Facilitating Digital Citizenship in an International Baccalaureate (IB) - Primary Years Program (PYP) school in Singapore

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Keywords

Digital Citizenship, Digital devices, Digiventures, Cyberbullying, Plagiarism, Academic honesty, Net / Digital Etiquette, Social networking communities, 21st -century skills, BYOD / BYOT

Abstract

Research has shown that children as young as two to three years old are learning through and with digital devices. It becomes imperative that children who use digital devices acquire the necessary skills through curriculum integration that facilitate the ethical use of digital devices and develops digital competency skills. The Digital Citizenship framework integration with the curriculum creates awareness among students for effective and appropriate use of technology. This study investigated the integration of a Digital Citizenship curriculum within the International Baccalaureate, Primary Years Program at an International Primary School located in Singapore. A quasi – experimental, research design was used to conduct the study. An online closed questionnaire was used to collect the data related to the effectiveness of a Digital Citizenship curriculum with two classes of 38, fifth-grade students, aged 9-10 years old. Results showed a positive outcome related to students' understanding of nine elements of Digital Citizenship and their attitudes towards the use of technology for learning. Students were found to become more reflective and responsible users of digital technology through integration of the Digital Citizenship curriculum within the IB PYP framework. The results concluded that with the exception of Digital Access (where there was negligible change), there was a significant change in students' attitudes for all elements of Digital Citizenship. In-depth statistical analysis of the results indicated that the integration of Digital Citizenship curriculum within the IB PYP Framework aligns with the IB philosophy and facilitates digital competency skills in primary school students for 21st-century learning. It also enables the lifelong learning journey and responsible Digital Citizenship among students.

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Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature: _____ _____

Date: **21-04-2016**

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List of Abbreviations

AUP – Acceptable Use Policy

BYOD - Bring Your Own Device

BYOT – Bring Your Own Technology

EUP -- Empowered Use Policy

DCQ – Digital Citizenship Questionnaire

IBO- International Baccalaureate Organization

ICT – Information Communication Technology

PYP – Primary Years Program

TCK - Third Culture Kids

Definitions

Bring Your Own Device / Technology (BYOD/T): BYOD /BYOT is the term used for learners own devices that are allowed in an educational institution for the purpose of learning. BYOD refers to a specific type of device requirement set by schools and BYOT refers to any digital device that enables learning with some basic application requirement set by the school (An, Alon & Fuentes, 2014).

Cyberbullying: Cyberbullying is defined as bullying that occurs online while using digital devices, communication tools, and social networking sites.

(http://www.stopbullying.gov/cyberbullying/what-is-it/)

Digital Ecology: Digital Ecology is sometimes referred to as Media ecology and is defined as the environment whereby diverse groups with different or varied viewpoints coexist to form a networked ecosystem. Digital Ecology is defined as "A closed set of digital and non-digital artifacts and a user acting as nodes of a network where its boundaries are specified by an activity and the structure and patterns of organization are either user and/or designer defined" (Raptis, Kjeldskov, Skov, & Paay, 2014, p. 4).

Digital Citizenship: Digital Citizenship is the norms of appropriate, responsible technology use. It is the right and the responsibility of every member of the digital world to experience a safe and secure digital environment (Ribble, 2011).

Digiventure/s: Self-created terminology to describe students' adventure and risk taking capabilities in the digital world. The learning journey of an individual using technology and expressing oneself through digital media is one adventure full of new

discoveries and achievements. Hence, the term digiventure/s was created by the author.

Digital Footprint: A digital trace of a person's activities left on the internet and digital devices which can be used to identify the person and his or her location. Digital footprints are categorised into 1] passive and 2] active depending on one's interaction in the digital world. The passive Digital footprints are caused by web surfing, visiting and reading through different websites where as active digital footprint are caused by actively participating in the digital world through social networking, emailing, and many more online applications. (http://techterms.com/definition/digital_footprint, 2014).

Net / Digital Etiquette: Net / Digital Etiquette is defined as the code of conduct while using digital devices for communication with other members of the digital world. It is a set of acceptable behaviours towards others in the digital world (Ribble, 2011).

Third Culture Kid: "A third culture kid is a person who has spent a significant part of his or her developmental years outside their parents' culture. The third culture kid builds relationships to all the cultures, while not having full ownership in any" as defined by Van Reken (http://www.tckworld.com/).

Transdisciplinary Skills: As mentioned in the IBO curriculum guidelines, Transdisciplinary skills are set of skills –"social skills, communication skills, thinking skills, research skills and self-management skills" (p.21) to be acquired by the student through the PYP program. These skills are transferable and applicable within classroom learning as well as in the real life context (IBO, 2009).

21st Century Learning: 21st-century learning encompasses "the skills, knowledge and expertise students must master to succeed in work and life; it is a blend of content knowledge, specific skills, expertise and literacies".

(http://www.p21.org/our-work/p21-framework)

Chapter 1: **Introduction**

Technology has become an integral part of our education system. Advances in technology have brought forward a revolutionary change in teaching and learning strategies (Facer & Sandford, 2010; Groff, 2013). Technological innovation has transformed the meaning of education and its application in our lives. We now know that lifelong learning with digital technology is the "new reality" of the 21st-century education (Field, 2006, p. 10). The concept of the lifelong learning is supported by the integration of mobile digital technology and digital tools (Igel, 2014; Sharples, 2000). Digital tools and technology are the foundational pillars of the digital landscape. Childhood play has been somewhat transformed and transferred to the digital playground.

Students' constant interactions with the digital environment have led to changes in their cognitive processing skills, allowing them to process multiple sets of information in a parallel manner (Jukes, McCain, & Crockett, 2010). The idea of lifelong learning, in turn, is constantly transforming the educational landscape. Preschools, as well as primary and secondary schools, have integrated technology into their curricula (Gimbert & Cristol, 2004; Sutherland et al., 2004). Digital devices are the new pen and paper of today's classrooms. In other words, digital devices are classroom tools similar to pens, paper, and scissors. Like any other learning tool, teachers need to facilitate the appropriate use of digital devices within the classroom environment.

Students as young as pre-schoolers are familiar with digital technology in its various forms (Media, 2013). "Digital" is the language spoken by these students

according to Jukes, McCain, and Crockett (2010) who describe it as the "first language" of students in our schools. Students see digital devices as the extension of the self and as a "must have" accessory for a successful school and social life (Jukes et al., 2010).

Students and digital devices are an inseparable combination in today's world. Students are constantly looking for new ways for self-expression, and digital devices provide them with new *Apps* and tools to do so. Students are at times not aware of the unethical and irresponsible use of digital devices when connecting with others online. Therefore, it is important that students use technologies to connect, gather, evaluate, construct and share knowledge using 21st-century skills and become responsible lifelong learners.

Technology and digital devices are not defining the way technology or digital devices are being used, but the user's knowledge is the guiding force of whether its use is ethical or unethical. Students do want to ensure that they use digital devices and technology in the right way; however, they are not sure how to do so. Students are eager to learn, and they adapt very quickly to the new technologies around them. Students observe teachers, parents and other adults using digital devices as they try to work their way around the digital world. The irony of this situation is that adults, in the majority of cases, are not aware of how responsible and ethical their behaviour is. Therefore, it is imperative that the responsible and appropriate use of digital technologies be embedded into the school curriculum so that students, teachers and parents can monitor and acquire necessary digital competency skills.

To be digitally literate is to understand the purpose of technology and to use it in an appropriate manner. Any person using digital technology and participating in the digital world is responsible for using the technology and participating in a

networked society appropriately (Hague & Williamson, 2009). The availability of the latest technology in schools does not guarantee the development of efficiency or expertise in students' digital skills. Like any other skill, such as writing, motor and logical thinking skills, digital skills should be integrated into the curriculum, and students should be challenged to develop their digital competencies (Ananiadou & Claro, 2009; Dede, 2010a).

Students in Primary Years Programme (PYP) schools are engaged in active inquiry and research processes throughout the day. They are constantly working on their research skills through inquiry-based learning through the Topic of Inquiry. Digital technology is integrated into almost every aspect of learning in PYP schools in Singapore. ICT facilitates student inquiry and supports the development of conceptual understanding of the inquiry topics (Voogt & Knezek, 2008). The amalgamation of content-based knowledge with digital skills allows students to represent their ideas and perspectives in innovative ways. The use of digital devices supports students' quest to understand, create and transmit knowledge.

Traditional skills and curriculum development plans are no longer sufficient to prepare students for 21st-century careers. The 21st-century skills framework is based on life skills such as collaboration, problem solving and innovative technology as well as media literacy skills (P21, 2015a). As described by Fisch, McLeod, and Brenman (2008) in their video called "Shift happens," educational pedagogy needs to be changed as the global world is changing, and jobs that exist now had no foundation ten years ago. We are in fact "preparing our students for jobs that do not yet exist" (Fisch et al., 2008). For students to lead more productive and balanced lives in the knowledge-based globalised world, they need a curriculum that is flexible and prepares them for competitive and innovative careers. A Digital Citizenship

framework forms the foundation for 21st-century fluencies required to succeed in the present and the future world (Crockett, Jukes, & Churches, 2011).

Twenty-first-century technology has provided opportunities for students to use digital devices for learning and social interactions. However, the power of these technologies and devices can only be properly channelled through effective and appropriate use by students. Students are well versed with the current abilities of digital devices and their connectivity, but they are not necessarily using them responsibly. There is a widening gap between mastering how digital devices work and using digital skills responsibly to display the understanding of the topic in the digital world.

Frand (2000) has concluded that today's generation is more focused on doing rather than knowing when it comes to working with digital devices. Thus, students with expertise on the usage of digital devices must be motivated to use these digital devices with competency, strategically and innovatively. The students must be guided to have a balanced approach towards learning with digital technologies that benefits them and others in the global world. Frand (2000) further recommends that learning and teaching strategies need modification for integrating technology into the curriculum and ensuring that real learning takes place to form "communities of lifelong learners" (p. 24). This recommendation implies that students know how the technology works, but curriculum integration is required so that students can learn to use digital devices responsibly and participate in the digital world appropriately.

The question is: **how do we empower our students with essential digital learning skills to be good Digital Citizens?**

Being responsible and using technology ethically needs to be a part of the school curriculum so that students can understand the connection between the online and offline world. Ribble (2010) states that "Helping children understand the appropriate use of technology can be difficult even with those who use these tools every day, but it can seem overwhelming for parents and educators who feel that they cannot keep up with the rapid changes in a technological world" (p. 16). Ribble has developed a Digital Citizenship framework, which he says guides curriculum coordinators to support the ethical use of technology and develop good Digital Citizenship skills among students. One aim of this research is to develop an Information Communication Technology (ICT) curriculum based on a Digital Citizenship framework for use in primary school.

As will be discussed, the author developed a Digital Citizenship framework suitable for use with primary school students in an IB PYP school based on Ribble's (2011) Digital Citizenship framework. This ICT scope and sequence was intended to support students' acquisition of the appropriate digital competency skills in an International Baccalaureate (IB) PYP (Primary Years Programme) School in Singapore. The Unit of Inquiry based on Digital Citizenship for the IB PYP School was designed and implemented for this research project. The research and the subject of this report sought to test the effectiveness of this Digital Citizenship Unit of Inquiry in the IB PYP School in order to provide further direction for the curriculum integration. The Digital Citizenship Unit of Inquiry used in this study was integrated with the IB PYP curriculum to support and develop digital competency skills among students of this International primary school in Singapore.

As will be discussed in Chapter 2, the nine elements of the Digital Citizenship framework developed by Ribble (2011) formed the basis of the Unit of Inquiry

developed for this study. The effectiveness of the Digital Citizenship, Unit of Inquiry was evaluated in this study to facilitate digital competency skills among students in an IB PYP school.

The goal of the research was to understand the effectiveness of the integration of this Digital Citizenship framework within the IB PYP curriculum to support the acquisition of digital competencies among primary school students.

BACKGROUND

1.1   THE DIGITAL AGE IN SINGAPORE

Students want to participate actively in the online world and share their views with others. As reported by the *Infocomm Development Authority of Singapore* (IDA Singapore), the household broadband connection rate in 2011 was 195.3%, indicating more broadband connections than homes (IDA, 2015b). The recent report from IDA Singapore states that 98% of children in the age range of 7-14 years in Singapore use the internet and digital devices (IDA, 2013, p. 24). Mobile digital devices are making participation in the virtual world easier and faster. Singapore is the fifth largest country across Asia-Pacific using social networking sites (comScore, 2010). The majority of the Singaporean population, including primary school students, use digital devices and tools as a daily routine, a notion also supported by Unantenne (2014). The report by ComScore stated that Singaporeans above 15 years of age on an average spent 21 hours online during the research month (ComScore, 2009).

Livingstone, Olafsson and Staksrud (2011) reported that 38% of nine to twelve-year-olds use social networking sites across Europe, and 43 % use them in the United Kingdom. Similar reports have also been reported in BBC's online edition, raising serious concerns about underage children on social networking sites (BBC,

2011). The reports mentioned above and many others indicate that a change in social settings, nature of relationships and interactions that students are involved in the digital world. Students and young adults "connect and reconnect with friends and family members" (Subrahmanyam et al., 2008, p. 420) using social networking sites. On one hand social networking sites and other communication technologies facilitate online communication and connect students with their friends and family; on the contrary, these social networking sites and other digital tools such as email and chats are the breeding ground for cyberbullying and cyberthreats.

1.1.1 Cyberbullying

Price and Dalgleish (2010) who based their research on 548 Australian youth (50% of whom were 10-14 years) found that teen students were involved in cyberbullying. They found that cyberbullying has a direct impact on social relationships with peers and family members as well as affecting the overall well-being of the child (2010).

Kwan and Skoric (2013) identified strong links between online bullying and school bullying among secondary school students in Singapore. Cyberbullying – bullying that occurs online is an extension of bullying in school and needs to be dealt sensitively. Hinduja and Patchin (2014) found that "many teens lacked effective skills for dealing with cyber bullies" (p. 72) and therefore, they resisted getting support from adults for the challenges faced online.

Singapore has a high rate of cyber bullying, one which is comparable to a bigger nation like the U.S. and the U.K. (Chew, 2010). Chew reported in her research that 25 % of Singaporean students between the ages of 13-17 have been cyberbullied. Chew stated that "one in four secondary students" (Ng & Rigby, 2010, p. 82) were

cyberbullied, and 31% reported that cyberbullying was an extension of traditional bullying faced by them in Singapore schools.

Price and Dalgleish (2010) also suggested that "specific strategies" (p. 58) should be incorporated into the curriculum so that students can learn to protect themselves online. Furthermore, the increasing penetration of digital technology in education has prompted the Ministry of Education in Singapore (2010) to come up with a 21st-century competency framework, which encompasses Information and Communication skills as one of three prime areas of focus. The Singapore government is proactively promoting good Digital Citizenship by promoting global events such as "Safer Internet day", which was organised for a first time on 5th February 2013. The focus of this event was online rights and responsibility as stated by the Ministry of Communication and Information Singapore ("Safer Internet day," 2014). The Digital Citizenship Unit of Inquiry will facilitate students to develop digital competency skills to use appropriate digital etiquette and not be a cyberbully, identify the situation of being bullied online, apply coping strategies and seek help from trusted adults in cases where situations are beyond their control.

1.1.2 Digital Media and Devices

Digital media has penetrated the lives of young children, and media habits have changed with emerging technologies (Gutnick et al., 2011). The availability of advanced technology has allowed students to consume media in many different ways. For example, children's books are now available in E-book format. E-books are interactive and can be read, heard on tablets and television channels; movies can be streamed to the computer using internet services and mobile phones are used for navigation, Web searches, booking tickets and for storing music and videos for on-the-go usage. The advancement of ICT has given children access to "networked

publics which are characterised by their persistence, searchability, replicability and invisible audience" (Ito, 2010, p. 19). Ito (2010) has suggested that the instant feedback and reciprocity available within digital communities is an important dimension of 21st-century learning. Hence, students must be mentored not only to differentiate between the instant feedback available to them but also to use the feedback productively and effectively to enhance their work or digital creations. Digital devices have become a necessity in our lives, but they come with a responsibility that needs to be taken seriously.

1.2   DIGITAL CITIZENSHIP

To date, research undertaken in the field of Digital Citizenship has generally focused on different aspects of digital learning. It includes research on separate digital elements like cyber bullying (Hinduja & Patchin, 2010; Li, 2007; Smith et al., 2008; Tokunaga, 2010), plagiarism (Martin, 2005; Townley & Parsell, 2004), copyright /academic honesty (Dichtl, 2003; Selwyn, 2008; Strom & Strom, 2007), cyber safety (Ybarra, Mitchell, Wolak, & Finkelhor, 2006), and identity theft (Souza & Dick, 2009). Understanding the impact of cyberbullying, plagiarism, cyber safety and identity theft has given us some insight into the challenges faced by educators facilitating technology integration within the curriculum.

Research by Hoff and Mitchell (2009), Mishna, Saini and Solomon (2009) and Trolley and Hanel (2010) has focused on the impact of cyber harassment on children and interventions aimed at preventing cyberbullying in schools. However, Trolley and Hanel have also provided guidelines for curriculum integration related to cyber security and the acquisition of necessary digital skills by students. Furthermore, research conducted by Ma, Lu, Turner and Wan (2007) on students' perspectives of academic honesty has also provided guidelines for school administrators and

curriculum coordinators for creating an academic honesty policy framework for students' use of digital resources in education. Similarly, Wheeler and Anderson (2010) also recommend "a less punitive, more educative approach" (p. 166) to support students' acquisition of digital competency skills. These guidelines suggest that learning engagements that are meaningful and based on students' interest will facilitate good academic honesty skills among students. These were guidelines followed for lesson and activity plans used for Digital Citizenship lessons which formed the intervention in this research.

As educators, we have an important task to not only understand the realities of children's lives but also to facilitate the acquisition of necessary digital skills through everyday interactions in classrooms. Moreover, learning is not confined to the school environment, and digital technology facilitates extended learning processes in digital ecology. Digital Ecology is defined as the networked world created through digital devices connecting to various services and applications (Raptis et al., 2014). Therefore, it becomes imperative according to Lee and Finger (2010) that "ethical information behaviour" is not limited to the school environment but incorporated into students' lives (p.147).

Ribble (2011) has suggested that schools work to support the informal learning occurring through interactions in the digital world - a sentiment also endorsed by Hollandsworth, Dowdy, and Donovan (2011). Hence, the curriculum framework that integrates the Digital Citizenship and its nine elements (as suggested by Ribble, 2011) would facilitate students' Digiventures. Students' adventures in the digital world through the use of digital technology tools are termed as "Digiventures". Digital Citizenship integration with the curriculum would support students' acquisition of digital skills and thereby create a generation of responsible lifelong

learners. The aim of this research project was to use a Unit of Inquiry to develop digital competency skills, which would facilitate the appropriate and effective use of digital devices and technology among students.

Digital Citizenship is a common framework used to facilitate the proper integration of digital technology in the educational system to support advanced digital competencies that are required by users in today's ever-changing digital world. Researchers who have worked with educational technology have reached a consensus regarding the importance of digital skills that are necessary for 21st-century learning and professional lives (Hollandsworth, Dowdy, and Donovan, 2011; Ohler, 2010; Ribble, 2011; Ribble and Bailey, 2006). Reports of the increased use of digital devices and social media sites by underage children imply that today's generation of young people live in a connected reality which allows them to access and be accessed by anyone, at any time (Cavoukian, 2013; Media, 2013; Ohler, 2010). Ohler (2013) states that "As our students head further into the 21st century, they will face extraordinary challenges to make the world a safe, inspiring place. Better test scores may not help them meet those challenges. However, creative ideas, along with command of the literacies of their day, just might" (p.46).

