap brainstorm using paper, pen, and post-it notes and taking a photograph to show evidence of the work as opposed to using a tool like Google Jamboard, which encourages students collaborating online.

Recommendations

Prior to COVID, support for those afflicted with this addiction varied. The research suggests some coping strategies that can be helpful in preventing negative effects of PIU, starting with detecting early warning signs of addictive tendencies and switching from using digital media to physical or no-screen activities (Király et al., 2020). Most researchers admitted that total abstinence was neither possible, nor helpful, but rather abstinence from problematic applications and the development of controlled and balanced internet usage might be a desirable goal (Petersen et al., 2009). The approaches to tackling PIU and digital addictions depend on the severity of the issue and may include pharmacological or psychological interventions. A non-psychological, pharmacological approach with the use of selective serotonin reuptake inhibitors (SSRIs) because of the co-morbid psychiatric symptoms (depression and anxiety) of IAD (Huang et al., 2010). Some common psychological approaches focus on self-help coping strategies, such as accepting the issue; identifying its triggers; tracking, scheduling, and moderating of screen time; practising digital detox and digital dieting; and reinforcing and rewarding positive behavioural changes (Gupta et al., 2020). Others supported psychological measures, such as physical exercise to compensate for the decrease in the dopamine level due to limited online usage (Greenfield, 2000; Lanjun, 2009), engaging in family therapy (Peukert et al., 2010), motivational interviewing (Miller, 2010), reality therapy (Kim, 2007), acceptance and commitment therapy (ACT) (Twohig & Crosby, 2010), cognitive-behavioural therapy (CBT) (Widyanto & Griffiths, 2006), or a multimodal approach utilising a number of strategies (Du et al., 2010). Approaches that changed patterns and timing of internet use, prompted or limited engagement, including time-related goals, abstaining from specific applications, using reminder prompts of the costs and benefits for behaviour change, developing a personal log, attending support groups and engaging in family therapy, were all shown to be effective in changing addictive habits (Young, 1999).

However, as a result of COVID, we now need to learn to use and adapt these well-established support strategies as they apply to ever-changing situations, to ensure secure behaviours and enhance users' well-being and quality of life (Lopez-Fernandez, 2020; Young, 2013). The pandemic has also taught us the importance of regular sleep and exercise, routines, a healthy diet, stress-reduction techniques, maintaining relationships, alone time if living in a family group, and following World Health Organisation updates, whilst also minimising excessive exposure to news updates. Specific measures also include monitoring and regulating screen-time, role-modelling reducing the time on devices, using well-being apps and analogue technical tools (e.g., watches), keeping in touch with friends, and seeking help (Király et al., 2020). Numerous prevention programmes have been developed for schools (Carbonell et al., 2018; Ministry of Education, 2022b; Neverkovich et al., 2018), but, generally, these are designed to keep a user safe from others and do not specifically address internet addictions. Little, if anything, is designed to keep learners and teachers safe from themselves, and often self-diagnostics and self-help remain the only accessible options to tackle the PIU. Few guidelines have considered the impact of lockdowns and the COVID-related hybrid learning and compulsory teaching of digital fluency and technologies on those afflicted with digital addictions.

We all react to situations in different ways, and through no fault of their own, a proportion of people, including those in our teaching and learning community, have digital addiction issues. Teachers who are expected to teach technology online and face-to-face have the added difficulty of not being able to utilise some of the classical coping mechanisms and support approaches. These teachers are expected to be cognisant of the latest digital technologies and their use; hence, their role requires a personal online experience and presence. Due to the demands of the profession, these technology teachers cannot easily change the time of their online usage, nor limit their time online; as for many, it is their job to be online.

Recommendations for future research

The technology education sector has a key role in preventing digital and online addictions. Even after 20 years of research, there is still a need to raise awareness and inform users about the risks (Lopez-Fernandez & Kuss, 2020). More research is needed into the drivers of online addictions. Is technology seen as the medium of communication and connecting with others (ability to have online interactions), a source of information, or access to an activity (gambling, computer games)? Is an addiction driven by the cost, instant gratification, ability to become "famous", anonymous, or partake in an alternative reality? Or whether it is a result of poor mental health or poor parent/child relationships. How do these drivers affect teaching and learning, especially when intensive use of devices and digital resources is required?