The International Baccalaureate Organisation (IBO) has updated the role of ICT in PYP, and it now includes a transdisciplinary skill: "Becoming responsible Digital Citizens who make informed and ethical choices, while acting with integrity and honesty" (IBO, 2011). It is, therefore, essential that schools include Digital Citizenship in the curriculum to support students' acquisition of digital skills. This research sought to investigate the development of digital competency skills among IB PYP students through a Digital Citizenship Unit of Inquiry.

1.3   EDUCATIONAL CONTEXT

The challenges related to the use of digital devices and digital tools by students have forced educators and policy makers to think about ways to curb the misuse as well as promote the constructive use of digital technology in education. As Ingle and Duckworth (2013) have stated "learning technology" in the primary years will impact the digital endeavours of students in secondary and tertiary education. Ribble (2011) advocates that educators, technical experts and parents, need to work collaboratively to create awareness and understanding of Digital Citizenship among children (Hollandsworth, Dowdy, & Donovan, 2011).

Students in the present day and age would like to be a part of the whole learning process in terms of not only what is being taught to them but also how. The advancement of technology has accelerated evolution in education from being teacher-centric to a collaborative teaching and learning process between student and teacher. As indicated by Condie and Munro (2007) as well as Kozma (2005), the involvement of technology in education has enabled students to be a part of the education system through a knowledge creation process. The role of educators has been transformed and changed from didactic teachers to facilitators who supports, challenges and assesses students' development and progress (Condie & Munro, 2007; Kozma & Voogt, 2003).

Digital devices are the tools of 21st-century education and like any tool; such tools cannot exist in a vacuum and remain effective. Rather, guidance for the use of digital devices by students should be properly integrated into the educational environment (Kosakowski, 1998). We need a proper curriculum framework to support our students' digital adventures or Digiventures and to promote responsible lifelong learning skills.

Digital skills function in a similar manner to other skills which are taught in schools, and which are nurtured in a socio-cultural context and embedded in the curriculum. The acquisition of digital skills through a process of small steps using guided instructions and allowing time to practice would enable students to use digital devices responsibly for the purpose of learning. The potential of technology and digital devices as learning tools in education need to be harnessed through a thoughtful integration of digital devices, to enable appropriate use for the benefit of learning.

1.3.1 Web 2.0

The introduction of Web 2.0 technologies, which enable the user to read and write on the internet has transformed the user interface from a passive to an active use of the World Wide Web. Primitive Web or Web 1.0 was mostly a "read only version" of the internet which means users were not able to interact with a website like the present generation of the Web (Lytras, 2008, p. 173). The internet was meant to distribute information controlled by the owner of the website. However, with the arrival of Web 2.0, users have become contributors by creating, publishing and sharing, using *Blogs, Wikis, Weebly*, social networking sites like *Facebook* and many more. Web 2.0 technologies have also enhanced the use of digital technology for education, thus enabling users to interact, create and share across multiple platforms (Aghaei, Nematbakhsh, & Farsani, 2012). Web 2.0 has revolutionised education by allowing learners to interact with a wider audience on a digital platform and across borders. Some students are equipped with knowledge and expertise in the use of applications and its outreach with digital devices even before they begin their formal schooling years (Hopkins, Brookes, & Green, 2013; Teng, 2013; Zevenbergen, 2007).

1.3.2 Digital Footprints

Today's digitally literate students are constantly interacting, navigating, creating and sharing information, using digital devices and unknowingly leaving their trail or traces online. The trails and traces left by users of digital devices online are termed "Digital Footprints". There are consequences related to online interactions and communication. Students need to understand that any communication in cyberspace remains there forever and can affect them later in life. Any activity done by students online will leave behind a trace or trail that could be traced back to them. The impact of Digital Footprints can be positive as well as negative, depending upon the type of interaction involved. The use of digital devices and the internet is unavoidable as our daily interactions with people depend on these devices. However, curriculum integration will allow students to create positive and constructive digital footprints online, which will support students to enhance their online profile.

The *Huffington Post* and *The Guardian* newspapers have reported on a large number of underage users on the *Facebook* internet site; a social networking site with a minimum age restriction of 13 years (Reuters, 2012; Sweney2013). *The Guardian* has also reported that *Facebook* has not been able to prevent underage users of the site, and it defers to parents who allow their children to be on Facebook to be more accountable (Sweney, 2013). Similar reports have been published highlighting underage users in Singapore and Australia by Ho and Zaccheus (2012) and Stefano (2013). Ho and Zaccheus have voiced their concerns about primary school students in Singapore who "are posting risque photos" on *Facebook* and asking complete strangers to rate them. These concerns are consistent with Stefano's report on underage children in Australia posting photos online. Primary school students are totally unaware of the risk and consequences of posting photos online. Students need

to be guided so that they will use social media appropriately and constructively. The study undertaken hereby is aimed at facilitating the responsible use of digital media through curriculum integration and allowing students to experiment with blog posts and comments in a safe digital environment, monitored by the teacher, before being published. The Digital Citizenship curriculum mapped vertically and horizontally will allow students at different year levels to acquire necessary digital skills. These digital skills will enable students to understand the importance of responsible digital communication as well as thoughtful action during their online activities.

1.4 DIGITAL LITERACY

Lankshear and Knobel (2008) have suggested that Digital Literacy is a cocktail of cognitive and socio-cultural skills. This means students' cognitive abilities and social skills together form Digital Literacy skills, allowing them new avenues of self-expression. Moreover, Digital Literacy is transforming children's interpersonal relationships, and self-expression skills as children are connecting with the wider audience through online interactions.

Researchers like Livingstone (2003) and Alkali and Amichai-Hamburger's (2004) have highlighted the importance of digital skills and inappropriate use of technology among high school students and young adults. Livingstone (2003), has reported on the socio-cultural and economic background impacting on children's use of the internet. Livingstone and Helsper (2009) reported that literacy is not simply a metaphor for reading and writing skills but with advanced technology, it is a social experience forming communities and relationships online. Ito et al. (2013) reported on the impact of connected learning through digital media providing new opportunities for youth for career success. Alkali and Amichai-Hamburger's (2004) research on Digital Literacy skills on senior secondary and college students indicated

that educators and the curriculum play an important role in the acquisition of "specific digital skills" (p. 427) among students.

Digital skills are best incorporated into the curriculum through the integration and guided use of digital tools for demonstrating an understanding of the topic of study. Sisti's (2007) research on plagiarism revealed that although students were aware of intellectual property rights, they were unsure of the ethical boundaries of information usage due to unclear guidelines on academic honesty.

Hew and Brush (2007) identified gaps in technology integration among K-12 schools in America as well as other countries. They have recommended some strategies to overcome these gaps to integrate the best technology in K-12 schools. Hew and Brush (2007) suggested strategies including the redesigning of assignments, using a shared vision of technology integration within the classroom and creating a culture of innovation to bring about change in attitude and beliefs about technology. Sisti (2007) also recommended redesigning assignment tasks and the evaluation process to be creation based like *Podcasts*, *Blogs*, and *Animations* which can enhance students' learning experiences (p.227). The creation based assignments and tasks also develop the sense of ownership among students presenting or submitting their work as opposed to rote learning and content mining (Sisti, 2007).

Through this research project, students will work independently on creative projects of self-expression and thereby develop the sense of ownership and digital authoring skills. The required assignment and task during the research will facilitate students to acquire academic honesty skills by integrating digital tools like *Noodletools* to create a bibliography for the final submission of projects.

Researchers in the past have shed light on different aspects of digital competency; however; the most vulnerable group of children in primary schools has not been the focus of these researchers. The focus of past research on digital competency and Digital Literacy has been high school and tertiary students. Therefore, it is important to conduct research that includes primary school students as well as examining how different aspects of digital competences are interlinked in daily interactions and curriculum requirements.

The connected reality of present times calls for connected learning approaches, as students learn, relearn, channel their knowledge and collaborate with others using digital devices. Challenges of plagiarism accompany accessibilities and abilities of children to use digital devices and technology. Other challenges are cyberbullying, identity theft, privacy / personal security and online sales targeted at children (Beasley, 2004; Bilge, Strufe, Balzarotti, & Kirda, 2009; Calvert, 2008; Hinduja & Patchin, 2010; Holtzman, 2006; Patchin & Hinduja, 2006). At this point, it is interesting to note that "the approaches to combating plagiarism have focused on education and honour code programs, and detection of plagiarism after it has occurred" (Beasley, 2004, p. 2). Holtzman (2006), a security analyst, has described in his book different ways the privacy of common man is jeopardised using technology, and this could be prevented by an awareness of available measures. Measures such as privacy settings on online accounts, clearing cache and cookies after financial transactions and installing firewall and internet security software. These researchers have stressed that it has become necessary to train children to be good Digital Citizens irrespective of the age of the child. As Ohler (2010) notes " The goal is to use technology effectively, creatively and wisely…to bring together technology, community, and learning in ways that work" (Ohler, 2010, p. ix).

Primary school students are increasingly using digital technology for a variety of activities including learning and social interactions. However, they have not been the focus of the research carried out on Digital Citizenship or digital competency in the past. The present study is pioneering research that has not been done before for IB primary school students. The aim is to facilitate responsible Digital Citizenship among students. This study seeks to create the foundation for students to understand and incorporate digital competencies as a habitual process while using digital devices for any activities throughout the day. A Digital Citizenship unit of work has been created, based on Ribble's (2011) suggestions for developing these skills amongst users of the digital world. This study will examine the effectiveness of this unit using a quasi-experimental research design. The results of this study will shed light on our understanding of digital competency requirements and allow the researcher to review the school's ICT scope and sequence document for further integration of Digital Citizenship with the IB PYP Curriculum.

The Digital Citizenship Unit of Inquiry developed for this research involved the integration of different elements, i.e. strands of Digital Citizenship as described by Ribble across the year levels, with the IB PYP curriculum. Ribble defines Digital Citizenship as "norms of appropriate, responsible behavior with regards to technology use" (2011, p.10). Ribble has divided Digital Citizenship into nine elements 1] Digital Access ("Full electronic participation in the society"), 2] Digital Commerce ("The electronic buying and selling of goods"), 3]Digital Communication ("Electronic exchange of information"), 4] Digital Literacy ("The process of teaching and learning about technology and the use of technology"), 5] Digital Etiquette ("The electronic standards of conduct or procedure"), 6] Digital Law ("The electronic responsibility for actions and deeds"), 7] Digital Rights and Responsibilities ("Those requirements

and freedoms extended to everyone in a digital world"), 8] Digital Health and Wellness ("Physical and psychological well-being"), and 9] Digital Security (Self-protection) and ("The electronic precaution to guarantee safety") (2011, p.11). These nine elements guide students to be responsible Digital Citizens, and as will be discussed in detail in the next chapter, encompass every aspect of the digital life of students.

1.5   STUDY AIMS

The aim of this study is to support students' digital journeys through the integration of Digital Citizenship elements for the use of technology in a responsible manner that benefits the self as well as the community. The aim of this study is also to test the effectiveness of the Unit of Inquiry to develop Digital Citizenship among primary school students. The Digital Citizenship framework will guide students to develop the attitude of responsibility to maintain, protect and communicate effectively in the digital world. The effectiveness of the Digital Citizenship Unit of Inquiry will further support the formation of the revised future ICT scope and sequence to facilitate digital competency skills across the year levels in the IB PYP School.

The stand-alone Unit of Inquiry based on Digital Citizenship will allow students in an IB PYP School to enquire, research and learn important digital skills required for being responsible Digital Citizens. The student's acquisition of digital skills will be supported and assessed at various stages through different tasks whereby students will have to display their decision-making, problem-solving, and patience and perseverance skills. The data collected, analysed and interpreted through the research will allow the researcher to develop a future ICT scope and sequence document. Moreover, the results will enable the researcher to integrate the Digital Citizenship curriculum across the other grades in the IB PYP School. Therefore, this

research can be looked upon as applied research whereby the research benefits the community and its members. This research is the first of its kind to be conducted in the primary years in an IB PYP School.

1.6 PURPOSE

The purpose of this study was to investigate the effectiveness of a Unit on Digital Citizenship through a Unit of Inquiry within the IB PYP curriculum framework. The principle objectives of the research were to 1] Design and implement the Digital Citizenship Unit of Inquiry in a PYP classroom and 2] Test the effectiveness of the Unit of Inquiry for Digital Citizenship in a PYP classroom.

This study will contribute to our current understanding of Digital Citizenship and its importance in curriculum development for primary students and how we can better equip our youngest population to become good Digital Citizens as well as promote safe and secure digital learning environments. If this study shows that the Digital Citizenship Unit of Inquiry is effective, it will lay the foundation for students in IB primary schools to work with digital technology around the world.

The research problem investigated through this study was "Does the awareness and knowledge of digital rights and responsibility support primary students in being responsible, informed and ethical users of the technology?"

Research questions explored through this study were:

1] How effective is the Digital Citizenship Unit of Inquiry in a year 5 IB PYP classroom?

2] Does Digital Citizenship curriculum integration, facilitate the appropriate and effective use of technology?

Chapter 2: **Literature Review**

This section explores the evolution of technology in education and research data available to date. The challenges faced by students and teachers are also studied in this literature review. Additionally, this section closely examines how technology has not only changed teaching and learning processes, but also how we perceive the world today. Literature review has been further divided into sub section to understand different aspects of educasional technology in today's schools.

2.1   DIGITAL TECHNOLOGY AND EVOLUTION

The life of the student without Digital devices is hard to imagine. Technology has transformed the way we communicate, express our thoughts and views on different topics and the way we react to world issues. Students' with the latest Digital devices at their disposal "can take pictures or record sounds" (Rogers & Price, 2009, p. 3) to record and document the happenings around them. Furthermore, they can edit, tag, add details and upload "these artistic creations" (Rogers & Price, 2009, p. 3) on the Web to share with family and friends.

Unknown to young people using Digital devices is the digital footprints that are being created, thereby creating a trail of their online identity (Palfrey & Gasser, 2013). Digital footprints are of two types: Passive and Active digital footprints which are created based on different activities that a person participates in the online world (Management Association, 2011). Passive digital footprints are created through Web searches, data logs of temporary files and activities on a computer. A Passive digital footprint is less invasive, and the real identity of the user of the device is not recorded. By contrast, Active digital footprints reveal complete details of the user,

including Web activity patterns, locations, financial transactions and much more (Management Association, 2011).

The findings of research by Madden, Fox, Smith, and Vitak (2007) indicated that only 47% of American adults are aware of their digital footprints and of those only 3% regularly monitor their online presence. Furthermore, 60% of the adult population in the US is not worried about their digital footprint nor do they feel compelled to limit the availability of personal information online (Madden et al., 2007). According to Landau (2013), a common trend for expecting mothers and fathers is to post the ultrasound pictures of their child on their Facebook page. Furthermore, some enthusiastic parents create an email and Facebook accounts for their children when they are born, and unwittingly create a digital trail without their child's knowledge or permission. Similarly, students in primary school are unaware of the digital footprints created through their online activities like watching videos, playing games, commenting and chatting as well as its impact on their online profile. Holloway, Green, and Livingstone (2013) have indicated that "children's digital footprints are now taking shape from very young ages" (p. 5) and the children's ability to control and erase them when required is not certain. Therefore, Digital Competency skills that support students to create constructive and positive digital footprints need to be facilitated through curriculum integration in schools.

Of similar importance are issues of etiquette, health and cyber bullying while using Digital devices. Cassidy, Brown and Jackson (2012) through their research with students, parents and educators of British Columbia and Canada found that 32% of students were victims of cyberbullying while 36% were cyberbullying others online. In addition, Cassidy et al. (2012) found that parents laid more importance on modelling the right behaviour compared to educators who were more likely to suggest

that there should be consequences connected to the act of cyberbullying. Marx (1994) identified that communication through different digital tools like text messaging, email, and chats need a differentiated approach to Digital Etiquette and norms of etiquette need to evolve with evolving technologies. Katz (2014) has also reported the key findings of research on cyberbullying in Australia, pointing out that cyberbullying tactics change with available technologies and are "most prominent among young people aged 10–15 years" (p. 2). This means that Digital Etiquette is no more about being polite online; but about being a responsible Digital Citizen with respect for others in the digital world.

Cyberbullying has been a problem among youths in Singapore as well as around the world - a sentiment also endorsed by Campbell (2005) recognising cyberbullying as a global problem that needs proper intervention as well as preventive strategies. Ang and Goh (2010) reported on 12-18-year-old Singaporeans and their online dispositions. The findings of research by Ang and Goh (2010) suggest that empathy training and positive interactions between adults and children may reduce the cyberbullying incidences among young adults (2010). Kwan and Skoric's (2013) research has shed light on social media interactions and their relation to bullying in schools. Singapore has the fifth highest rate of "Social Network penetration" in the Asia-pacific region and due to the availability of advanced technology, with 25% of 13-17-year-olds have cyberbullying experiences (Kwan & Skoric, 2013, pp. 17-18).

An incident which was one of the extreme cases of cyberbullying reported in Singapore resulted in the suicide of a female secondary school student who was from Myanmar and studying in Singapore (Chen, 2011). The student was cyberbullied by her ex-boyfriend in the form of an online posting, and she underwent enormous trauma during her ordeal (Chen, 2011). The negative impact of cyberbullying on

psychological, physical and social well-being is irreparable and can be severe for the victims. Sameer Hinduja and Patchin (2007) reported that some of the damage caused by cyberbullying is permanent, and victims need support and intervention by adults.

Campbell, Spears, Slee, Butler and Kift (2012) reported on their research on Australian students aged 9 to 19 noting that victims of cyberbullying "reported significantly more social difficulties, and higher levels of anxiety and depression than traditional victims" (p. 389). Couvillon and Ilieva (2011) have suggested that cyberbullying can be prevented through schoolwide curriculum integration and positive reinforcement towards students' actions. Educators can play an important role in modelling appropriate behaviour and facilitating positive Digital Communication skills among students through curriculum integration.

Jukes, McCain, and Crockett (2010) have stated that "This digital world is not static. It is a fast-paced, dynamic world where new activities and trends develop overnight" (p.53). As educators, we need to understand the digital world of our students and how it impacts them and their overall development. Students have access to vast amounts of information due to the availability of advanced technology and increased accessibility through the internet. They are affected by national and international issues and would like to express their views about them. For example, there was an incident involving a junior college student in Singapore, who posted inappropriate comments on his blog post as a reaction to a speech by Singapore's deputy prime minister during a pre-university seminar in 2012. The student realised his mistake of overreacting to the minister's speech after reading comments from his friend. He later removed the post, apologised and said that his comments were rash (Stacey Chia & Chew, 2012). A similar case was reported on an online portal "STOMP" whereby, a student studying on a scholarship in Singapore posted

derogatory comments on *Facebook* about Singaporeans. The student later apologised for his comments via online media (http://singaporeseen.stomp.com.sg/this-urban-jungle/foreign-student-apologises-after-making-insulting-remarks-about-spore-on-facebook). Students involved in both cases were expressing their perspectives in a digital world accessible to everyone and causing damage to someone else's image. This raises concerns over the appropriateness of Digital Communication and its impact. Students need to understand there is a demarcation between reacting and responding to a situation; also, frustration or anger are negative forms of emotion that require caution when expressing them on online.