How can we ensure the students and teachers involved in technology education are aware of the issue and provided with strategies to manage and mitigate the issues safely? How can we strengthen the role of the Nature of Technology to include such issues to increase student awareness?

Implications for technology education

The scale of the digital and online addictions' issue in technology education is yet to be determined as well as the effective support strategies for those suffering from digital addictions and who are exposed to working in a digital environment. Those working in the technology education field, and hence most at risk and possibly most affected, need to be prioritised. COVID must have hit this group hard and yet their plight has gone undetected thus far. Accepting that: 1. the PIU issue exists and is being exacerbated in the "new normal"; 2. that it might affect an increasing number of educators and learners, particularly in technology education; and 3. that the issue should be formally recognised to enable adequate support mechanisms is essential for mitigating the long-term physical and mental health impacts of the PIU. Therefore, further research on digital addictions among teachers and learners and the ways of mitigating these in the educational contexts is an urgent matter.

Acknowledgement

This paper has been adapted as a result of feedback gained from a presentation given at the 2022 PATT 39 Conference, St John, Canada (21–24 June).

References

Abbasi, A. Z., Rehman, U., Afaq, Z., Rafeh, M. A., Hlavacs, H., Mamun, M. A., & Shah, M. U. (2021). Predicting video game addiction through the dimensions of consumer video game engagement: Quantitative and cross-sectional study. *JMIR Serious Games, 9*(4), e30310. https://doi.org/10.2196/30310

Bahkir, F., & Grandee, S. (2020). Impact of the COVID-19 lockdown on digital device-related ocular health. *Indian Journal of Ophthalmology, 68*(11), 2378–2383. https://doi.org/10.4103/ijo.IJO_2306_20

Beland, L. P., & Murphy, R. (2016). Ill communication: Technology, distraction and student performance. *Labour Economics, 41*, 61–76, https://doi.org/10.1016/j.labeco.2016.04.004

Bergert, C., Köster, A., Krasnova, H., & Turel, O. (2020, February). Missing out on life: Parental perceptions of children's mobile technology use. In (Eds.), *Wirtschaftsinformatik (Zentrale Tracks)* (pp. 568–583). https://library.gito.de/wp-content/uploads/2021/08/F1_Bergert_Missing_Out_on_Life.pdf

Block, J.-J. (2008). Issues for DSM-V: Internet addiction. *American Journal of Psychiatry, 165*(3), 306–307. https://doi.org/10.1176/appi.ajp.2007.07101556

Brand, D. (2018, January 19). Norwegian city is fighting poverty by giving free internet to kids. *Global Citizen.* https://www.globalcitizen.org/en/content/bergen-norway-internet-kids-universal-access/

Brandtzæg, P. B. (2016). The social media natives. In E. Elstad (Ed.), *Digital expectations and experiences in education editors* (pp. 149–162). Springer. https://link.springer.com/book/10.1007/978-94-6300-648-4

Burchell, K. (2017). Finding time for Goffman: When absence is more telling than presence. In T. Markham & S. Rodgers (Eds.), *Conditions of mediation: Phenomenological perspectives on media* (pp. 185–196). Peter Lang.

Cahir, J., & Lloyd, J. (2015). "People just don't care": Practices of text messaging in the presence of others. *Media, Culture & Society, 37*, 703–719. https://doi.org/10.1177/0163443715577242

Carbonell, X., Chamarro, A., Oberst, U., Rodrigo, B., & Prades, M. (2018). Problematic use of the internet and smartphones in university students: 2006–2017. *International Journal of Environmental Research and Public Health, 15*, 475. https://doi.org/10.3390/ijerph15030475

Cash, H., Rae, C. D., Steel, A. H., & Winkler, A. (2012). Internet addiction: A brief summary of research and practice. *Current Psychiatry Reviews, 8*(4), 292–298. https://doi.org/10.2174/157340012803520513

Cheever, N. A., Rosen, L. D., Carrier, L. M., & Chavez, A. (2014). Out of sight is not out of mind: The impact of restricting wireless mobile device use on anxiety levels among low, moderate and high users. *Computers in Human Behavior, 37*, 290–297. https://doi.org/10.1016/j.chb.2014.05.002

Chotpitayasunondh, V., & Douglas, K. M. (2016). How "phubbing" becomes the norm: The antecedents and consequences of snubbing via smartphone. *Computers in Human Behavior, 63*(October), 9–18.