Online posting leaves a permanent mark even after deletion of the post. Facilitating Digital Communication within the curriculum is vital for students as they live in a connected digital world and are communicating with a global audience through technology. The curriculum integration of Digital Citizenship will enable students to engage in creative dialogue with an online audience by effectively and appropriately expressing their perspectives on the ongoing topic of discussion.

2.2   HEALTH AND WELL - BEING OF DIGITAL USERS

Prolonged and continuous use of Digital devices by children also has an adverse impact on their physical health and well-being. Students at the time do not realise the strain that the body is experiencing while they are working on computers, tablets or other devices. They are so engrossed in their activity on Digital devices that minor pains and stiffness go unnoticed. These minor health problems may turn into more serious medical conditions when they are ignored for long periods. Certain medical conditions affecting the overall well-being of students such as bad posture, eye strain, net/ gaming addiction, obesity and repetitive stress injuries related to joints have been

reported by researchers. For example, Alexander and Currie (2004) have concluded that continuous use of computers by Swedish children leads to neck/ shoulder pains and headaches. Alexander and Currie also added that these physical conditions can be prevented through proper user education in schools.

Rosen et al. (2014) stated that the "total consumption" of digital technology and unmonitored use of Digital devices among children and preteens has negative health consequences such as obesity, sleep deprivation, and anti-social behaviour as well as diminished physical activity (p. 364). Sigman (2012) has reported on several physical and mental health problems among young children due to the overuse of screen media. Sigman stated that children should be taught to use Digital devices appropriately to avoid permanent health damage and certain diseases like type II diabetes, and at the same time, their screen time should be reduced in order to facilitate physical activity. Similarly studies have reported other health risks, such as poor posture, and eye strain in pre-schoolers due to the extensive use of Digital devices (Teng, 2013).

Karuppiah (2015) has reported both a positive and negative impact of the use of technology by young children. The positive impact on children using technology is the development of knowledge and vocabulary while the negative impact includes eyesight strain and computer addiction. Karuppiah further suggests that proper education regarding the use of technology will not only benefit students, but will also facilitate the formation of lifelong habits to prevent physical and mental health issues associated with the use of Digital devices.

These incidences and reports indicate that our children need to be educated about the proper and ethical use of Digital devices to ensure their overall well-being. The Digital Citizenship curriculum integration, which will assist students in forming

appropriate habits for using Digital devices, will enable students to self-regulate their activities and monitor time spent on these devices. Therefore, any curriculum integration for the productive and positive use of technology should begin at primary school.

Hollandsworth, Dowdy and Donovan (2011) have reported on a survey of teachers' views of Digital Citizenship integration within curricula which found that skills should be facilitated during the primary years, preferably grades three and four. The timing of integrating Digital Citizenship with the curriculum is important as students' attitudes and habits of working with technology are set by the time they enter their teens and are difficult to change during the high school years (Hollandsworth et al., 2011). Integrating Digital Citizenship in the primary years curriculum would support students to build a foundation for becoming lifelong responsible Digital Citizens.

The International Society for Technology, which is a global non-profit organisation for connected learners, has included Digital Citizenship as an essential skill in the National Educational Technology Standards (NETS) for students, teachers and computer science coaches (International Society for Technology Education, 2007). Similarly, the IBO, as well as the Singapore Ministry of Education (MOE), have recognised that it is important for primary students to acquire digital competencies (IBO, 2011; "MOE to Enhance Learning of 21st Century Competencies and Strengthen Art, Music and Physical Education," 2010). There is a common consensus among technology leaders and educators about young people acquiring Digital Citizenship knowledge and its importance in education (Ribble & Bailey, 2004).

There is a large body of research on the importance of teaching Digital Citizenship to students in secondary and tertiary educational institutions. Calvani, Fini, Ranieri and Picci (2012) concluded from their studies of Italian teenagers that their applications of digital skills to display their conceptual understanding, critical cognitive skills and socio-ethical knowledge were not satisfactory and that their foundation of digital competencies was weak. Hatlevik and Christophersen (2013) reported that since Digital Competency varied among the secondary school students, their Information Communication Technology (ICT) requirements would vary too. According to Kuiper, Volman, and Terwel (2008), students lacked the ability to analyse, evaluate and use information in meaningful ways. Similar findings were obtained by Walraven, Brand-Gruwel and Boshuizen (2009) who found that students were not habituated to evaluate the results and sources of information on the Web. Therefore, digital competencies and ethical use of digital tools should be integrated in primary years of school to lay a firm foundation of digital literacy skills and become responsible Digital Citizens.

Greenhow, Robelia, and Hughes have highlighted the changes in Web technology, and its impact on the way learners create, communicate and express their views (2009). Web 2.0 technology has enabled students to participate in the digital world through interconnected Web-based platforms by creating, sharing and publishing to reach a wider audience without boundaries (Greenhow et al., 2009).

Tsai, Yu and Hsiao (2012) suggested that digital games have some effect on learning. Digital games when used effectively in alignment with students' abilities, allow students to extend their understanding of the topic and solidify underlying conceptual understanding of subject matter (Tsai et al., 2012). However, these need further in-depth research to be proven conclusive.

The research mentioned in this literature review is largely related to digital learning technology, which influences learners in schools. It has not, however, been inclusive of the primary level students and has not been comprehensive enough to suggest how suitable learning strategies in primary schools may be implemented.

2.3   DIGITAL LITERACY IN SCHOOLS

Digital Literacy is the domain that concerns educators around the world and the inclusion of Digital Literacy in classroom practices is an ongoing effort by schools. This is evident from the inclusion of Digital Literacy as a curriculum requirement of the major curriculum and assessment bodies like The International Society for Technology Education (ISTE), NETS, Common Core, IB and 21st Century learning. Digital Literacy as defined by Ribble (2011) is the "process of teaching and learning about technology and the use of technology" (p. 26). Students are now exposed to digital media through the internet, and so "both the amount of information and access to it have grown exponentially; a significant potential for using varied resources in numerous ways for instruction and learning has emerged" (Hill & Hannafin, 2001, p. 37). It is, therefore, important that students learn ethical and appropriate ways of using and sharing information in the digital world.

Digital Literacy includes interpretation of information in various formats including multimedia, analyses and creation of new knowledge based on an understanding acquired through exposure to available information. Students need to understand that information in any form require careful evaluation and the source of the information has to be verified as well as cited if the information is used in their work. Intellectual property rights and academic honesty are aspects of Digital Literacy which must be taught explicitly and right from the time that students learn to copy and paste as a digital skill. Alkali and Amichai-Hamburger (2004) have

reported on the complexity of skills required by students to acquire Digital Literacy skills and to become competent users of technology.

Fast access to information through the internet and Digital devices has been an easy path to academic dishonesty. As stated by McCabe (2001), the use of the internet by younger students and the versatile nature of the internet makes it difficult for students to perceive it as an "academic tool". McCabe also noted that high school students have a general understanding that if the information is available on the internet, firstly it is public, and secondly there is no need to cite the source (McCabe, 2001). At times, students tend to take issues of copyright and intellectual property lightly. However, students need guidance in giving proper credit to the original author and getting permission before reusing someone's work. This is a major challenge and concern for educators, and it needs to be addressed right from primary classes with students engaged in inquiry learning.

Similarly, Sisti (2007) outlines the reasons for plagiarism in high schools ranging from academic pressures to the ease of completing assignments. Sisti also found that high school students claim ownership of purchased papers justifying them as any other purchase of materialistic articles (Sisti, 2007). Sisti suggested that educators should craft assignments that are not directed at rote learning, give Cloze tests and use plagiarism-checking software to curtail academic dishonesty among high school students (Sisti, 2007). (Plagiarism and copyright will be addressed in detail in the Digital Citizenship section of this literature review.)

There is a possibility that educators could learn from the research and integrate Digital Competency skills in the primary years curriculum to lay a firm foundation for students to be responsible Digital Citizens.

2.4   UNDERSTANDING THE DIGITAL GENERATION

In order to design the curriculum and measure the effectiveness of Digital Citizenship in primary school students, we need to understand how these students, who are born immersed in technology, think and work with technology. Digital generations see the world as virtual realities, connected communities and collaborative learning spaces. The Digital generation as described by Jukes, McCain and Crockett (2010) is the generation that has grown up in a digital landscape which provides them with easy access to digital technology. Due to constant exposure to digital media and information, digital generations think, communicate and react differently from any other generations (Jukes et al., 2010). Learning styles and communication methods may differ from traditional forms of learning recorded in past generations; however, the basic requirements for this generation are the same: that is a better world for all in terms of education, healthcare and life choices.

Students of the Digital Generation have a preference for multitasking, like listening to music, working on an assignment and chatting with a friend all at the same time (Mesch, 2009). Such students are constantly switching between different activities while learning. Therefore, as educators, we need to understand and accept that multitasking is a common way of functioning for this young generation (Mesch, 2009). Educators must redesign the curriculum so that it encompasses strategies focused on learning digital skills to minimise distraction and self-management while working with Digital devices. The Digital Generation is "nurtured by a world of digital technology, instant information, global communication, individually customised environment" (p. 21) who demand personalised learning experiences (Pletka, 2007).

Multitasking has its own advantages and disadvantages. The challenges students face while multitasking arises when they have to work at tasks and skills that are new and require complete focus to master them; they are distracted and unable to manage the urges to switch tasks. Constant switching in-between tasks lead to lapses in productivity and extends the duration for completion of the given task (Burak, 2012; Kraushaar & Novak, 2010). Multitasking if done mindfully could increase productivity, malleability in thinking processes and exercise parallel thinking skills (Ie, Haller, Langer, & Courvoisier, 2012). This ability can also be a hindrance in learning new skills due to the lack of ability to focus on a single task (Jukes et al., 2010). The challenge here is not about multitasking being good or bad, but how we handle multitasking in children. The classroom environment and learning activities need to be carefully planned and structured to positively harness these abilities to facilitate learning (Gasser & Palfrey, 2009). However, in this research, students were not permitted to multitask during the intervention lessons, as the research is focused on developing digital competencies for the appropriate and effective use of Digital devices for learning and becoming responsible Digital Citizens.

2.4.1 Online Interactions by Digital Generation

The audience and their responses are key factors affecting students' online activities. The emergence of faster internet facilities has provided students with the ability to publish their work online and generate instant feedback from a wider and varied audience. The feedback or response to online learning can be positive, negative or just a request for an improved version of the published creation. This supports the self-regulated learning of the students by allowing them to improve and republish their work without hassle. As such they need to be in charge of their own learning at all times.

Traditionally, many theorists like Piaget, Vygotsky and Bruner have suggested that feedback has an impact on learning as it allows learners to evaluate and revise their understanding of the subject. Cooperstein and Kocevar-Weidinger (2004), have suggested that social interactions, supportive learning environments and well-structured activities facilitate students' understanding of abstract concepts, which are transferable and retained for further learning. Formative feedback by teachers through formative assessments during the lessons allows students to identify their strengths and weakness to improve their own learning. As indicated by Greenhow (2011, p. 7), access to social networking sites through the internet enables students to revise or improve their work while chatting, brainstorming, sharing and exchanging feedback with other students before final submission of assignments. Students perceive such online activities as supporting the development of their creativity, with technology and communication skills thus opening doors to diverse viewpoints of digital technology for learning (Greenhow, 2011).

However, caution needs to be exercised as students will need to understand that not all reviews or feedback are genuine. The quality of the feedback depends upon knowledge of the subject matter that the person who is providing the feedback may or may not have. The language and style of online feedback need to be appropriately structured to avoid misinterpretation by the readers. Online feedback is also guided by differing perceptions. Furthermore, the online nature of feedback does not allow the person who is receiving the feedback to interpret emotions behind the feedback. Digital Communication skills play the key role in which the feedback has been interpreted by students of differing abilities. For example students with English as a second language or as native English speakers, will interpret the same feedback differently. As stated by Demiray (2011), the tone of online feedback conveys the

writer's attitude and "writing that is complex, ambiguous and/or indirect may lead to misinterpretation of message" (p. 108). Teachers need to carefully scaffold activities for students to develop the necessary Digital Communication skills, thus enabling students to differentiate between positive and negative feedback, and to use constructive feedback technique to support each other's learning journey.

The interactive nature of the internet has facilitated active learning and engagement among students. Digital technology has enabled students to research and explore subjects from different perspectives both in and out of the classroom. Students are not only analysing the content by various authors but also putting forth their own perspective on the topic through online applications and engaging in active discussions. Resnick (2002) advocates that access to online learning opportunities broaden the learning ecosystems of students and provides them with connected knowledge, thus building communities to learn from each other using digital technology. Indeed, the habitants of the Digital generation are not only consumers of knowledge, but also active creators of knowledge in the digital world.

2.4.2 Connecting through technology

Technology has brought about changes in our social settings and totally transformed the way we interact with each other. It has managed to dissolve the importance of distance and aided communication between family members. According to Hampton, Sessions, Her and Rainie (2009), people connect with each other, neighbourhood communities, friends, work buddies and extended family members with digital applications like phone calls, *Facebook, WhatsApp, Skype* and many more. In fact, these technologies have enabled us to extend our social network beyond the borders and remain connected with people who we possibly may not meet for years.

Similarly, children's social lives and social interactions are dependent on the technology available to them. This is especially relevant when we are talking about Third Culture Kids (TCK) who are facing constant struggles about their "belongings, relationships and cultural identity" (Fail, Thompson, & Walker, 2004, p. 319). Students' in international schools who come from diverse nationalities and are born to migratory parents belong to this TCK community. These students are generally open-minded and accepting towards diverse cultural immersions and tend to remain connected with friends from school even after moving countries (Lam & Selmer, 2004; McGregor, Renu, & Deepa, 2013).

Technology has allowed TCK students to be connected with family members and friends via social network sites and *Skype* calls. On another hand, communication via digital tools may cause isolation, depression and possible inappropriate behaviour in children (Subrahmanyam, Robert, Greenfield, & Gross, 2000). Subrahmanyam et al.(2000) critically reviewed the research on the impact of computers on children and concluded that though the research is in its infancy, it does suggest that inappropriate use of technology leads to negative physical and social impact on children's lives. This is supported by research conducted by Dworak, Schierl, Bruns, and Strüder (2007) suggesting that excessive use of digital technology leads to sleep deprivation and negatively impacts on children's learning and memory. The negative effects of social interaction using technology may arise due to other social, psychological and developmental reasons yet to be explored through research. Digital Citizenship integration with the curriculum will support students to form habits of digital learning that would prevent a negative impact and focus on the effectiveness of technology in learning.

2.4.3 Social online culture

Digital tools and technology have altered our social culture and to some extent enhanced our social interactions. However, as educators, we need to support these new social settings with a curriculum for students to understand the boundaries of socially accepted behaviours and to differentiate between public and private expressions of emotions. Livingstone and Bovill (1999) have concluded that interactive technology has resulted in the "blurring of boundaries between information, education, work and entertainment" (pp. 10), and students need to acquire the necessary skills to distinguish between these boundaries. Livingstone and Bovill conducted a mixed method study in phases across countries in the UK through surveys, interviews and follow-up interviews which included both parents and children 6-17 years of age. Livingstone and Bovill concluded that ever changing media, technology and its availability to all students may cause a social divide. However, schools are crucial in integrating appropriate digital skills in the curriculum for students to be good Digital Citizens (1999). Thus, the impact of digital technology on social interactions and communication is determined by "our use of the technology for and by our children"(*Communication Technology and Social Change: Theory and Implications*, 2014, p. 72).

Students at present are immersed in the digital world where information is at their fingertips. However, information literacy also known as Digital Literacy can only be achieved by an ability to evaluate the collected information, analyse and categorise the same. "It is important that the positive benefits of using online digital tools be counterbalanced with the negative effects that accompany their use" (Jukes et al., 2010, p. 2). The adults responsible for mentoring children through education are themselves unaware of the imbalance in their digital lives. Teachers, parents and

other adults who are a part of children's lives are constantly on their Digital devices carrying out various activities like communication, photo taking and so on that is being watched by children. Hours spent, the language used, the way a digital device is used by adults are constantly scrutinised by children and most-adults do not realise that they are being observed, along with their etiquette while using these Digital devices. If an adult can do it why a child cannot is the question always popping-up in a child's mind.

Bandura's (1977) social learning theory suggest that children learn behaviour mostly by observing adults first and then other children. At the same time, Vygotsky (1980) suggested that children's learning can be scaffolded by appropriate adult interaction. Adults must model appropriate Digital Competency skills so that children learn to communicate, create, share and publish in an appropriate way in the digital world.

Most schools have developed an Acceptable Use Policies (AUP) to guide adults and children using technology and to set boundaries for appropriate and inappropriate use of Digital devices on campus. It has been proven that AUP's "have little effect on teaching responsible technology behaviour" (Ribble & Bailey, 2006). AUPs are set to guide students and have set consequences for inappropriate behaviour related to the use of digital devices at school. However, as we now know Digital devices have extended interaction beyond the wall of classrooms and students like to express their views on various topics using online platforms. This indicates AUPs will not be beneficial as students are interacting with the wider audience in the digital world through the internet. Students need to be taught what is acceptable behaviour in order for AUP's to work. Therefore, Ribble and Bailey have suggested schools

should look at Empowered Use Policy (EUP) by giving students responsibility for choices that they make while using Digital devices (2015).

Understanding how digital technology is rewiring children's brains will help us to design the most effective curriculum, integrating technology and digital tools to facilitate an optimal learning environment for students (Jukes et al., 2010). Due to the constant bombardment of digital media, students thinking processes have changed from linear to parallel thinking. Students' visual memory and visual processing skills have been enhanced, and they enter the classroom with a different set of skills than previous generations (Jukes et al., 2010). This knowledge about students' cognitive abilities will allow educators to design a curriculum that integrates effective use of Digital devices by students for learning to facilitate the acquisition of 21st-century skills and be responsible Digital Citizens.

2.5   TECHNOLOGY IN PRIMARY SCHOOLS

Primary schools and preschools are today equipped with computers and other Digital devices to keep their students in line with global trends as well as facilitate a collaborative learning culture. Henderson and Yeow (2012) established that IPads in the classroom support-students' learning through easy access to information and collaborative learning processes.

The MOE Singapore launched the "Third Master Plan" for ICT integration in education on August 5, 2008. The primary aim of this plan was to strengthen ICT integration in all areas of the curriculum, including assessments, and to support ICT infrastructure development in schools ("MOE Launches Third Masterplan for ICT in Education," 2008). This masterplan also has provision for professional development

for educators to enhance student learning ("MOE Launches Third Masterplan for ICT in Education," 2008).

The MOE Singapore has subsequently introduced cyber wellness and a teacher mentoring program to support ICT integration within state schools. Cyber wellness is the positive well-being of the internet user avoiding any harmful interaction and being safe online ("Cyberwellness," 2010). Through this cyber wellness framework, MOE Singapore has developed professional development programs to support teachers to develop Digital Competency so that teachers can further integrate appropriate online behaviour or etiquette in their classrooms. Understanding the digital habits of students and availability of technology at home will facilitate teachers to integrate the appropriate digital competency skills in schools.