Core Ed. (2020). *CORE education ten trends 2020 retrospective.* https://core-ed.org/free-resources/ten-trends

Davey, S., & Davey, A. (2014). Assessment of smartphone addiction in Indian adolescents: A mixed method study by systematic-review and meta-analysis approach. *International Journal of Preventive Medicine, 5*(12), 1500–1511. https://pdfs.semanticscholar.org/4b3d/645207ac36c01279bbb6266c0a4dd8966611.pdf?_ga=2.173383716.668867514.1658083405-1828173160.1655761094

Davis, N. (2017). *Digital technologies and change in education: The arena framework.* Routledge. https://doi.org/10.4324/9781315638201

Davis, R. A. (2001). A cognitive-behavioral model of pathological internet use. *Computers in Human Behavior, 17*(2), 187–195.

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems, 49*(1), 5–22. https://doi.org/10.1177/0047239520934018

Digital Promise. (2014). *Bridging the digital divide for low-income students.* http://digitalpromise.org/2014/04/07/11-learning-24-7-at-sunnyside-unified-school-district/

Du, Y.S., Jiang, W., & Vance, A. (2010). Longer term effect of randomized, controlled group cognitive behavioural therapy for internet addiction in adolescent students in Shanghai.

Australian and New Zealand Journal of Psychiatry, 44(2), 129–134. https://doi.org/10.3109/00048670903282725

Eppel, E., & Allen, B. (2020). Digital government: Leadership, innovation and integration. In E. Berman & G. Karacaoglu, G. (Eds.), *Public policy and governance frontiers in New Zealand (Public Policy and Governance* (vol. 32, pp. 233–255). Emerald Publishing. https://doi-org.ezproxy.auckland.ac.nz/10.1108/S2053-769720200000032032

Fairlie, R. W., & Robinson, J. (2013). Experimental evidence on the effects of home computers on academic achievement among schoolchildren. *American Economic Journal: Applied Economics, 5*(3), 211–240.

Gecikli, F. (2020). Digital addiction. In M. S. Erciş & E. E. Başar (Eds.), *GeNew communication approaches in the digitalized world* (pp. 1–13). Cambridge Scholars.

Goldberg, I. (1995). Internet addictive disorder (IAD). *Diagnostic Criteria. [Electronic Version], 13*, 2008.

Greenfield, D. N. (2000). *Suchtfalle Internet. Hilfe fuer Cyberfreaks, Netheads und ihre Partner. Virtual addiction.* Walter.

Griffiths, M. (1999). Internet addiction: Fact or fiction? *The Psychologist, 12*(5), 246–250.

Gupta, T., Swami, M. K., & Nebhinani, N. (2020). Risk of digital addiction among children and adolescents during COVID-19 pandemic: Concerns, caution, and way out. *Journal of Indian Association for Child and Adolescent Mental Health, 16*(3), 199–208.

Gurvich, C., Thomas, N., Thomas, E., Hudaib, A-R., Sood, L., Fabiatos, K., Sutton, K., Issacs, A., Arunogiri, S., Sharp, G., & Kulkarni, J. (2021). Coping styles and mental health in response to societal changes during the COVID-19 pandemic. *International Journal of Social Psychiatry, 67*(5), 540–549. https://doi.org/10.1177/0020764020961790

Hansen, S. (2002). Excessive internet usage or "internet addiction"? The implications of diagnostic categories for student users. *Journal of Computer Assisted Learning, 18*(2), 232–236.

Hargittai, E., & Hinnant, A. (2008). Digital inequality: Differences in young adults' use of the internet. *Communication Research, 35*(5), 602–621. https://doi.org/10.1177/0093650208321782

Higgins, S., Xiao, Z., & Katsipataki, M. (2012). *The impact of digital technology on learning: A summary for the Education Endowment Foundation.* https://v1.educationendowmentfoundation.org.uk/uploads/pdf/The_Impact_of_Digital_Technologies_on_Learning(2012).pdf, 14

Home Access. (2010). *Get on in school, get online at home*. https://www.homeaccess.org.uk/

Huang, X.-q., Li, M.-c., Tao, R., (2010). Treatment of internet addiction. *Current Psychiatry Reports, 12*(5), 462–470. https://doi.org/10.1007/s11920-010-0147-1

Hur, M. (2006). Demographic, habitual, and socioeconomic determinants of internet addiction disorder: An empirical study of Korean teenagers. *Cyber Psychology and Behavior, 9*(5), 514–525.

Hyun, A. S., Hui, Y. C., Seung, H. J., & Mi, H. C. (2011). Relationship between young children's habitual computer use and influencing variables on socio-emotional development. *Early Child Development and Care, 181*(2), 245–265. https://doi.org/10.1080/03004430.2011.536644

International Telecommunication Union. (2020). *Guidelines for parents and educators on child online protection*. https://8a8e3fff-ace4-4a3a-a495-4ea51c5b4a3c.filesusr.com/ugd/24bbaa_f8a17ad2a3b94490add9a586ce4b6db8.pdf

Internet World Stats. (2021). *World internet usage and population statistics 2021 year - Q1 estimates*. https://internetworldstats.com/stats.htm

Jung, Y. (2014). What a smartphone is to me: Understanding user values in using smartphones. *Information Systems Journal, 24*, 299–321.

Kim, J.-U. (2007). A reality therapy group counseling program as an internet addiction recovery method for college students in Korea. *International Journal of Reality Therapy, 26*(2), 3–9.

King, D. L., Delfabbro, P. H., Billieux, J., & Potenza, M. N. (2020). Problematic online gaming and the COVID-19 pandemic. *Journal of Behavioral Addictions, 9*(2), 184–186. https://doi.org/10.1556/2006.2020.00016

Király, O., Potenza, M. N., Stein, D. J., King, D. L., Hodgins, D. C., Saunders, J. B., Griffiths, G., Gjoneska, B., Billieux, J., Brand, M., Abbott, M. W., Chamberlain, S. R., Corazza, O., Burkauskas, J., Sales, C. M. D., Montag, C., Lochner, C., Grünblatt, E., Wegmann, E., Martinotti, G.,… Demetrovics, Z. (2020). Preventing problematic internet use during the COVID-19 pandemic: Consensus guidance. *Comprehensive Psychiatry*, 152180. https://doi.org/10.1016/j.comppsych.2020.152180

Klimmt, C., Hefner, D., Reinecke, L., Rieger, D., & Vorderer, P. (2018). The permanently online and permanently connected mind: Mapping the cognitive structures behind mobile Internet use. In P. Vorderer, D. Hefner, L. Reinecke, & C. Klimmt (Eds.), *Permanently online, permanently connected: Living and communicating in a POPC world* (pp. 18–28). Routledge.

Kuss, D. J., & Griffiths, M. D. (2012). Internet and gaming addiction: A systematic literature review of neuroimaging studies. *Brain Sciences, 2*(3), 347–374.

Kuss, D. J., Griffiths, M. D., & Pontes, H. M. (2017). Chaos and confusion in DSM-5 diagnosis of internet gaming disorder: Issues, concerns, and recommendations for clarity in the field. *Journal of Behavioral Addictions, 6*(2), 103–109. https://doi.org/10.1556/2006.5.2016.062

Kuss, D. J., & Lopez-Fernandez, O. (2016). Internet addiction and problematic internet use: A systematic review of clinical research. *World Journal of Psychiatry, 6*(1), 143–176. https://doi.org/10.5498/wjp.v6.i1.143

Kuss, D. J., Van Rooij, A. J., Shorter, G. W., Griffiths, M. D., & van de Mheen, D. (2013). Internet addiction in adolescents: Prevalence and risk factors. *Computers in Human Behavior*, *29*(5), 1987–1996.

Kwon, M., Kim, D. J., Cho, H., & Yang, S. (2013). The smartphone addiction scale: Development and validation of a short version for adolescents. *PloS One*, *8*(12) p. e83558. https://doi.org/10.1371/journal.pone.0083558

Lanjun, Z. (2009). The applications of group mental therapy and sports exercise prescriptions in the intervention of internet addiction disorder. *Psychological Science, 32*(3), 738–741.