According to a survey by Unantenne (2014), 17 % of children in Singapore use a family shared the digital device while 11% children have their own Digital devices with most parents allowing their children to use the mobile devices on an average of one hour per day. Haddon and Vincent (2014) have reported that 53% of children under 12 own smartphones and 48% own desktop computers in European countries. Similarly a study of Australian children has found that nearly one-third own their own Digital devices and parents allow their children to spend about one to three hours per day on Digital devices ("Study Finds Majority of Australian Parents Educate Their Children about Online Safety and Take Security Precautions with Mobile Devices and Kids," 2014). These studies suggest that children as young as three to four years old have access to an internet connected Digital devices. It becomes essential that students are guided through the curriculum to use the Digital devices appropriately and effectively.

Based on their research on primary grade students Kampylis, Fokides, and Theodorakopoulou (2011) stated that Computer-Based Learning Environments (CBLE) bridge the gap between the uses of digital technology in and out of school and promotes students' creative thinking and learning. Moreover, a CBLE enhances the accessibility and availability of learning resources for students through internet connectivity on Digital devices. In addition to an ICT lab most international schools in Singapore are also integrating Digital Competency through Interactive White Boards in classrooms, laptops for upper primary and sets of IPads for lower primary and preschool students. Some schools have implemented Bring Your Own Device (BYOD) programs, both for primary and secondary school students.

BYOD programs facilitate personalised learning for students as students feel more responsible for self-owned Digital devices (*Bring Your Own Device:A Guide for Schools*, 2012). At times, schools do dictate what type and model of the devices are acceptable for the BYOD program. For example, some schools would require a Mac or Windows-based device whereas some will allow multiple operating systems within the classroom to be functional. The choice of the device by the school depends on available infrastructure in the school to support the devices. This constricts the flexibility of choice of the mobile devices in terms of the type, for example, Mac, Windows, Android and Chrome, although these devices seek to provide the learner with a comfortable learning environment. The benefits of BYOD cannot be underestimated in terms of students' educational outcomes. Research by Kong and Song about the impact of BYOD in teacher education suggests that BYOD "promote learners to be engaged in reflective inquiry for deep learning and personal growth" (2015, p. 227). Song (2014) concluded that BYOD enhanced students' research abilities and the students "developed positive attitude" towards inquiry learning in

science. Hopkins, Sylvester, and Tate (2013) found that BYOD supported autonomous learning when they were being complimented with a cyber safety program and good technical infrastructures.

As schools are moving towards personalised learning, they need to have a phased implementation plan, infrastructure, BYOD policy and network security for successful BYOD integration in schools. As suggested by Raths (2012) the BYOD rollout within the school environment requires careful consideration of the available wireless network in terms of capacity as well as security, different access levels for students, staff and parents and proper design plans to install access points for wireless access based on a number of users. The BYOD policy is required to set the expectations or purpose of the usage of the digital device within the school. The policy is to ensure that all the stakeholders students, teachers and parents understand that acceptable and appropriate use of Digital devices is a necessary requirement, and there are consequences attached to any inappropriate usage of Digital devices.

Digital competence and information literacy are the requirements for 21st-century learning. Technology integration and digital tools for schools are essential for the acquisition of 21st-century skills and Digital Literacy. In addition, the collaboration of parents' with schools is important to support the necessary acquisition of the skills by students. As students are required to work on homework assignments and projects at home, parents are the monitoring authority at home. Parents should be aware of the appropriate and effective use of Digital devices set by the school so they can guide their children while working on Digital devices at home. Kong (2008) stated that any curriculum integration involving technology is incomplete without the support of parents to develop the right attitude and skills for using Digital devices. Based on their research of 440 primary schools in Hong Kong,

Kong and Li (2009) concluded that parent-school collaboration is important as Digital devices have extended learning beyond school boundaries and such collaboration will support the acquisition of appropriate Digital Competency skills.

Students use Digital devices and tools outside the school setting for homework, gathering information, recreation and connecting with friends (Hsi, 2007; Itō, 2010). Twenty-first-century learners are searching for information and tutorials via online sources like the *Khan Academy, Tedtalk, Youtube, Blogs, and Wikispaces*, for research as well as to enhance their knowledge base on topics of interest. The use of Digital devices and tools by students needs to be monitored by students themselves as well as parents in order to ensure the appropriateness of information accessed/shared and the safety of students. Students facing challenges or experiencing some discomfort in viewing certain videos or websites that are not age appropriate, or experiencing physical pain due to prolonged use of Digital devices at home, need to know whom to consult for support. Parents need to be equipped to identify and understand these challenges in order to support their children appropriately while they are using technology at home.

Research by Özdamlı and Yıldız (2014) has provided an important view on parents' willingness for parent-school partnerships for the use of mobile technology in education. Parents must be informed of their children's Digital Competency skills requirements and set rules for use of Digital devices so that they can maintain those while students are working at home on Digital devices. Kong and Li (2009) have concluded that the parents- school collaboration benefits mobile learning and "seamless transition" between school and home. Kong and Li (2009) have also suggested that research should be done in the field of supporting parents to tactfully handle the challenges faced with technology use and learning at home (p. 282). This

can only be done through ongoing workshops for parents on Digital Citizenship and technology learning at school. Clark rightly said "we must take a lead and become advocates of good Digital Citizenship, we must know what is out there, and parents and kids must be involved together to ensure success" as quoted by Hollandsworth et al. (2011, p. 38). Ribble (2009) advocates that collaboration between parents and teachers through transparent communication will support students to gain digital competencies through the home and the school Digital Citizenship program.

Recent studies by Kenney (2011) have highlighted the direct connection between technology integration in rural elementary classrooms and students' motivation (Kenney, 2011, p. 67). Kenney's finding suggest that technology and Digital devices when aptly integrated with curriculum "actively engage students, drive participation, and are a vital part of both teaching and learning in the classroom" (p. 73). Dede's (2010b) qualitative research suggests that interactive and multimedia-based technology included in the curriculum enables students to be the co-constructors of knowledge, improves the success rate and provides differentiated learning strategies. Despite these recommendations Dede failed to mention the practical application and the age of the students included in the research, and so it is difficult to gauge the implications of these findings for primary students.

The use of Apps for acquiring concepts in other subjects is known and practiced in school, for example, *Star walk* is used for understanding star positions and constellation. There are other Apps which are targeted and are specific subject based Apps such as *Educreations*, Math Apps for concepts of addition, subtraction, fractions and *ITooch* for Elementary school students. There are creation based Apps such *Explain everything*, *Imovies, Garageband, Storyboard That* and many more that are versatile and can be used across subject areas. These Apps enable students to

express their views on topics innovatively and support the acquisition of particular concepts through technology integration in classrooms. The impact of these Apps on overall learning and Digital Competency is yet to be discovered.

Using Apps for learning in primary school is a recent phenomenon and the use of the same has to be carefully monitored so that Apps, when used, extend the learning of students and are not used because they look good. Digital Citizenship and its nine elements cover all the aspects of the technology used in students' daily lives, including socialising, communication, safety and learning. Research on integrating Digital Citizenship with curriculum for the effective use of technology in gaining the understanding of those concepts is sparse. Schools need to strategically plan to integrate Digital Citizenship with curriculum to support students' acquisition of Digital Competency skills to be responsible Digital Citizens.

The Singapore case study conducted by Tay, Lim, Lim, and Koh (2012) in primary schools on the influence of technology on English and Mathematics suggests that the wide variety of teaching strategies employed by teachers play an important role in tech-curriculum integration. As mentioned, the transformation of Web to Web 2.0 has enabled creative and participatory learning experiences for students. Greenhow et al. (2009) have noted that Web 2.0 technology has opened up a hybrid learning space beyond the traditional learning environment. Students create their online profiles and identity on Web 2.0 sites like *Bloggers*, *Wikispaces*, and *Podbean*, to connect, share and collaborate with others.

According to Alvermann et al. (2012), students create multiple online identities using a variety of Web 2.0 resources and Digital Literacy skills. These technologies offer students an opportunity to author multimedia and literary creations and easily publish them online for the entire digital community. Remixing music-

videos, modifying photos, researching information and presenting their understanding in totally new formats is normal for Googloids. Googloids using digital devices convey their perspective or display their understanding of the topics of interest and learning using latest technological tools. Googloids is another term used for the Digital generation of children born after the Web 2.0 revolution in 2004. Googloids is a term used for persons who are "geeky" about anything related to Google or Web searches. A research review on the impact of Web 2.0 technologies by Hew and Cheung (2011) strongly indicates that the positive impact of Web 2.0 technologies on learning is due to "specific pedagogy" targeting technology and its tools.

2.6 DIGITAL CITIZENSHIP

Ribble (2011) created the flexible framework for including the concept of Digital Citizenship in the school curriculum. Ribble defines Digital Citizenship "as the norms of appropriate, responsible behavior with regard to technology use" (p. 10). Sweeny (2010) affirms that Digital Citizenship is a mode through which students begin to understand and evaluate the implications of the use of technology and develop a "positive attitude towards" the use of technology that would be educationally beneficial. The concept of appropriate or ethical use of technology is not new, and researchers have worked towards a balanced approach towards technology integration in education since 1970 (Fouts, 2000). Walklin (1990) has stated that the use of appropriate teaching material, software and the citing of sources while creating computer-based teaching aids is important to support learning in classrooms. Moreover, computer-based learning provides flexibility in learning environments, greater emphasis on performance-based tasks and supports the integration of real life situations for meaningful learning within the classroom.

ICT is an essential learning tool in classrooms and it supports a constructive learning approach. However, it is important that teachers maximise students' learning using ICT or Digital devices as a tool in the classroom (Cook & Finlayson, 1999). Leask and Meadows (2000) reported on case studies involving teaching different subjects using ICT in primary schools. They concluded that in a "carefully constructed learning environment" (p. 8) technology enhances students learning, communication and thinking skills (Leask & Meadows, 2000). An OECD report published in 2000 states that besides the constructive impact on students' learning with Digital devices, there are certain areas that need attention for careful integration of technology in schools. Areas of concern raised by the OECD report include the digital divide among learners, gaps between the digital competencies of adults and children, the appropriate use of technology in education and the development of open and flexible infrastructure. The concerns raised in the OECD report are genuinely affecting how technology integration is handled in educational settings. The development of innovative curriculum involving technology, parents' awareness workshops and professional development for teachers will support all learners and facilitate the appropriate and effective use of technology in schools.

Higgins and Packard (2004) have published a teacher's guide for teaching using technology in primary school covering legal, ethical, health and safety related issues. Barron, Kemker, Harmes and Kalaydjian (2003) conducted large-scale studies on effective technology integration in K-12 schools in the US. They found that technology as a learning tool was only used by 20% of teachers, whereas 59% of teachers used it as a communication tool in Elementary schools. Kerawalla and Crook (2002) found there was a huge disparity between the use of computers by children at the school where they were mainly for learning while at home they were

being used for recreational gaming. Ainley, Banks and Fleming (2002) gathered data from case studies in five Australian schools on the use of technology in education. Ainley et al. (2002) established that while technology supports learning, the role of the school in embedding technology needs to be clear; gaps between the potential of technology and actual implementation need to be narrowed, and monitoring of competencies of teachers and students are issues to be addressed while integrating technology in schools. Similarly, Roschelle, Pea, Hoadley, Gordin, and Means (2000) stated that the effective use of technology in education is based on educators' ability to integrate into the curriculum and broaden an educational reform agenda of schools. These studies provide guidance to teachers to control technology and its tools in the classroom in order to ensure appropriate use of Digital devices. The use of technology has been found to be more teacher-centric, and didactic in schools rather than student-centric. This practice may have prevailed to ensure safety and avoid inappropriate use by students as well as teachers' limited abilities to integrate technology within the classroom (Cuban, Kirkpatrick, & Peck, 2001; Hayes, 2007; Wang, 2002).

Moreover, pace and complexity of the technology available suggests that we are not prepared enough to support the acquisition of 21st-century skills and competency required for work and life in the digital world (Voogt, Erstad, Dede, & Mishra, 2013). Highlights of the 21st-century learning are to support lifelong learning blended with "content, knowledge, specific skills, expertise and literacies" (P21, 2015b). The framework for 21st-century skills includes information, media and technology skills as core competencies. Twenty-first century competency requirements are endorsed by the Ministry of Education Singapore (MOE), in a press release stating that 21st-century competencies will "prepare our students to thrive in a

fast-changing and highly-connected world"("MOE to Enhance Learning of 21st Century Competencies and Strengthen Art, Music and Physical Education," 2010). Researchers affirmed that Digital Competency is the connecting link between 21st-century skill and education. Dede (2010b) emphasised that ICT tools are essential for 21st-century learning and Crockett et al. (2011) have placed global Digital Citizenship as a core concept to acquire 21st-century fluencies in this digital age.

Ribble, Bailey and Ross (2004) suggested that combining technology requirements with appropriate use under one guiding umbrella of Digital Citizenship will support adults as well children to be responsible users of technology. As mentioned by Ohler (2010) ISTE had published version one of standards for integration of the technology in education in 2000 which was then revised in 2008 to include "Promote and Model Digital Citizenship and Responsibility"(pp. 20-21).

Ribble has categorised Digital Citizenship into nine elements so as to encompass every aspect of the digital life of students. These nine elements are Digital –Access, Literacy, Law, Etiquette, Communication, Commerce, Security, Rights and Responsibility and Health and Wellness (Ribble, 2011). Nine elements of the Digital Citizenship framework described in detail below form the basis of the Unit of Inquiry developed for this study. The effectiveness of the Digital Citizenship, Unit of Inquiry is evaluated in this study to facilitate digital competency skills among students in the IB PYP school.

2.6.1 Digital Access

As defined by Ribble (2011) Digital Access is the *"Full electronic participation in society"* (p.11).

Technology and its evolution has the potential to allow everyone to be connected and have equal access rights to participate in an information-rich digital world. However, there are discrepancies to this notion as less developed countries and lower income groups may or may not have access to technology. Therefore, at times students and teachers in private schools and urban cities like Singapore, do not realise that having access to multiple technologies is a privilege and that not everyone is fortunate to have access to digital technology. A Digital divide is most prevalent in developing countries and lower income communities in other parts of the world. Due to a number of reasons- political, economic, infrastructure development, some members of our society may not have access to digital tools and internet based services. Mossberger's (Chadwick, Chadwick, Howard, & Howard, 2008) research indicated that there was a digital divide among the African-American adult population in the USA and recommended the adoption of Digital Citizenship nationwide as a solution for access to ICT. Gunduz's (2010) research in 375 elementary schools on the impact of the digital divide on school success and grades suggests that students with access to computers and the internet performed better than those who did not have any access at home or school. Making provisions for equitable access to digital technology to participate in the digital world is a huge challenge for governments, as reported by the UK Cabinet (2014). The Digital Access element will allow students through the curriculum integration and inquiry process to analyse the importance of Digital Access for everyone irrespective of age, gender, socioeconomic status and educational competence.

2.6.2 Digital Commerce

Digital Commerce is defined as *"The electronic buying and selling of goods"* through internet enabled devices (Ribble, 2011, p.11).

Digital Commerce is the transaction of the purchase or sales of goods through websites and digital payment portals like *PayPal, Master and Visa Cards* services. Digital commerce is a complex element to be taught to young children (Ribble, 2011). However, it is important that students understand that purchasing anything online incurs a cost which is usually paid by their parents. The digitization of trade and commerce has provided businesses with a flexible online transaction option through the use of Credit cards, *Google Wallet and Pay pal.* Due to the lack of a physical exchange of currency, it is hard for children to conceptualise the purchase process. According to a report in The Wall Street Journal (Bensinger, 2014), the U.S. Federal Trade Commission sued Amazon.com Inc. for unauthorised purchases by children through In-App purchase. The App developers allow free download of Apps, but In-App purchases of new modules, characters, songs and virtual currency is just a tap away. The In-App purchase costs real money which is deducted from a parent's credit card account tied to mobile devices. Similar reports have been noted against Web giant Google. Both Apple and Google have increased their security, and now In-App purchases can be restricted, and password protected through parental control on devices.

Big companies and marketing strategists are targeting children to buy their products through interactive advertisements termed "Advergaming" (Weber, Story, & Harnack, 2006). For example, Minion figurines which are very popular amongst children were set to have a huge toy sale in 2015 (Kell, 2015). Students' need to understand that the companies are using marketing strategies to increase their sales, and as children are easily coerced into buying these branded goods, they design children focused advertisements.

Identity theft is another major challenge facing the Digital generation and, therefore; digital commerce education becomes vital for students to be safe and avoid online scams that target them. A study by Power and CyLab (2011) found that the identities of over 4000 children in the US, 51% higher than adults, were not only stolen but also shared for criminal activities. Predators are targeting young children through gaming sites and console extracting information by posing as a child on these websites. Identity thieves use the stolen identities for criminal activities, opening bank and credit accounts, purchases of houses, cars and insurance claims (Weisman, 2014). This information implies that children are targeted for identity theft by people with criminal intentions. Therefore, Weisman (2014) has advised parents on how to keep their children safe and made suggestions on what can be done if their child is a victim. The Digital Citizenship curriculum integration used in this study was designed to facilitate students' understanding of some of these predatory tactics and enable them to seek help if they feel threatened.

The National Institute of Education, Singapore in partnership with Citibank has designed a pedagogy training program for primary and secondary school teacher on financial literacy (http://www.finlit.nie.edu.sg/). The special branch of Money Sense, which provides resources, and workshops for teachers based on financial literacy was setup in 2004 to create more awareness among students on money matters. "It is not uncommon for students to go online and purchase items without thinking about consequences" (Ribble, 2011, p.20), but as educators, we can facilitate students' understanding of the digital economy through curriculum integration. The Digital Citizenship curriculum integration sought to guide students to make appropriate choices while working on Digital devices and deal with any transactions related to information or money exchange with unknown people.

2.6.3 Digital Communication

Digital Communication is defined as the *"Electronic exchange of information"* for professional or social purpose using Digital devices (Ribble, 2011, p. 11)

Innovative technology and mobile Digital devices with lightning speed capacities have pushed human interactions to different levels. People are quick to comment, send pictures, have video chats and email using these devices. The tone and language of internet communication are very important. In general, students need to know that once something is posted on the internet, it will always remain on the internet. Any kind of communication done through the internet remains in cyberspace somewhere on the server or archives even after being deleted (LeClair et al., 2015). Students are unaware of the consequences and what inappropriate communication can lead them into. A childish act of today can be an embarrassing situation for tomorrow, a realisation that may come a bit too late for many (Dillion, 2013).

Language or current digital lingo used by students for Digital Communication is worrisome for some linguists and researchers. Salem (2013) concluded that while applications aided social communication it also led to language deterioration among upper primary, secondary and tertiary students. However, thoughtful integration of digital applications in education has led to improved writing and comprehension skills among students (Caplan & Lam, 2014; Okoth, 2014). Educators must facilitate the Digital Communication rules and ethics through curriculum integration whereby students are able to self-assess their Digital Communication and reflect on their online interactions. Most online communication does not involve face-to-face interaction and sometimes it is difficult to gauge the tone and intentions of the persons communicating. We are in the era of hyper connectivity where messages are delivered within a matter of a few seconds. This increases the possibility of

cyberbullying, victimisation as well as thoughtless communication among students. The interpretation of the communication language is based on readers' understanding of language as well as experience. This could be one reason for misinterpretations and misunderstandings of online communications.

Bucciarelli (2014) has invented an application to monitor children's online communication based on research and the requirement of parents to keep their children safe. Bucciarelli's application forwards all the communication from monitored children's device to their parent's device, analyses the communication and automatically generates an alert if the communication is deemed to be inappropriate (2014). This may ease parents' worries, but a child's right to privacy and space is neglected.