Lepp, A., Barkley, J. E., & Karpinski, A. C. (2014). The relationship between cell phone use, academic performance, anxiety, and satisfaction with life in college students. *Computers in Human Behavior*, *3*1, 343–350. https://doi.org/10.1016/j.chb.2013.10.049

Lewin, C., Smith, A., Morris, S., & Craig, E. (2019). *Using digital technology to improve learning: Evidence review.* Education Endowment Foundation, 32, London. https://files.eric.ed.gov/fulltext/ED612157.pdf

Lim, S. S. (2009). Home, school, borrowed, public or mobile: Variations in young Singaporeans' internet access and their implications. *Journal of Computer-Mediated Communication, 14*(4),1228–1256.

Lodha, P., & De Sousa, A. (2020). Mental health perspectives of COVID-19 and the emerging role of digital mental health and telepsychiatry. *Archives of Medicine and Health Sciences, 8*(1),133–139. https://doi.org/10.4103/amhs.amhs_82_20

Lopez-Fernandez, O. (2020). Considering existing classic and contemporary proposals for preventing online addiction problems: Some old recipes for new problems: Commentary on: Problematic risk-taking involving emerging technologies: A stakeholder framework to minimize harms. *Journal of Behavioral Addictions, 9*(4), 903–907. https://doi.org/10.1556/2006.2020.00084

Lopez-Fernandez, O., & Kuss, D. J. (2020). Preventing harmful internet use-related addiction problems in Europe: A literature review and policy options. *International Journal of Environmental Research and Public Health*, *17*(11), 3797. https://doi.org/10.3390/ijerph1711379 7

MacCallum, K., & Brown, C. (2021). Children live online more than ever – we need better definitions of "good" and "bad" screen time, *The Conversation*. https://theconversation.com/children-live-online-more-than-ever-we-need-better-definitions-of-good-and-bad-screen-time-168650?fbclid=IwAR2kE3BZ7oTLLYF9Vn330x4N3n9puRE3oeu-YSRhC87v_v0EkU5p2uCbnQ0

Malamud, O., & Pop-Eleche, C. (2011). Home computer use and the development of human capital. *The Quarterly Journal of Economics, 126*(2), 987–1027.

Marengo, D., Fabris, M. A., Longobardi, C., & Settanni, M. (2022). Smartphone and social media use contributed to individual tendencies towards social media addiction in Italian adolescents during the COVID-19 pandemic. *Addictive Behaviors*, *126*, 107204. https://doi.org/10.1016/j.addbeh.2021.107204

Marks, I. (1990). Non-chemical (behavioural) addictions. *British Journal of Addictions, 85*, 1389–1394.

Meyer, J., McDowell, C., Lansing, J., Brower, C., Lee, S., Tully, M., & Herring, M. (2020). Changes in physical activity and sedentary behavior in response to COVID-19 and their associations with mental health in 3052 US adults. *International Journal of Environmental Research and Public Health, 17*(18). https://doi.org/10.3390/ijerph17186469

Miller, N. H. (2010). Motivational interviewing as a prelude to coaching in healthcare settings. *Journal of Cardiovascular Nursing, 25*(3), 247–251.

Ministry of Education. (n.d.-a). *Digital fluency*. https://elearning.tki.org.nz/Teaching/Digital-fluency#js-tabcontainer-1-tab-2)

Ministry of Education. (n.d.-b). *Digital technologies.* https://elearning.tki.org.nz/Media/Images/e-Learning-vs-Digital-Technologies

Ministry of Education. (1995*). Technology in the New Zealand curriculum*. Learning Media.

Ministry of Education. (2006). *Enabling the 21st century learner – e-learning action plan for schools 2006-2010.* http://www.minedu.govt.nz/educationSectors/Schools/Initiatives/ICTInSchools/ICTInitiativesAndProgrammes/E nablingThe21stCenturyLearner.aspx

Ministry of Education. (2007*). The New Zealand curriculum*. Learning Media.

Ministry of Education. (2017a*). The revised New Zealand curriculum*. Learning Media.

Ministry of Education. (2017b). *Revised technology learning area: Digital technologies, Hangarau Matihiko. https://tmoa.tki.org.nz/Te-Marautanga-o-Aotearoa/Nga-Wahanga-Ako/Hangarau*

Ministry of Education. (2022a). *Hybrid learning 2022.* The New Zealand Government.