Aho (2005) has explained that "effective Digital Communication skill is the ability to create persuasive communications using different forms of media" (p. 34). Digital communication skills are essential 21st-century skills for students to gain in their early years of schooling. Educating and teaching students appropriate Digital Communication skills would enable students to be alert, use appropriate language and ask for help if required. Ribble's (2011) Digital Citizenship framework guides students to be responsible users of digital technologies for online communications.

2.6.4 Digital Literacy

Digital Literacy is *"The process of teaching and learning about technology and the use of technology"* (Ribble, 2011, p.11).

The use of technology in the classroom for teaching and learning is a common practice. As mentioned before Digital devices are tools for learning and just like any other tool, first learning what the tool does and how to use it is important. The focus

on technology integration should be on the appropriateness for a particular lesson or activity to make it more meaningful and relevant. Using technology in the classroom because it is available and not checking for meaningful connections with ongoing curriculum will not support students' acquisition of Digital Literacy skills. Purcell, Buchanan, and Friedrich (2013) have indicated that while teachers believe that digital technology has enhanced students' communication skills the focus of communicating through written work is still an important skill to be developed. Teachers need to be mindful about technology integration and use it effectively to boost students' knowledge and skills.

Similar results were reported by Mokhtar et al. (2013) involving students from secondary schools in Singapore. They found low levels of information literacy skills among primary and secondary students in Singapore and that school libraries were under-utilised by students in favour of fast access to information through the internet. The evolving technology has changed reading and writing practices drastically. Students are reading, writing and publishing on online portals more than ever before (Williams, 2008). Digital tools have enabled students to record and transmit knowledge easily and effortlessly for the purpose of reflective studies. ICT allows multiple possibilities and combinations of the use of words, images, sounds, animation and videos to convey one's understanding of the subject. Admitting this, Ribble (2011) points out "teaching how to use technology appropriately has not kept pace" (p. 26), this is due to an assumption that teachers will figure out the ways to integrate new technology in the classroom. However, teachers need professional development and time to play with technology in order to use it appropriately and integrate it effectively with the curriculum.

The challenges for today's educators concerning Digital Literacy are the availability of vast amounts of information, analysing information's originality and using it so as to enhance the learning process. Digital technology and the internet have allowed students to search for information in seconds. It is important for students to sieve through various sources of information and find what is appropriate for the set class project. Educators play an important role in facilitating this process of searching and analysing by using guided lessons on research through the internet. Bevort and Breda (2008) undertook a comparative study on media appropriation in education and concluded that young students' feel that it is important that schools teach them how to search for useful websites and use information effectively as part of the curriculum.

While it is important for students to search effectively and analyse information, it is equally important for them to understand that not all the information online is true. There are websites and posts that go viral and have no actual reliable sources as proof. These websites are created to look authentic, and so it is difficult to figure out whether the source is reliable or not. Krane (2006) found that 25 middle school students believed that a "Tree Octopus" was a real creature and concluded that schools need to do more in order to facilitate information evaluation skills among students. Moreover "Young people are especially prone to misperceive the perspectives and opinions of others" (Berson & Berson, 2003, p. 166). Therefore, they need to be carefully guided to develop appropriate Digital Literacy skills. Through curriculum integration teachers can facilitate good research skills so that students form a habit of checking information on at least 3-4 websites and books before using the information for their work. Educators have an important task on their hands to engage young minds through innovative learning experiences, to

continue dialogues on Digital Literacy practices and to nurture appropriate digital skills.

2.6.5 Digital Etiquette

Digital Etiquette is *"The electronic standards of conduct or procedure"* while working on Digital devices connected through the internet (Ribble, 2011, p.11).

Digital Etiquette is challenging behavioural aspects to be acquired and taught in the classroom. It involves understanding culturally accepted behavioural practices, another person's perspective and reacting constructively online. Keeping in mind the unlimited reach of the internet, to maintain Digital Etiquette is difficult even for adults let alone primary school children. The problems experienced concerning Digital Etiquette include "cyberbullying, happy slapping" and identity kidnapping (assuming someone else's identity online) (Luppicini, 2012, p. 115). In a physical setting it is not acceptable to follow random people, like or tag others, comment on how they look, make a request for friendship, walk up to an unknown person to chat and agree with another's perception. However, this is all possible and to some extent acceptable, on online social networks. According to Ribble, Bailey and Ross (2004), there are no written rules for using emerging technologies and sometimes users are free to make assumptions about the acceptable use of a particular technology.

An important behavioural trend observed in children is that they follow what adults do with technologies; whether it is appropriate or inappropriate thinking that it is okay for them too. Children are unaware that the adults they are trying to learn from are at times unaware of their own inappropriate behaviour (Bandura & McClelland, 1977). Responsible adults should be aware of their behaviour online and offline while using Digital devices so that they project appropriate digital etiquette to

the children around them. Adults, as well as children, have to face the consequences of inappropriate Digital Etiquette and sometimes it can totally change lives. This is evident from the sacking of a National Trade Union Congress, assistant director for a racial comment posted on a personal Facebook profile and subsequent public apology (Durai, 2012). This proves that adults at times are not aware of the consequences of their actions on Social networking sites, resulting in regretful situations. The school administration and educational leadership often create sets of rules and regulation / policies related to online etiquette for school networks or work related Digital Communication to prevent the misuse of Digital devices on the school premises. Humour online has diverse interpretations depending upon the cultural background of the people on the digital network. Therefore, "It is not enough to create rules and policy, we must teach everyone to become responsible Digital Citizens in this new society" (Whitehead, Jensen, & Boschee, 2013, p. 130). Cyberbullying as mentioned before is prominent in Singapore and embedding Digital Etiquette in the curriculum is one way to support our students to act thoughtfully online.

2.6.6 Digital Law

Digital Law is defined as *"The electronic responsibility for actions and deeds"* online (Ribble, 2011, p.11).

Digital Law is defining the boundaries for the appropriate use of information available both online and offline. There is a general perception among educators that if work is being used for the purpose of education or learning, it can be used freely. Secondly, copyright is not the law of the digital world but has been in existence since 1710 in England and 1790 in America (http://www.historyofcopyright.org/). The issues related to copyright and fair use have surfaced and become visible due to the internet's outreach to common people.

Most internet users believe that any information, multimedia creation which is available on the internet is free to use. This misconception needs to be addressed as information as well as multimedia creation is the intellectual property of their original author/s. Ribble (2009) states that most users are unaware of inappropriate actions while sharing information and "issues of intellectual property rights and copyright protection are very real and have very real consequences for violations" (p. 31). Researchers have found that plagiarism is an increasingly common problem among tertiary and secondary education (Ma et al., 2007; Park, 2003). Software, music and video piracy have increased due to inequality in available resources and economic constraints. As stated by Ribble (2011) students and faculty are aware that " it is wrong to download and swap files" (p. 31). Websites like BitTorrent and Pirate Bay are making illegal downloads easier for students. The anonymous feature of the internet facilitates this kind of activity and laws are unable to protect the intellectual property right of individuals (Boyle, 2013; Larsson, Svensson, Kaminski, Rönkkö, & Olsson, 2012).

Palfrey, Gasser, Simun, and Barnes (2009) found that students between ages 12-22 are illegally sharing and distributing creative material online completely ignorant of copyright laws. Palfrey et al. (2009) also found that there is "disconnect between technical, legal, and social norms as pertaining to copyright law" (p.79) among young students. Students in any era will test the boundaries and in the digital era, the line of demarcation between what is appropriate and what is inappropriate is very thin. At times, teachers of these students are not sure about the copyright laws themselves and how they impact children (Shane, 2001). In that case, how can we expect students to use appropriate referencing techniques while creating any type of documentation or presentation to express their understanding of the topics of research

and study? Copyright law has special consideration for the work being used for education and has sections explaining how the work can be used under "Fair Use" condition in Section 107& 110 ("Copyright Basics: Fair use,"). Under the Fair Use terms and conditions, any material can be used by educators and students to a certain extent for educational purposes.

Technology has transformed the copyright law as this copyright law was set in 1970's whereby the materials were in printed format. In the present age, Web 2.0 has enabled users to create and share information with a global audience. However, there has been an even stronger appeal from original creators to strengthen the copyright law to protect their work (Palfrey et al., 2009). There is an alternative system available for educators and students whereby they can use work licensed under Creative Commons with some rights reserved, and create their own or use royalty free digital creations for their work. Palfrey et al.'s (2009) study of students found that they were aware of copyright, but their understanding of the term and the law lacked an understanding and comprehension of intellectual property rights.

Educating students about academic honesty and intellectual property rights has become very important due to the digitization of materials available online. Digital technology has enabled students to be creators and publishers, but they have not been taught how to protect their work or give credit for using work created by others. Therefore, schools and educators must facilitate academic honesty as well as intellectual property rights through curriculum integration and empower students to be good Digital Citizens. Professional development for teachers and the inclusion of Digital Citizenship in the curriculum will guide the Digital generation to "become more aware of the legal ramifications of technology use" (Ribble, 2011, p.33) and be responsible users of digital technology.

2.6.7 Digital Rights and Responsibilities

Digital Rights and Responsibility is defined as *"Those requirements and freedom extended to everyone in a digital world"* (Ribble, 2011, p.35)

Each person has a right to use technology in this globalised world. Every civilisation that existed on this planet has created certain rights and responsibilities which were mutually agreed upon by their members to support proper functioning of society by regulating the acceptable behaviour of its members. Similarly, the digital world also has some rights and responsibilities of the users involved and for the use of digital technology. Students are very much a part of this digital world, and they need to understand clearly their rights and responsibilities in the digital world (Ribble & Bailey, 2004). Students in primary school with access to internet enabled Digital devices are interacting with others in the digital world. Therefore, students need proper guidance on not only Digital Etiquette and digital law, but also risks and threats while working online. Ribble, Bailey and Ross (2004) further stated that every student producing authentic, original work in digital society has the same copyrights available to them as anyone else.

Students should be aware of their rights in the digital society in order to act responsibly. Recent technology has enabled students to learn through social interaction in a networked world. Digital tools have given students the ability to transform their learning and understanding through collaborative processes, conversations and feedback through online portals. Students are now able to create content by recombining, connecting links and rebuilding other people's ideas. They can also transmit their understanding and creations through the internet. A Web 2.0 technology has multiplied the possibilities of social interaction for learning among students and in schools. "The greatest affordance of the Web for educational use is

the profound and multifaceted increase in communication and interaction capability"
(Anderson, 2008, p. 54) that needs to be mitigated through curriculum delivery in
schools. Digital technology and tools open possible doorways to use the technology
negatively. For example, students may use phones, and messaging services to cheat
on quizzes and online assessments ("Using technology to cheat: teens with cell
phones send 440 text messages a week and 110 a week while in the classroom,"
2009). The process of cut and paste is so easy that students forget that it is a form of
plagiarism or cheating. Trinchera (2002) states that "using direct quotes from articles
and resources should not be discouraged" (p. 5) but along with that students must be
taught the process of correct documentation and sourcing as part of the curriculum.

Students certainly have rights to express themselves online, but the dangers in
the digital world are bigger than conceived by students interacting in the digital world.
According to recent survey research, 80% of teens have witnessed others being mean
and cruel online, 41% have faced offline negative outcomes such as the end of
friendship, physical fights, face to face confrontation, anxiety and consequences from
school authorities due to interactions online (Lenhart et al., 2011). Lenhart et al.
further report their findings of the dependence of teens on their parents and peers for
advice about challenges faced by them while interacting online. Besides
cyberbullying, the children are also vulnerable to online predators that are targeting
children for sexual abuse, abduction and kidnapping (Crimaldi, 2007). These
perpetrators usually use social networking sites and publicly available information
about children to narrow down their targets. Clemmitt (2013) states increased
opportunities for children to network, come along with increased dangers of
perpetrators lurking in the online world. This is consistent with the findings of
research by Mitchell, Finkelhor, Jones and Wolak (2010) which indicated a

considerable number of crimes involving social networking sites, which are used to communicate with victims and the first point of contact.

Students in K-12 schools receive sparse training on the topics of cyber ethics and cyber security. Teachers also fail to capture learning opportunities to teach digital skills to students during lessons (Pruitt- Mentle, 2010). Students need to be taught appropriate Digital Competency so that they can defend themselves as well as ask for help if they feel threatened while working online.

The ethical use of information through citing sources, the right to be protected online against cyber bullies and perpetrators are serious challenges facing educators. A National cyber ethics, cyber safety, cyber security baseline survey undertaken by Pruitt-Mentle (2008) made two important recommendations: 1] User education for people using Digital devices is essential and 2] students when they leave school should know the appropriate online behaviour and must use their Digital devices responsibly. Educators can manage these challenges through the facilitation of digital rights and responsibilities within the curriculum. Lessons targeted to develop Digital Communication skills, requiring students comment on blogs, creating secured online profiles and learning to analyse online information will support students' acquisition of Digital Competency. Ribble (2011) acknowledges that integrating the Digital Citizenship framework within the curriculum will inspire students to be responsible users of digital technologies and become good Digital Citizens.

2.6.8 Digital Health and Wellness

Digital Health and Wellness is *"Physical and psychological well-being"* of the user *"in a digital technology world"* (Ribble, 2011, p.38).

Using Digital devices for a prolonged period has many repercussions on the health and well-being of the user (Yan et al., 2008). The interactive nature of digital technology keeps us glued to the screen for a longer time than necessary. Twenty-four seven access to the internet and mobile devices allows children to chat, play games, watch *Youtube* videos and work at any time of the day and night. Posture, lighting and physical fatigue are ignored by children as they are not knowledgeable about the long-term effects on their health (Bradley, 2001).

Ribble (2011) notes that "internet addiction" (p. 38) is a growing problem among children and needs to be addressed as it causes both physical and psychological problems.

Internet addiction and its five subcategories viz "Cybersex, Cyber-relationships, online stock trading or gambling, information surfing, and computer games" (Young et al., 1999, p. 475) are creating psychological and social disorders among users. Two subcategories, information surfing and computer games, are most relevant to young children with Digital devices. Ding et al. (2013) through their studies on adolescents' internet addictions found that problematic behaviours like impulsiveness, craving, withdrawal and impaired cognitive abilities were related to excessive use of the internet. Ding et al. concluded that educating students about health related issues and redirecting them to use technology appropriately will help to curb problematic behaviour and support students to be responsible users of digital technology (2013).

Computer Vision Syndrome affects - the eyes, neck and back, its prevention and treatment affects users of any generation equally (Yan et al., 2008). Upadhyaya and Joshi (2014) established that knowledge and the attitudes of 160 higher secondary students towards physical care while working on computers changed due to a

structured teaching program. Due to a change in students understanding, the possibility of Computer Vision Syndrome was reduced as students were taking frequent breaks while using computers (Upadhyaya & Joshi, 2014).

Prevalent musculoskeletal pain syndrome among students playing extensive video games was reported by Hakala et al. (2012). Hakala et al. surveyed 436 students aged 12-13 and 15-16 years and concluded that moderate to severe back pain, headaches and neck and shoulder pain were related to daily computer usage of more than two hours. Similar results were reported by Skemiene et al. (2012) based on their cross-sectional studies of 1806 students aged 13-16 years old. This research suggests that students experience intensive physical and psychology issues while using Digital devices and other forms of technology. Therefore, students need to be supported in developing better habits while using Digital devices for work and play by educating them about the health issues and possible solutions.

These issues related to children's health and well-being can be prevented through ergonomic equipment and stations along with teaching students strategies to take breaks, perform some body stretches, manage their time effectively, balance physical activity with the use of Digital devices and report discomfort without being afraid. Parents and teachers need to model appropriate behaviour related to technology use so that children are able to make the right choices. A Digital Citizenship framework with specially designed lessons to create awareness among students, modelling appropriate behavioural habits during lessons will benefit students to gain an understanding and the skills to use Digital devices appropriately. For example taking breaks every 30-40 minutes and moving around, maintaining the right posture while working on computers and balancing classroom activities which are a

combination of technology and non-technology strategies will support students to form better habits.

2.6.9 Digital Security

Digital Security is defined as *"The electronic precaution to guarantee safety"* of users using Digital devices (Ribble, 2011, p.40).

Information in the digital world is stored electronically on servers and cloud, which might be located in a country other than the origin of the information. The security of personal, professional and national data is an important factor, and it begins with personal devices. Personal Digital Devices need to be password protected and loaded with anti-virus / anti-theft software to prevent the hijack of Digital devices over the internet. Cyber criminals use advanced methods to extract sensitive, financial and personal information (Newman, 2009).

Young children using Digital devices are the most vulnerable to these new threats. It is practically impossible to watch a child at all the times while using a Digital device and, therefore, it is important for her/him to learn strategies to keep her/himself safe. Students should be able to identify threats such as hacking, viruses and *Trojans*, identity theft, location tracking, phishing and online stalking. Trojan is a malicious computer program used by criminals to extract personal information from computers. Other similar computer viruses are known to disrupt and destroy network systems (Mezzour et al., 2014; Taylor et al., 2014). Cyberstalking is the use of internet enabled digital devices to harass and threaten another person (Ronel, 2013). Cyber stalking is prevalent among young adults and can have disastrous psychological and cognitive impact on students (Ronel, 2013). The integration of

cybersecurity in education is "an excellent method of building awareness in students" (Rowe et al., 2011, p. 118) and keeping them safe while working on Digital devices.

The basic rule of "no talking to strangers" also applies to strangers online and that should be the first line of defence for children. Keeping passwords safe and data backed up should be routine classroom practice and reiterated by parents at home. Parents should install parental locks and alerts on devices used by children. The school ICT curriculum must be inclusive of lessons on cyber security and strategies to protect oneself while working online. Educators can easily instil these qualities in students through curriculum integration. After all, digital security is all about keeping oneself and others safe.

UNICEF has also included Digital Citizenship as an important aspect of children's lives. UNICEF is working on various projects with young people around the world to provide children with safe and secure digital environments ("Digital citizenship and safety,"). As argued by Bennett et al. (2008), there is a misconception about the high level of technical skills of digital natives and its implication for education. The research by (Bennett et al., 2008) tells us "while technology is embedded in their lives, young people's use and skills are not uniform" (p. 783). As recommended by Ribble, students need to see how Digital Citizenship is connected to them (Hollandsworth et al., 2011).

The Digital Citizenship curriculum framework provides educators with guidelines to "actively train students in the opportunities and ethics of digital activities" and therefore "Digital Citizenship in education is inevitable" (Ohler, 2011, p.17). With limited skills and the motivation of teachers, educating these students is imperative to form a framework that guides the acquisition of digital competence among these students. Integrating the elements of Digital Citizenship with different

areas of the curriculum to enable students to understand the constructive use of technology to gain and construct knowledge will be supported through this framework. Connecting Digital Citizenship education with inquiry-based lessons designed for students to analyse everyday online threats will support the students' understanding of cyber security. A presentation or chat with an expert in the field and allowing students to explore available options for anti-virus software and firewall for hardware security along with activities that require students to decide what type of information about them should be available online through private blogs formed part of this Digital Citizenship project.