Ministry of Education. (2022b). *Digital technology – A safe-use guide for schools.* https://www.education.govt.nz/school/digital-technology/digital-technology-guide-for-schools/#incidents

Ministry of Education. (2022c). *PLD priorities – Professional Learning and development.* https://pld.education.govt.nz/regionally-allocated-pld/pld-priorities/

Neverkovich, S. D., Bubnova, I. S., Kosarenko, N. N., Sakhieva, R. G., Sizova, Z. M., Zakharova, V. L., & Sergeeva, M. (2018). Students' internet addiction: Study and prevention. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(4), 1483–1495. https://doi.org/10.29333/ejmste/83723

Newton, C. (2018). *Towards digital enablement: A literature review*. Report commissioned by the Ministry of Education. https://www.educationcounts.govt.nz/publications/schooling/towards-digital-enablement-a-literature-review

OECD. (2015). *Students, computers and learning: Making the connection.* OECD Publishing. https://doi.org/10.1787/9789264239555-en

OECD. (2017). *PISA students' well-being.* https://doi.org/10.1787/9789264273856-en

Oberle, E., Ji, X. R., Kerai, S., Guhn, M., Schonert-Reichl, K. A., & Gadermann, A. M., (2020). Screen time and extracurricular activities as risk and protective factors for mental health in

adolescence: A population-level study. *Preventive Medicine, 141*, 106291. https://doi.org/10.1016/j.ypmed.2020.106291
Oswald, T. K., Rumbold, A. R., Kedzior, S. G. E., & Moore, V. M. (2020). Psychological impacts of "screen time" and "green time" for children and adolescents: A systematic scoping review. *PLoS One, 15*(9), e0237725. https://doi.org/10.1371/journal.pone.0237725
Petersen, K. U., Weymann, N., Schelb, Y., Thiel, R., & Thomasius, R. (2009). Pathological internet use – Epidemiology, diagnostics, co-occurring disorders and treatment. *Fortschritte Der Neurologie Psychiatrie [Review], 77*(5), 263–271.
Peukert, P., Sieslack, S., Barth, G., & Batra, A. (2010). Internet- and computer game addiction: Phenomenology, comorbidity, etiology, diagnostics and therapeutic implications for the addictives and their relatives. *Psychiatrische Praxis, 37*(5), 219–224. https://doi.org/10.1055/s-0030-1248442
Rainie, L., & Zickuhr, K. (2015). *Americans' views on mobile etiquette*. http://www.pewinternet.org/2015/08/26/americans-views-on-mobile-etiquette
Rigby, S., & Ryan, R. (2011). *Glued to games: How video games draw us in and hold us spellbound.* Praeger.
Salehan, M., & Negahban, A. (2013). Social networking on smartphones: When mobile phones become addictive. *Computers in Human Behavior*, *29*(6), 2632–2639. https://doi.org/10.1016/j.chb.2013.07.003
Salicetia, F. (2015). Internet addiction disorder (IAD). *Procedia-Social and Behavioral Sciences*, *191*, 1372–1376. https://doi.org/10.1016/j.sbspro.2015.04.292
Schneider, F. M., & Hitzfeld, S. (2019). I ought to put down that phone but I phub nevertheless: Examining the predictors of phubbing behavior. *Social Science Computer Review*, *39*(6), 1075-1088. https://doi-org.ezproxy.auckland.ac.nz/10.1177/0894439319882365
Shapira, N. A., Goldsmith, T. D., Keck, P. E., Khosla, U. M., & McElroy, S. L. (2000). Psychiatric features of individuals with problematic use. *Journal of Affective Disorders, 57*(1–3), 267–272. https://doi.org/10.1016/S0165-0327(99)00107-X
Shotton, M. (1991). The costs and benefits of computer addiction. *Behaviour and Information Technology, 10*, 219–230.
Singh, S., & Balhara, Y. P. S. (2021). "Screen-time" for children and adolescents in COVID-19 times: Need to have the contextually informed perspective. *Indian Journal of Psychiatry*, *63*(2), 192–195. https://doi.org/10.4103/psychiatry. IndianJPsychiatry_646_20
Smith, L., Jacob, L., Trott, M., Yakkundi, A., Butler, L., Barnett, Y., et al. (2020). The association between screen time and mental health during COVID-19: A cross-sectional study. *Psychiatry Research, 292*, 113333. https://doi.org/10.1016/j.psychres.2020.113333
Starkey, L., Eppel, E., Sylvester, A., Daoud, R., & Vo, D. (2018). *Equitable digital access to the internet beyond school: A literature review.* Ministry of Education.
Stavridou, A., Kapsali, E., Panagouli, E., Thirios, A., Polychronis, K., Bacopoulou, F., Psaltopoulou, T., Tsolia, M., Sergentanis, T., & Tsitsika, A. (2021). Obesity in children and adolescents during COVID-19 pandemic. *Children, 8*(2), 135. https://doi.org/10.3390/children8020135
Suler, J. (2004). Computer and cyberspace addiction. *International Journal of Applied Psychoanalytic Studies, 1*, 359–362.
Tang, C. S.-K., Koh, Y. W., & Gan, Y. (2017). Addiction to internet use, online gaming, and online social networking among young adults in China, Singapore, and the United States. *Asia Pacific Journal of Public Health*, *29*(8), 673–682. https://doi.org/10.1177/1010539517739558
Turkle, S. (1995). *Life on the screen: Identity in the age of the internet*. Simon & Schuster.
Turkle, S. (2011). *Alone together: Why we expect more from technology and less from each other*. Basic Books.
Twohig, M. P., & Crosby, J. M. (2010). Acceptance and commitment therapy as a treatment for problematic internet pornography viewing. *Behavioural Therapy, 41*(3), 285–295. https://doi.org/10.1016/j.beth.2009.06.002
UNICEF. (2015). *Guidelines for industry on child online protection.* https://www.unicef.org/media/66616/file/Industry-Guidelines-for-Online-ChildProtection.pdf