2.7 TEACHERS PERSPECTIVE ON DIGITAL CITIZENSHIP CURRICULUM

Educators themselves are very uncertain about the elements of Digital Citizenship and how to manoeuvre the curriculum in the right direction. The research on teachers' perspectives on Digital Citizenship norms indicates, that while teachers are aware of the elements of Digital Citizenship, they are more focused on Digital Literacy and communication and display low concern over other elements of Digital Citizenship (Sincar, 2011). Sincar (2011) has suggested that Digital Citizenship norms should be included in teacher training programs. The successful integration of Digital Citizenship with the curriculum will require an examination of different perspectives on technology integration within educational settings. Teachers must understand that technology and pedagogy coexist. This requires teachers to carefully design a technology inclusive curriculum to support students' acquisition of Digital Competency skills along with other core competencies (Sieber, 2005).

Integrating technology effectively requires teachers to carefully plan lessons and understand the digital skill requirements of their students. Teachers must be

decisive about how digital tools will be used and how they can enhance learning and understanding as part of the pedagogical connection to curriculum. The educational institution must "establish a pedagogic framework and didactic content related to teachers' practices in school" (Krumsvik, 2008, p. 284) in order to support the acquisition of digital competence skills by their students. Seiber suggested that teachers can be change agents and bring about innovative pedagogical change in the curriculum by being open minded about digital technology in education (2005). To understand the digital generation and how they operate, teachers need to get into the shoes of their students by experimenting and learning new digital tools.

Kumar and Vigil (2011) found that preservice teachers indicated the requirements to model technology use and creation of digital artefacts in teacher education were necessary to prepare them for 21st-century schools. Ala-Mutka, Punie, and Redecker (2008) have suggested that to enable teachers to integrate Digital Competency skills within classrooms education institutes must embed Digital Competency skills as an organisational strategy providing support, continue training for teachers, revisit Digital Competency requirements and bridge the gap between Digital Competency and ICT skills. Integration of the Digital Citizenship framework will support teachers to model as well as use technology appropriately and effectively to make the connection with different subject areas and support their students to be responsible users of digital technology.

2.8 SUMMARY

The Digital Citizenship framework developed for use in this study encompasses all the areas of concern through its nine elements to support students' digital journies. The research cited above provides some insights of primary school

students' use of digital technology and the need for student acquisition of digital competence skills.

Technology and the appropriate use of technology are causes of concern for educators, schools and even national security. The research undertaken so far in the field is not enough to understand the implications of Digital Citizenship in schools. Students as young as preschool age are constantly exposed to visual media and Digital devices, yet there is no significant research that supports ICT integration for students of 3-11 years age. The lack of user education influences the students' behaviour while using Digital devices and technology (Ribble, 2011). The review of the literature, understanding of the digital generation and the necessity to holistically support primary students working on Digital devices is an inspiration to create a horizontally and vertically aligned ICT scope and sequence based on the IB Primary Year Program (PYP) framework. Will the Unit of Inquiry based on the concept of Digital Citizenship be effective in generating digital competence among PYP students? This is the question that is worth investigating through this research.

The concerns about technology and Digital devices being used in education are real and the fact is students will test the boundaries set around them. It is only through education and curriculum that we can support their digital thirst. Students may have higher technology skills, but not necessarily appropriate ones. As educators, it is our prerogative to design a curriculum that integrates the ethical and responsible use of the technology in our classrooms. As suggested by Ribble, the flexible framework of Digital Citizenship and its nine elements integrated into the curriculum would support the responsible use of technology by our students (2011).

Chapter 3: **Method**

This section describes in detail the methodology used for the research, design and implementation of intervention, overview of the lessons and schedule of the lessons to be delivered. This section also addresses Ethics, Instrument in the form of the Digital Citizenship Questionnaire, formative and summative assessment to be used, data analysis, elements of rigour and importance of rigour in research.

A quasi-experimental research design was used in this study. As explained by Cohen, Manion, and Morrison (2013), a quasi-experimental research design, which involves a one group Pre-Test and Post-Test research method, allows researchers to measure the effectiveness of new teaching methods and curriculum interventions. A quantitative research design allows for the establishment of the relationship between variables, and the experimental design is most suited for this educational research as the experimental design facilitates understanding of the effects of lessons/activities on the actions taken by the participants (Creswell, 2012). In this study, the quantitative, quasi-experimental, one group Pre-Test-post-Test design was used to investigate the effectiveness of integration of the Digital Citizenship curriculum in an IB PYP school in Singapore.

I was employed at the school as an ICT specialist teacher, and I was requested by the school curriculum coordinator to develop an ICT-based stand-alone Unit of Inquiry to facilitate Digital Citizenship development for participants in IB PYP schools. I designed a Unit of Inquiry suitable for year five participants. The school did not want any participants to be left out in the study, so two full year five classes participated in the research. The random assignment of participants to an

experimental and control group was not possible, so a pre-test- post-test approach was utilised (Creswell, 2012).

The experimental research design was developed in late 19th century to test practice or procedure to measure its impact on the participants involved in the experimental research (Creswell, 2012). There are two major groups of experimental design 1] Between Group design and 2] Within a group or individual design. A quasi-experimental design is a quantitative analysis of the cause and effect between independent and dependent variables whereby a non-randomised or intact group of participants are used as treatment group (Creswell, 2012). Martella, Nelson, Morgan and Marchand- Martella (2013) suggested that quasi-experimental design "should be employed when it is critical for the researcher to conduct a representative study" (p. 162) or when random assignment of the participant is not possible. The quasi-experimental research method is an appropriate approach for this study because random assignment to control and treatment group was not possible.

The quantitative data collected before and after the treatment will provide evidence of the effectiveness of integrating the Digital Citizenship Curriculum in the IB PYP School. Moreover, the quasi-experimental design is the connecting link between the experimental and non-experimental methods. A Quasi-experimental design involves the manipulation of the independent variable, which in this instance is the Digital Citizenship - Unit of Inquiry. A quasi-experimental design will facilitate the study of digital competency skills among the primary school participants and determine the effectiveness of the Digital Citizenship framework for the IB PYP School. The impact of Digital Citizenship on participants' attitude, knowledge and action will determine the possible ways of further integration and the success of the intervention.

The data collected and the ensuing results analysed will support the development of an ICT scope and sequence, which will integrate Digital Citizenship across the other year levels in the school. Due to space limitations, the initial ICT scope and sequence, which I developed is not reported here. A one group pre-test-post-test design was chosen for the research as the natural selection of the group size was small, consisting of 38 participants and as explained, random assignment of participants to experimental and control group was not possible (Creswell, 2012). The class size was small and convenient because participants were available and willing to participate in the study.

3.1   INTERVENTION: DIGITAL CITIZENSHIP UNIT OF INQUIRY

The treatment used for this research was in the form of a stand-alone Unit of Inquiry-based on Ribble's (2011) work on a Digital Citizenship framework. The success rate of this quasi-experimental research was determined by the effectiveness of treatment and action taken by participants to demonstrate the responsible and effective use of technology. In this study, the participant success rate was determined by the change in knowledge about Digital Citizenship and change in attitude and actions taken as a result of the intervention.

The intervention consisted of nine lessons based on nine elements of Digital Citizenship as defined by Ribble (2011) and detailed in chapter 2. All the lessons, as well as formative and summative assessment tasks, and Pre-Test-- Post-Test Questionnaires were delivered in the ICT lab, facilitated by the researcher and monitored by the curriculum coordinator of the school. Each lesson was divided into "provocation", "finding out" and finally "presentation". At the end of the lesson, participants displayed their understanding through published work such as a comic

book on cyberbullying, a personal learning blog to demonstrate digital literacy and a *Prezi* presentation on an independent inquiry of Digital Citizenship.

As defined by Creswell (2012) the dependent variable "is an attribute or characteristic that is dependent on or influenced by the independent variable" (p. 115). In this study, the knowledge, attitude and actions acted as the independent variables to measure the participants' success rate, which was dependent on the treatment in the form of the Digital Citizenship- Unit of Inquiry.

It was anticipated that the participants would lead their research and inquiry into Digital Citizenship and the appropriateness of the technology used by them for their school work. An inquiry-based approach was used for the curriculum delivery due to the diverse nature of the participants, the IB philosophy and to develop reflective learning practices.

Inquiry-based learning is part of the IB philosophy whereby participants have ownership of their learning through evaluation of the problem, issue or question, and participants engage in information seeking, questioning, making decisions, coming to a conclusion and finally taking action towards the solution of the problem. The inquiry-based approach allows participants to make connections with life experiences and, therefore, learning becomes concrete for participants undergoing the inquiry (Davidson & Carber, 2010). The inquiry-based approach is conceptually based, and it develops participants' conceptual and critical thinking skills. These skills prepare them for real life situations and problem-solving. The concept of Digital Citizenship formed the foundation of the research whereby participants would connect with real-life scenarios in order to become responsible Digital Citizens by making decisions about the appropriate and effective use of digital devices.

The intervention was based on the conceptual understanding of form (overlapping with connection), responsibility and reflection. The Unit of Inquiry had nine lessons designed to be delivered in blocks of one hour over nine weeks and was led through participant inquiry questions on the topic of Digital Citizenship. The lines of inquiry and inquiry questions guided participant-led inquiry and research into the world of Digital Citizenship. Each lesson was designed on a flexible design model starting with provocation, inquiry session, brainstorming, research and final presentation on the topic. Each of these lessons had an associated task which was to be submitted by the end of the lesson. The tasks were the formative assessment for lessons to understand the participants' learning journeys and to design the next lesson based on the task completed by the participants.

The aim of this study was to use this process to enable participants to understand the concept of Digital Citizenship and how the nine elements of Digital Citizenship work together like gears.

3.2   DIGITAL CITIZENSHIP LESSON SCHEDULE

The nine lessons conducted in the intervention or treatment are listed in Table 1. As shown, the first lesson was the introduction of the unit, set expectation and pre-test questionnaire and the last lesson was the consolidation of the learning through the Digital Citizenship unit and post-test questionnaire.

The second lesson was designed to enable participants to understand that access to digital devices and technology is not equal around the community and the world. Participants were tuned in through Dr. Sugata Mitra's TED video "Hole in the wall". Participants then were given a group task to research and find out how digital technology was distributed throughout the school. Students investigated the

technology available in other international schools and a local school in Singapore, interviewed a teacher or a staff member to find out their views on digital access and gathered information about the digital technology available in different parts of the world. The lesson was targeted to enable participants to work collaboratively and the amount of work was distributed according to student strengths so that they could present their views at the end of the lesson. Participants were given a choice to present their group presentation in the form of a PowerPoint or poster highlighting their key findings. The exit routine for the lesson was "think-pair-share" whereby participants paired with a member of the other group and shared their perspective on the topic of digital access.

The third lesson introduced participants to Digital Commerce and Digital Security. Participants were introduced to different E- commerce websites, the process of in-App purchase and personal data security involved in an online purchase. The aim of the lesson was to engage participants in an independent inquiry based on the questions and queries that they had. Finally, participants discussed their findings with each other and completed the exit task form "I used to think – Now I think."

Participants were introduced to the concept of Digital Footprints through the video "Digital Footprint" by Common Sense Media. Participants were given a task to watch two more videos of 2-3 minutes each (Pause & think online and Power of words), research the impact of digital footprints and create a poster which included a visual of a participant's digital footprint and steps to create positive digital image online. The posters were printed and pasted across the school to create awareness among the school community about digital footprints.

The Digital Literacy lesson was targeted to not only introduce participants to new digital tools but also to strategies to research and analyse information gathered

from various sources such as books, websites and interviews. Participants were able to identify different elements of Digital Literacy such as content, layout, alignment and flow of the information presented. The lesson was designed to engage participants in research on the topic and support them to use search strategies to evaluate the information by checking the information with at least one book and two websites. Students were also guided to create their *Noodle Tools* accounts and project on *Noodle Tools* site to start creating a bibliography for the topic of Digital Citizenship and their final presentation. The copyright law, plagiarism and academic honesty were included as part of provocation for the lesson. The student had an exit task "Connect- Extend –Challenge. Participants had to note down what was one thing that they connected to during the lesson, how did the lesson extend their understanding and what was challenging during the lesson.

The sixth lesson was designed to engage participants in an active discussion, research and authoring a comic book on Cyberbullying. Participants were introduced to the concept of Digital Communication and Etiquette. Participants were given some time to find out more information about whether digital communication and etiquette link up to their current study on Digital Citizenship. Differentiation between personal, interpersonal and public conversation was part of participants learning for the lesson. Participants researched cyberbullying and created a comic book using an online application called *ToonDoo.*

The lesson on Digital Health and Wellness introduced students to positive and appropriate habits for using digital devices for learning and recreational activities. How lights, posture and long hours affect the physical health of children was used as a provocation. The aim of this lesson was to provide students with strategies to develop

good habits, identify and ask for help if experiencing physical discomfort and create a balance between on screen and off screen activities.

The eighth lesson sought to engage students in an inquiry of the rights and responsibilities of users of Digital Technology. This lesson being the last lesson on Digital Citizenship included a summative assessment task where students presented a *Prezi* presentation on their understanding of Digital Citizenship or any one of the elements of Digital Citizenship that created an impact and extended their learning.

The ninth lesson consolidated the learning of Digital citizenship and its nine elements. The participants were given the post-test questionnaire with instruction not to discuss their answers with other and answer the question according to their understanding of the topic.

Lesson Scheduled for Digital Citizenship study

No.	Lesson	Brief introduction of lesson and activities
1	Introduction to Unit of Inquiry "Digital Citizenship" and the expectation.	Participants were introduced to the unit, and they were given the pre-test to complete. Participants were given specific instruction and essential agreement with participants were created as a set expectation for the unit work.
2	Digital Access – Access available to children of the world in form of technology for children	Ted "Hole in the wall video based provocation, led by participants' research on the topic, group presentation on the topic and Exit routine of Think –Pair- Share
3	Digital Commerce and Digital Security. The Internet as a marketing force.	Participants were introduced to different E-commerce sites followed by a discussion on the internet marketing like in APP purchase. Secured purchase logos and processes like clearing the cache. Data protection. Exit task " I used to think – Now I think."
4	Digital footprint	Participants were introduced to digital footprints and online activities that create an online trail visible even after deletion. Impact and creating positive trail was the essence of the lesson. Exit task poster on personal digital footprint and steps to create positive image online.
5	Digital Literacy, its elements and copyright laws	Participants will be introduced to techniques to search strategies, evaluate the websites for credibility and quality of information. Copyright and intellectual property importance. Introduction to Noodle Tools to create citations for projects. Exit Connect-Extend-Challenge.
6	Digital Communication and Etiquette (Including Cyberbullying)	Digital etiquette and communication for a particular audience as per the requirement of the situation. Personal and interpersonal communications build relationships. Introduction to Cyberbullying and research by participants on the impact of cyberbullying. Personal security online. Exit – Create a comic book on Toon Doo on Cyberbullying.
7	Digital Health and Wellness	Participants were introduced to common ailments related to inappropriate use of Digital devices, habits and routines for use of appropriate use of technology and digital devices. Exit Claim-Support -Question
8	Digital Citizenship – Rights and responsibilities	Participants were given the task to create a Prezi presentation on their understanding of the Digital Citizenship as whole or one of the elements that concern them the most. Present it to class.
9	Final Lesson	Post-Test Questionnaire. Participants were given specific instructions not to discuss their answers with each other and respond to the questionnaire as per their understanding of the topic.

Table 3.1 Digital Citizenship Unit of Inquiry and lesson plan schedule

3.3 ETHICS

This study was undertaken in an ethical manner. Permission from the principal of the school was obtained through a consent letter (Appendix A and B) allowing the research to be conducted in the school.

Parents: I had direct contact with all participants and their parents. A signed consent form was requested from the parents as the participants were less than 18 years old (Appendix C). The research project was introduced to parents and participants by a colleague who did not teach the year five participants and who had no contact whatsoever with the participants and parents. This was done to eliminate any conflict of interest arising on the part of the researcher.

The research project was introduced through a parent information session, and parents were given the printed copies of the research project, its objectives, and benefits to be obtained from the results. The document and consent form were both in English and Japanese as the class had six Japanese participants (Appendix D). One Japanese participant had one parent who was not fluent in English. A Japanese translator was available for the parent if any translation was required. Participation in the research was voluntary, and the emphasis on independent decision making was made clear to parents. The assurance of anonymity of participant identity was given to participants as well as information about the data to be collected. The method of collection was specified to parents verbally as well as in written form during the information evening.

Participants: Participants were introduced to the research project after the parent information evening through a classroom discussion. Participants in an IB PYP school are generally aware of research and inquiry processes that they go

through at their level of studies. The participants of year 5 had some background knowledge of Intellectual property and academic honesty as it was included in the curriculum of the school. The participants were informed about what and how the data would be collected. They were also informed that it was an inquiry process, and a Unit of Inquiry from their point of view and lessons would be led by their inquiry into Digital Citizenship. The participation in the research project was voluntary, and participants also signed the consent letter along with their parents to give their approval for their participation

Two-year five classes consisting of 38 participants formed the intervention group. The school runs an IB PYP curriculum from Nursery two to year six classes. Participants were aged from nine to ten years. The participants were both boys and girls from diverse nationalities and backgrounds. There were 26 male and 12 female participants. There were 11 British, 10 Indian, 6 Japanese, 3 American, 3 Australian, 2 United Arab Emirates, 1 French, 1 Filipino and 1 Dutch national among the group of participants. All participants were fluent in English as per developmentally appropriate criteria and were able to express their understanding through the English language as the medium of communication. The small number of participants in each class were allowed for focused inquiry that facilitated participants' independent research skills. The participants had no prior knowledge of the topic of Digital Citizenship and were prime candidates to be involved in a study to investigate the effectiveness of an intervention administered in the form of a stand-alone Unit of Inquiry for the year 5.

3.4   DIGITAL CITIZENSHIP QUESTIONNAIRE (DCQ)

The instrument used to measure the effectiveness of the Digital Citizenship Unit of inquiry was a purpose-built Digital Citizenship Questionnaire (DCQ), which

participants completed online pre and post-intervention. There was no tested instrument available in the research literature, and so the researcher had to design the instrument. The instrument used was a web-based series of questions with 7-point Likert-type scales. For example, one of the questions in the knowledge base section was – "How important are net etiquette skills for you?"- where participants answered by rating their response on a Likert- type scale of importance ranging from "not at all important" to "extremely important." Similarly, examples of questions included in the Use of Technology and Digital Citizenship sections were – "How strongly do you agree or disagree with the following statements?" and "Michelle wants to check the IT Lab drive for the security setting. How appropriate are the different actions she takes?" Participants were asked to rate their responses accordingly using a Likert-type scale. Such questions were used to determine participants' attitudes.

The questionnaire was divided into four sections 1) Knowledge 2) Technology use 3) Digital Citizenship 4) and Demographic questions. The questions tested participants' knowledge, attitude, and understanding of Digital devices, use of technology for learning and digital competency skills. Sections 1 and 2 measured knowledge and technology use, and were based on the nine elements of Digital Citizenship described by Ribble (2011). Each of these four sections is discussed below.

3.4.1 Section 1- Knowledge

There were twenty questions in section 1. The questions in this section were further grouped into knowledge about technology use and its terminology. Questions one and two were based on Digital Etiquette and were intended to measure participants' knowledge and understanding of devices on the internet and the requirement for net etiquette skills as well as the importance of net etiquette skills for the participants.