Vorderer, P., Kro¨mer, N., & Schneider, F. M. (2016). Permanently online—Permanently connected: Explorations into university students' use of social media and mobile smart devices. *Computers in Human Behavior*, *63*, 694–703. https://doi.org/10.1016/j.chb.2016.05.085

Wang, C. W., Chan, C. L., Mak, K. K., Ho, S. Y., Wong, P. W., & Ho, R. T. (2014). Prevalence and correlates of video and internet gaming addiction among Hong Kong adolescents: A pilot study. *The Scientific World Journal*. https://doi.org/10.1155/2014/874648

Widyanto, L., & Griffiths, M. (2006). Internet addiction: A critical review. *International Journal of Mental Health and Addiction, 4*(1), 31–51. https://doi.org/10.1007/s11469-006-9009-9

Wong, C. W., Tsai, A., Jonas, J. B., Ohno-Matsui, K., Chen, J., Ang, M., & Ting, D. (2021). Digital screen time during the COVID-19 pandemic: Risk for a further myopia boom? *American Journal of Ophthalmology, 223*, 333–337. https://doi.org/10.1016/j.ajo.2020.07.034

World Health Organisation. (2018). *International classification of diseases–diagnostics and statistics manual version 11.*

Wright, N. (2010). *e-Learning and implications for New Zealand schools: A literature review: Report to the Ministry of Education.* https://www.educationcounts.govt.nz/publications/schooling/e-learning-and-implications-for-new-zealand-schools

Young, K. (2009). Understanding online gaming addiction and treatment issues for adolescents. *The American Journal of Family Therapy*, *37*(5), 355–372. https://doi.org/10.1080/01926180902942191

Young, K. S. (1999). *Internet addiction: Symptoms, evaluation, and treatment. Innovations in clinical practice [serial on the Internet] 17.* http: //treatmentcenters.com/downloads/ internet-addiction.pdf

Young, K. S. (2013). Treatment outcomes using CBT-IA with internet-addicted patients. *Journal of Behavioral Addictions*, *2*(4), 209–215. https://doi.org/10.1556/jba.2.2013.4.3

Zilka, G. (2017). Children in front of screens: Alone or in company? Desktop or hybrid computer? Children's viewing and browsing habit. *Journal of Educational Technology*, *14*(3), 1–14.