Questions three and twenty were designed to measure participants' understanding of Digital Citizenship and who is required to exhibit responsible behaviour online viz, adults, tech experts, celebrity or anyone using the digital devices. Question four measured participants' perspectives of what type of devices constitutes digital devices. It was important to understand participants' perspectives on digital devices as there are different types of tech devices for varied purposes such as a *Fitbit* to measure physical activity during the day, and an *iPod* to listen to music and chat. Most digital devices in present times have the capacity to connect to the internet and keep records and logs for the person using the devices.

The rest of the questions in this section were designed to test and measure participants' knowledge on the use of digital technology and Digital Citizenship elements.

Questions five, eight and ten measured participants' knowledge and understanding of Digital literacy through their preference for search engines, work on public domains and the requirements for work to be protected by copyright.

Questions six, seven and 18 measured participants' knowledge and understanding of digital security regarding the implication of personal information online and account security. Question nine measured participants' perspectives on their rights and responsibility as owners of copyrighted materials.

Questions 11 and 12 measured participants' understanding of digital access and who must have access to devices in the school environment.

Questions 13 and 14 measured participants' understanding of online financial transactions. These questions helped the researcher examine how participants would respond to In APP purchase pop-ups while playing or working on digital devices.

Questions 15 and 16 measured participants' knowledge of digital communication and etiquette before sending emails.

Questions 17 and 19 measured participants' awareness of health and overall well-being concerning their digital habits.

Any positive changes in participants' awareness regarding the appropriate use of digital devices post intervention would suggest that the intervention had been successful in developing healthy habits among participants.

3.4.2 Section 2 –Technology use

There were seven questions included in this section, which sought to understand participants' technology use and purpose of use for various activities during the day.

Question 21 measured the frequency of use of digital devices used by participants for activities such as research for a unit of inquiry, study related to schoolwork, communication with friends and family members, reading Ebooks, collaborating with others on projects and online purchases. Question 22 measured participants' usage frequency for social networking sites.

Questions 23, 25 and 26 measured participants' ownership of digital devices, the purpose of use for communication and social interactions and the amount of time spent on digital devices each day. The statistical data obtained determined whether the participants' digital habits changed and what educational support could be provided to further facilitate digital competencies.

Question 24 measured participants' level of agreement on a 7- point Likert-scale for 1) tech devices and learning, 2) digital devices' ability to connect to the internet and use 3) staying connected, 4) strangers online and 5) child protection law. It was important to understand participants' perspectives on each of these situations

and any changes after the intervention. The participants' perspectives allowed the researcher to specifically design lessons and activities to address a particular issue. For example, questions asked participants to rate their views on talking to strangers online or whether tech devices make learning easier. The answers to these questions supported the mindful integration of the digital communication lesson and use of digital technology for learning in the classroom.

The last question in this section measured participants' perspectives on the right to use technology at school, and it focused on digital access. As mentioned in the literature review, students at times do not understand the importance of having access to technology and digital devices for learning. This data would provide an insight into the participants' perspectives and any changes to their perspectives following the intervention.

3.4.3 Section 3 Digital Citizenship

The questions included in this section provided a detailed examination of the nine elements of Digital Citizenship and the perceived role of each of these elements in developing digital competency skills among students. There were 31 questions based on classroom scenarios, real life situations such as unwanted pop-ups and antivirus notification, digital literacy tools, preferences and habits, digital etiquette and actions in response to particular circumstances, access to technology, online financial transactions, digital security and rights and responsibility of the digital user. The questions based on classroom scenarios were derived from the researcher's past experiences integrating and teaching with technology as well as concerns shared by parents during past parent teacher interview evenings. Changes in participants' perceptions, if any, for each of these questions would provide information on the effectiveness of the intervention in developing each of the nine elements of Digital

Citizenship. The data obtained would not only be compared with other studies done in the field but would also guide further curriculum integration in the IB PYP school.

3.4.4 Demographic questions

Section 4 included demographic questions such as age, gender, nationality, type of internet connection and ID code. Each student was given a specific ID code to insert as part of the questionnaire for the purpose of matching pre and post-tests.

The DCQ (Appendix E) was constructed with the Survey Gizmo online tool and pilot tested by participants not participating in the research project.

3.4.5 **DCQ Pilot**

The DCQ was initially evaluated by a small number of participants. One student from the United Arab Emirates and one from India were leaving and two British nationals who were not the part of this research project, comprised pilot participants. The DCQ was a closed online questionnaire only available through the link sent to participants and was administered as part of an ICT lesson by the researcher. The participants were briefed on the online questionnaire procedure and were requested to answer the questions based on what they knew about the topic addressed in each question.

The questionnaire was revised based on the feedback and observation of participants. For example, the participants were not able to move on to the next question if they did not know the answers. This was due to the element of compulsory answering of questions which was inbuilt into the survey. The questionnaire had some compulsory questions base on Digital Citizenship, which did not allow the participants to move to the next question before they answered them. The compulsory component was removed from the setting to give participants the flexibility to move on to the next question if they do not know the answers. This was

in alignment with good ethical procedures, where participants do not have to answer any questions they do not wish to. The questionnaire did not have any identifying elements that would directly reveal the identity of a particular participant.

3.4.6 PRE-TEST DCQ

The participants received the Pre-Test questionnaire to assess their knowledge of Digital Citizenship and its nine elements. The Pre-Test was administered before the intervention began and participants were given 60-70 minutes to complete the questionnaire. Each participant was given a unique code from DC1 – DC 38 just before the Pre-Test for the purpose of tracking and matching with the post-test DCQ. Participants were required to give their code back to the researcher once they had added it to the questionnaire. Participants were briefed before the start of the research on the importance of the study as well as their rights and responsibility throughout the research project. Administration of the questionnaire was carefully monitored by the researcher to avoid any cross contamination through discussion. Participants were requested to sit one seat away from each other during the questionnaire process and not to discuss the answers, as the answers were the reflection of their understanding of the topic.

The Pre-Test questionnaire was administered before the Unit of Inquiry discussions and lessons in the first semester of the academic year in August 2013. The coding of a participant on the questionnaire was recorded for further in-depth analysis of the responses.

3.4.7 POST-TEST DCQ

The Post- test DCQ had ten additional questions included to verify and affirm the results tabulated by the Pre-Test questionnaire (Appendix F). For example,

"Complete the sentence - Using online resources in an ethical manner is" and "Define Digital Access". All participants completed the post-test DCQ. The post-test web-based questionnaire was administered after eight lessons.

The additional questions included in the post-test questionnaire were based on each of nine elements of Digital Citizenship. The additional questions would confirm the findings and effectiveness of the intervention.

3.5   FORMATIVE AND SUMMATIVE ASSESSMENT

As the Digital Citizenship Unit was a stand-alone unit for an IB PYP school, the formative and summative assessments were used to analyse participants' understanding of the concept of Digital Citizenship. The formative, as well as summative assessments, are requirements of the IB PYP program and they highlight different stages of learning during the unit. Formative assessments were carried out through a visible thinking routine, observation, and some intermittent tasks. This type of assessment allows participants to receive feedback from teachers and peers to refine their understanding and improve their learning. It also provides participants with an opportunity to self-reflect and self -assess.

The final summative assessment task for the Unit of Inquiry was to create a presentation on Digital Citizenship, any one of the nine elements or independent participant-led inquiry into the topic of Digital Citizenship. The summative assessment was undertaken by participants as a presentation created with an online application "Prezi" and presented to the audience, which comprised of their peers from both classes and home teachers. The rubric for the summative assessment was discussed with the participants and was given to them two weeks prior to the

summative assessment task was due for submission towards the end of the intervention.

3.6   DATA Analysis

Data collected from the questionnaire were subjected to analysis using SPSS application software. In order to analyse any differences between Pre-and Post-Test data paired *t-* test and Chi-square tests were used for data analyses. The related *t*-test was used to compare the paired set of variables and scores of Pre and Post-Test Questions (Martella et al., 2013). Chi-square was used to determine significant differences between the pre-test and post-test results where data were categorical. Chi-square goodness of fit was used as the individuals from the single sample were classified into two categorical variables of responses viz Pre-Test and Post-Test responses before and after the intervention. The *p* value determines the significance of the result applicable to the general population and in this study a p-value less than .05 was set. The Wilcoxon test was conducted where the Chi test was unreliable because it contained fewer than the minimum number required in each cell. Descriptive statistics were used to measure the frequency and other basic features of the data. Descriptive statistics analysis allows the data and numerical results to be summarised so that it can be easily understood in relation to research requirements (Aldrich & Cunningham, 2015).

3.7   ELEMENTS OF RIGOUR

Rigour as defined by Mishra (2009) "is reflected in narrowness, conciseness and objectivity and leads to rigid adherence to research designs and precise statistical analyses" (Mishra, 2009, p. 25). In any quantitative research, rigour means looking for evidence-based scientific knowledge and statistical analyses of data to validate the

research process and findings. Rigorous educational research which is aligned to pedagogical objectives will enable educators and curriculum designers to reform the teaching and learning strategies to support lifelong learners. It is anticipated that this research on Digital Citizenship will support educators to implement the responsible and ethical use of technology by students through curriculum integration in the classroom. In order to do so, however, attention must be paid to threats to validity.

The pre-test- post-test design as stated by Campbell, Stanley, and Gage (1963) is the most popular design to be used for educational researchers. However, it does have some threats to its validity and threats need to be addressed so research may be considered reliable. There are two types of validities which are under threat that could undermine the research findings in this study.

1. **External Threats to Validity**

Threats to external validity are related to the generalisation of research findings to "other persons, settings, treatment variables, and measures" (Creswell, 2012, p. 306). There are external factors that might influence the outcome of the research result, and they need to be neutralised before the intervention.

A] Interaction of setting and treatment- is related to the setting of the experimental research and the findings cannot be generalised beyond the setting of the research (Creswell, 2012).

This research was conducted at an IB PYP school with an international curriculum. The identifying feature of an IB school is a curriculum that is designed for inquiry and conceptual understanding of the topic which facilitates the development of transdisciplinary skills. The transfer and application of knowledge across disciplines

nullify this threat and allow the application of research finding in any IB school setting (IBO.org, 2005-2014).

2. **Internal Threats to Validity**

Threats to internal validity as cited by Creswell (2012) "are problems in drawing correct inferences about whether the covariation between the presumed treatment variable and the outcome reflects a causal relationship" (p. 304).

A] History- Threat of History is described as a period between the beginning and ending of the experiments as well as events occurring during this period (Creswell, 2012). The selected participants worked in a controlled environment in the ICT lab during the research period thereby eliminating any contaminations. All the discussions and research were part of lessons designed for the research.

B] Maturation is described as changes occurring in participants in age, wisdom, strength and impact of the same on the outcomes (Creswell, 2012). As mentioned above, all the participants were in the same age group, and so they were growing through similar maturation cycles. Through an educational intervention such as this, it is expected that students would gain a substantial understanding of the topic during the treatment and would increase their knowledge base.

C] Instrumentation is related to changes in instrument during the period of pre-test and post-test (Creswell, 2012). Well-established Likert-scales were used as part of the instrumentation thereby nullifying the threat of scoring scales.

D] Testing is described as familiarization with test questions, "the outcome measures and remember response for the later testing (Creswell, 2012, p. 305). The participants were new to the topic of Digital Citizenship and so unaware of expected outcome measures. Moreover, the Post-Test questionnaire had some additional questions to

gauge the understanding of participants on the topic, eliminating any possibility of threat arising due to the familiarity of the test.

E] Parental Influences on participants - There was a possible parental influence on the participants' understanding of the concepts of the Digital Citizenship through family discussion. The lessons and tasks were not shared with parents as well as participants before the designated date of the lesson, thereby nullifying any parental influence on the task for the day.

3.8   IMPORTANCE OF RIGOUR IN RESEARCH

Rigour in educational research is important as it determines the trustworthiness of the research and further application regarding innovative changes. The intervention in the form of the Digital Citizenship- Unit of Inquiry for the current research was a focused requirement by the school to develop participants' digital competency skills. The findings from the research would determine the effectiveness of the Digital Citizenship framework in developing digital competency among participants to demonstrate the appropriate and effective use of technology. Evidence-based practice in educational settings, includes findings implemented for quality research undertaken for changes in the required curriculum. The rigour of the research is defined by the extent to which the researcher has maintained or enhanced the quality of the research

The internal as well as external threats were considered before the research was undertaken and steps were taken to minimise the effects of these threats to the validity of the research. The increase in validity increases the reliability of the research to be replicated in educational settings for supporting and developing the Digital Citizenship curriculum framework across year levels.

Chapter 4: **Results**

Results section of this research paper presents the finding of the Quasi experimental research. This section is further divided into sub-section to indicate major outcomes of each strand of the Digital Citizenship framework as well as Knowledge and Technology use by the students.

The findings presented here are the measurement of digital competency skills among primary school participants as the result of lessons based on the Ribble's (2011) Digital Citizenship framework. The findings are classified based on knowledge and technology use, nine elements of Digital Citizenship and additional questions included in the Post DCQ. The statistical results presented here demonstrate the effectiveness of the Digital Citizenship unit of inquiry for year five students in an IB PYP School in Singapore.

Participants

A diverse group of 38 students from nine different countries were the participants for the Digital Citizenship Unit of Inquiry research. Out of the 38 participants, 26 (68.4%) were boys, and 12 (31.6%) were girls. The average age of the participants was 9.5 years (S.D. = 0.49). All participants were English speakers, although 2.6 % were Dutch, French and Filipino, 5.3% were United Arab Emirates nationals, 15.8% Japanese and 26.3% were Indians.

4.1   KNOWLEDGE AND TECHNOLOGY USE

1. Elements of Digital Citizenship: Knowledge based questions measured the participants' understanding of elements of Digital Citizenship and digital devices

There were significant changes in the participants' understanding post intervention.

Pre-intervention, 15.8% of participants had responded correctly to the question on the

number of elements of Digital Citizenship, and this increased to 100% post

intervention (see Figure 4.1). The effect size suggested moderate, practical

significance[1].

How many elements of Digital citizenship are there?

	Correct (%)	Incorrect (%)
Pre Test	15.8	84.2
Post Test	100	0
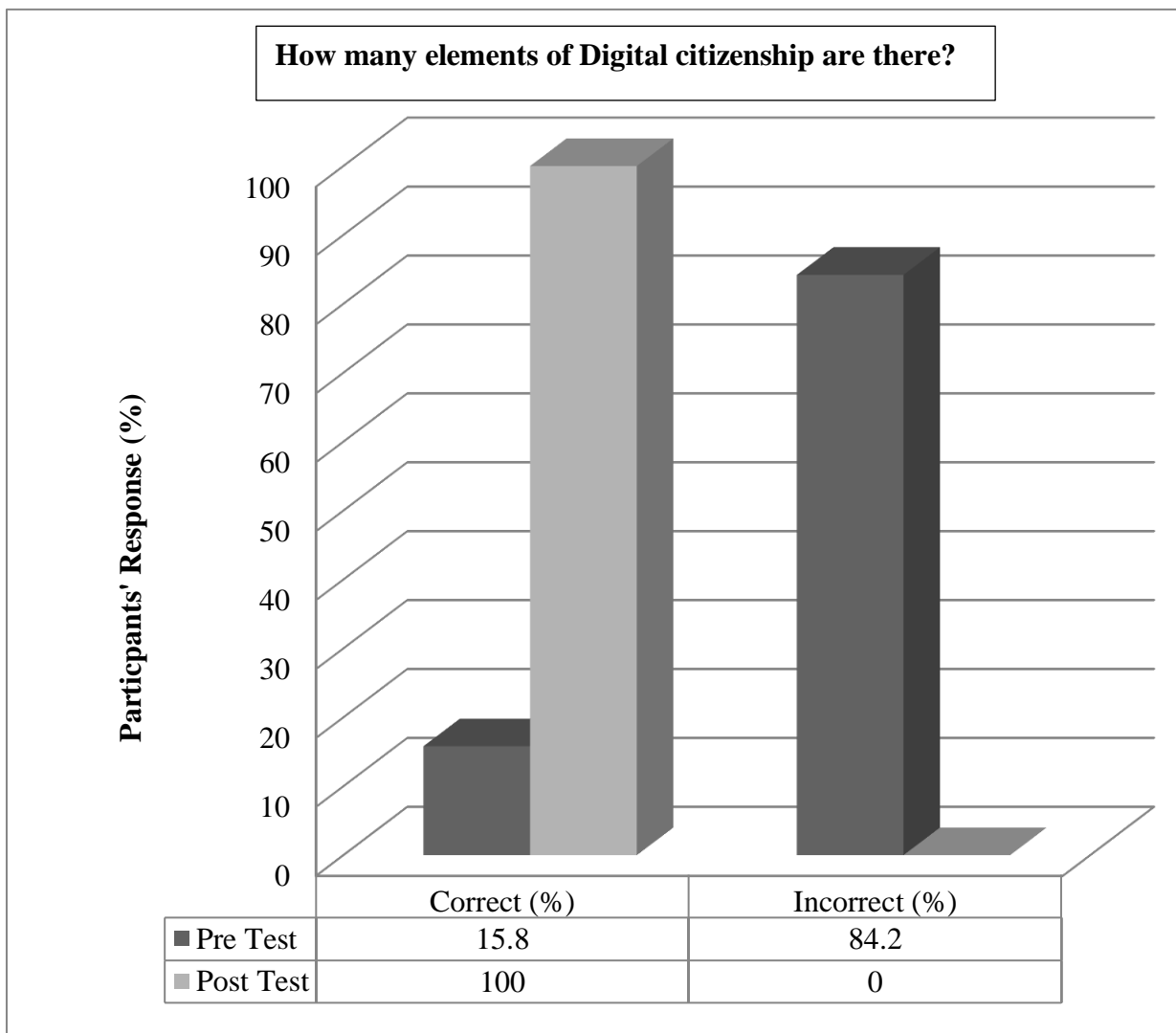
Figure 4.1 Participants' knowledge of the nine elements of Digital Citizenship

[1](Wilcoxon signed rank test $Z = -2.45$, $p = .014$, $r = -.44$)

2. <u>Digital Devices</u>: Post intervention there was a 42.1 % change recorded in participants' knowledge about digital devices. This is consistent with 97.4% participants giving the correct answer post intervention to the question asking what constitutes a Digital Device in terms of technology (see Figure 4.2). The effect size of $r = 0.15$ suggested low practical significance[2].

In terms of technology –"Digital Device" means any electronic device that enables people to access information in various forms, connects to others and allows communication with others through a set of signals sent in the form of numbers.

	Correct (%)	Incorrect (%)
■ Pre Test	55.3	42.1
■ Post Test	97.4	2.6
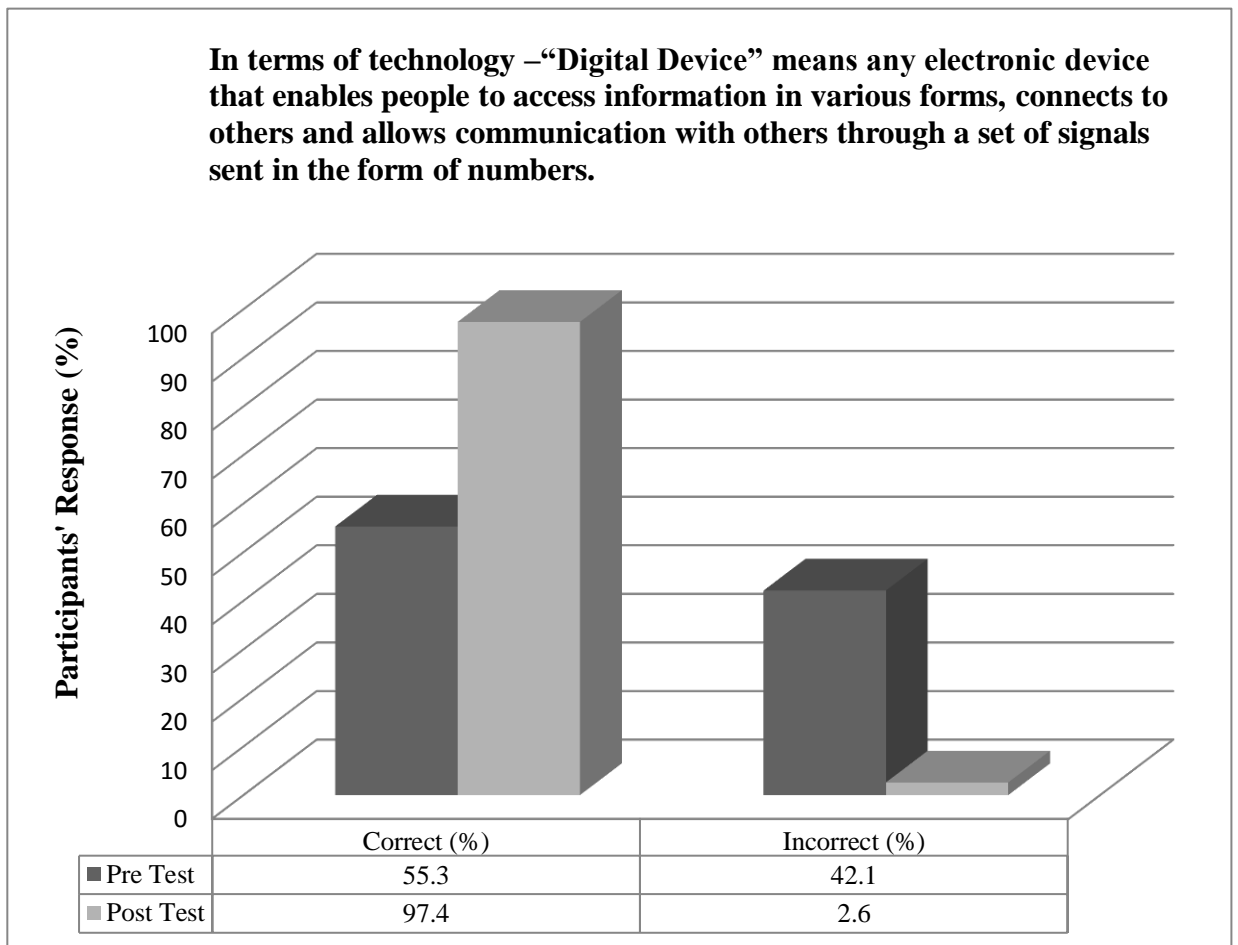
Figure 4.2 Students' knowledge of the meaning of "Digital device."

[2] Chi Square (χ^2 (1) = 0.78, p = .038)

3. <u>Time spent on Digital devices</u>: Pre-intervention, participants' responses to the question regarding the time they spent on digital devices outside school hours indicated that over one-third (34.2%) of the participants spent approximately one hour and 15.8% of participants spent more than 2 hours on digital devices. While 31.6% of participants spent a minimum of 30 minutes per day on digital devices, including mobile phones and game consoles (see Figure 4.3). A paired t-test indicated that there was no significant change in the use of technology and digital devices following the intervention.[3]

How much time do you spend on digital devices (outside school) per day including mobile phones and game consoles?						
	0 minutes (%)	30 minutes (%)	Less than 1 Hour (%)	Approximately 1 Hour (%)	At least 2 Hours (%)	More than 2 Hours (%)
Pre Test	5.3	15.8	15.8	36.8	5.3	21.1
Post Test	2.6	21.1	10.5	34.2	15.8	15.8
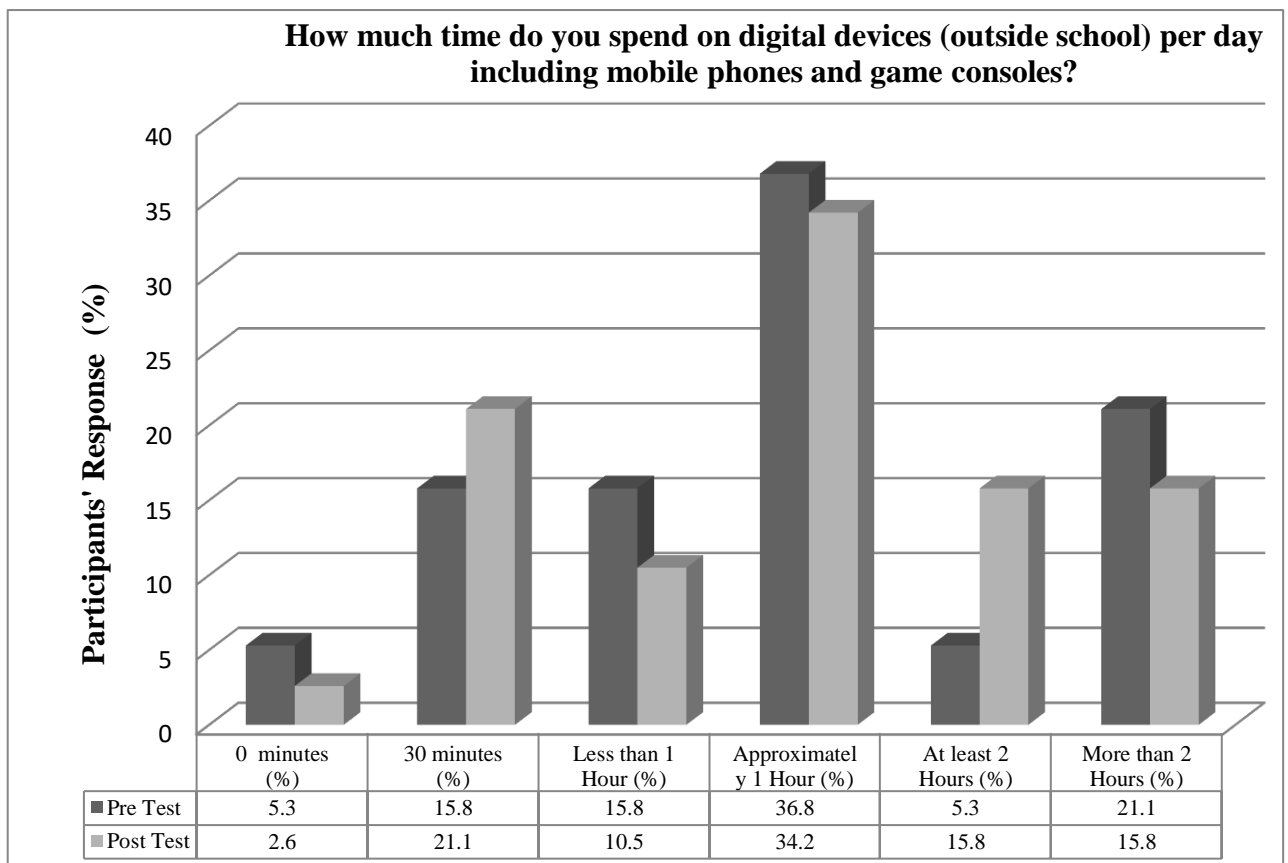
Figure 4.3 Time spent on Digital devices by participants after school hours

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[3] t Test- (t(37) =0.117, $p = .907$)

4. <u>Education and recreational activities</u>: A significant change was noted post-intervention in the duration of time participants spent using digital devices on various educational and recreational activities (see Figure 4.4). There was a significant increase in participants' usage of digital devices for research based tasks and studies related to school after the intervention. Post-intervention 71.1 % of participants' used digital devices once a day for research based tasks and 78.9% for studies related to school. Over half 57.9% participants used digital devices 2-3 times a week to collaborate with others and 47.4% of participants used digital devices several times a day to play games.

Significant changes were found for the following:

- Research based tasks- Post-intervention there was an increase of 57.9% of participants using the digital devices once a day for research-based tasks[4]. The effect size of $r = 0.67$ suggested high practical significance.

- Study related to school work – Post-intervention there was an increase of 28.9% of participants using the digital devices once a day for research-based tasks[5]. The effect size of $r = 0.58$ suggested high practical significance.

- E-book Reading – Post-intervention 60.5% of participants used digital devices at least once a month to read E-books [6]. The effect size of $r = 0.34$ suggested moderate, practical significance.

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[4] (pre-test $M = 3.74$, $SD = 1.35$ and post -test $M = 4.87$, $SD = 0.70$; $t(37) = -5.46$, $p < .001$)

[5] pre-test ($M = 4.26$, $SD = 1.31$) and post -test ($M = 5.21$, $SD = 0.41$) scores; ($t(37) = -4.38$, $p < .001$)

[6] (pre-test $M = 2.87$, $SD = 1.93$ and post -test $M = 2.21$, $SD = 1.30$; $t(37) = 2.19$, $p = .035$)

- Collaborating on projects - Post-intervention 57.9% of participants used digital devices two to three times a week [7]. The effect size of $r = 0.60$ suggested high practical significance.

No significant differences pre- and post-intervention were found regarding

- Communication with friends and family members- Post intervention there was minimal change in participants' usage of digital devices for communicating with friends and family members[8]. The effect size of $r = 0.09$ suggested trivial practical significance.

- Playing Games- Post intervention there was no or minimal change in participants' frequency of playing games online[9]. The effect size of $r = 0.04$ suggested trivial practical significance.

- Buying stuff online – There was no statistically significant change post intervention in participants' frequency of purchases online[10]. The effect size of $r = 0.023$ suggested low practical significance.

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[7] pre-test $M = 2.55$, $SD = 1.45$ and post -test $M = 4.16$, $SD = 1.03$ scores; ($t(37) = -4.38$, $p < .001$)

[8] (pre-test $M = 4.13$ $SD = 1.56$ and post -test $M = 4.29$, $SD = 1.54$; $t(37) = -0.57$, $p = 0.57$)

[9] (pre-test $M = 4.83$, $SD = 1.25$ and post -test $M = 4.89$, $SD = 1.35$; $t(37) = -0.26$, $p = 0.80$)

[10] (pre-test $M = 1.76$, $SD = 1.32$ and post -test $M = 1.50$, $SD = 1.01$; $t(37) = 1.43$, $p = 0.16$)

How often do you use digital devices for the following purposes?
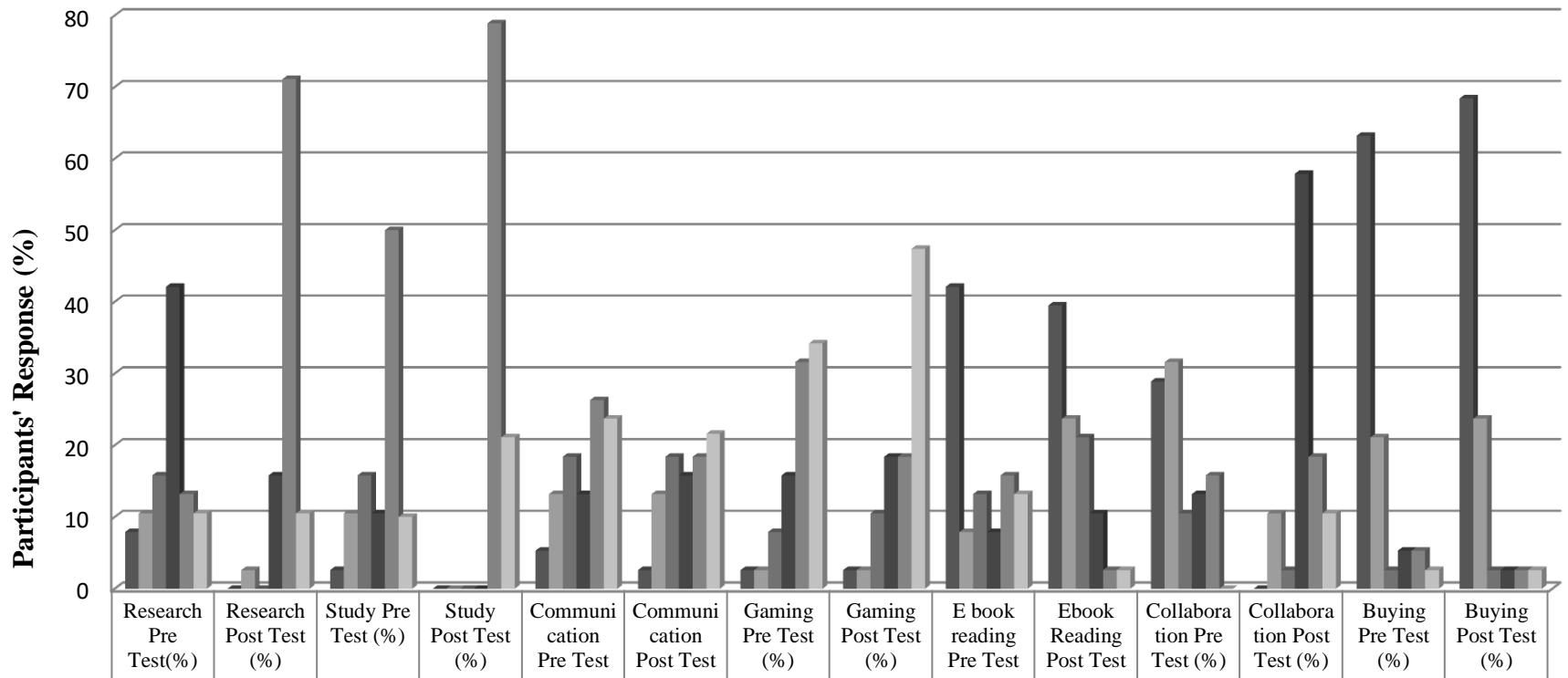
	Research Pre Test(%)	Research Post Test (%)	Study Pre Test (%)	Study Post Test (%)	Communication Pre Test (%)	Communication Post Test (%)	Gaming Pre Test (%)	Gaming Post Test (%)	E book reading Pre Test (%)	Ebook Reading Post Test (%)	Collaboration Pre Test (%)	Collaboration Post Test (%)	Buying Pre Test (%)	Buying Post Test (%)
Never	7.9	0	2.6	0	5.3	2.6	2.6	2.6	42.1	39.5	28.9	0	63.2	68.4
Once a Month	10.5	2.6	10.5	0	13.2	13.2	2.6	2.6	7.9	23.7	31.6	10.5	21.1	23.7
Once a Week	15.8	0	15.8	0	18.4	18.4	7.9	10.5	13.2	21.1	10.5	2.6	2.6	2.6
2-3 times a week	42.1	15.8	10.5	0	13.2	15.8	15.8	18.4	7.9	10.5	13.2	57.9	5.3	2.6
Once a day	13.2	71.1	50	78.9	26.3	18.4	31.6	18.4	15.8	2.6	15.8	18.4	5.3	2.6
Several times in a day	10.5	10.5	10	21.1	23.7	21.6	34.2	47.4	13.2	2.6	0	10.5	2.6	2.6

Figure 4.4 Pre and Post intervention frequency of participants' use of digital devices for learning and recreational activities

5. <u>Online activities:</u> Prior to the intervention, social media usage and participants online activities were not known to the researcher. It was important to understand whether students did or did not use social media to connect and communicate with others. In response to a question based on usage of social media the findings indicated that post intervention Goolge+ was used every day by 42.1% of participants to connect with friends and family (see Figure 4.5). Both pre and post results indicate that other social networking sites were not popular with participants. Paired *t*-tests were conducted to compare the popularity of social networking sites among participants, and the results found no changes pre- and post-intervention for the following

- *Facebook* – The effect size of $r = 0.24$ suggested low practical significance[11].

- *Twitter* – The effect size of $r = 0.08$ suggested trivial practical significance[12].

- *Google +* - The effect size of $r = 0.26$ suggested low practical significance[13].

- *My Space* – The effect size of $r = 0.20$ suggested low practical significance[14].

- *Flicker*- The effect size of $r = 0.19$ suggested small practical significance[15].

- *Blog* – The effect size of $r = 0.22$ suggested low practical significance[16].

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[11] (pre-test $M = 1.34$, $SD = 1.47$ and post-test $M =2.03$, $SD =1.70$; $t(37) = -1.48$, $p = .147$)

[12] (pre-test $M = 1.34$, $SD = 1.07$ and post -test $M = 1.39$, $SD = 1.20$ scores; $t (37) = -0.50$, $p =. 624$).

[13] (pre-test $M = 3.79$, $SD = 1.80$ and post -test $M = 4.24$, $SD = 1.97$; $t (37) = -1.62$, $p =. 114$).

[14] (pre-test $M = 1.68$, $SD = 1.44$ and post -test $M = 1.37$, $SD = 1.10$; $t (37) = 1.21$, $p =. 235$).

[15] (pre-test ($M = 1.53$, $SD = 1.30$ and post -test $M = 1.26$, $SD = 0.92$; $t (37) = 1.20$, $p =. 237$).

[16] (pre-test $M = 3.13$, $SD = 1.68$ and post -test $M = 3.58$, $SD = 1.75$; $t(37) = -1.35$, $p =.187$)

How often do you use following?

	Facebook Pre Test (%)	Facebook Post Test (%)	Twitter Pre Test (%)	Twitter Post Test (%)	Google + Pre Test (%)	Google + Post Test (%)	My Space Pre Test (%)	My Space Post Test (%)	Flicker Pre Test (%)	Flicker Post Test (%)	Blog Pre Test (%)	Blog Post Test (%)
Never	73.7	65.8	86.8	86.8	18.4	18.4	76.3	86.8	81.6	89.5	23.7	15.8
Almost Never	5.3	5.3	5.3	2.6	2.6	2.6	5.3	2.6	5.3	2.6	10.5	13.2
Sometimes	10.5	13.2	2.6	5.3	28.9	18.4	5.3	5.3	53	5.3	31.6	26.3
Use once a month	0	2.6	0	0	5.3	0	5.3	0	0	0	10.5	5.3
Once a Week	5.3	2.6	2.6	0	21.1	18.4	2.6	5.3	2.6	0	10.5	21.1
Everyday	5.3	10.5	2.6	5.3	23.7	42.1	5.3	2.6	5.3	2.6	13.2	18.4

Figure 4.5 Pre and Post intervention participants' use of Social Media

6. <u>Technology makes learning easier</u>: Participants were asked whether digital devices and technology made learning easier at school to understand the participants' attitude towards technology. There was a noticeable change in participants' attitudes post intervention as indicated by the 47.4% of participants who strongly agreed that ease of learning is aided by digital devices and technology compared to 26.3% pre-intervention (Figure 4.6). The overall level of the agreement changed from 57.9% before the intervention to 73.7% post intervention. However, there was also an increase in the overall level of disagreement as 5.3 % of participants strongly disagreed and 5.3% slightly disagreed that technology makes learning easier. A paired samples t-test failed to reveal a statistically significant difference to support the change[17]. The effect size of $r = 0.25$ suggested low practical significance.

How strongly do you agree or disagree with the following statement -the ability of digital devices to connect to internet is important

	Strongly disgree (%)	Moderately disagree (%)	Slightly disagree (%)	Neutral (%)	Slightly agree (%)	Moderately agree (%)	Strongly agree (%)
Pre Test	10.5	2.6	7.9	26.3	13.2	10.5	28.9
Post Test	5.3	2.6	5.3	26.3	2.6	23.7	34.2
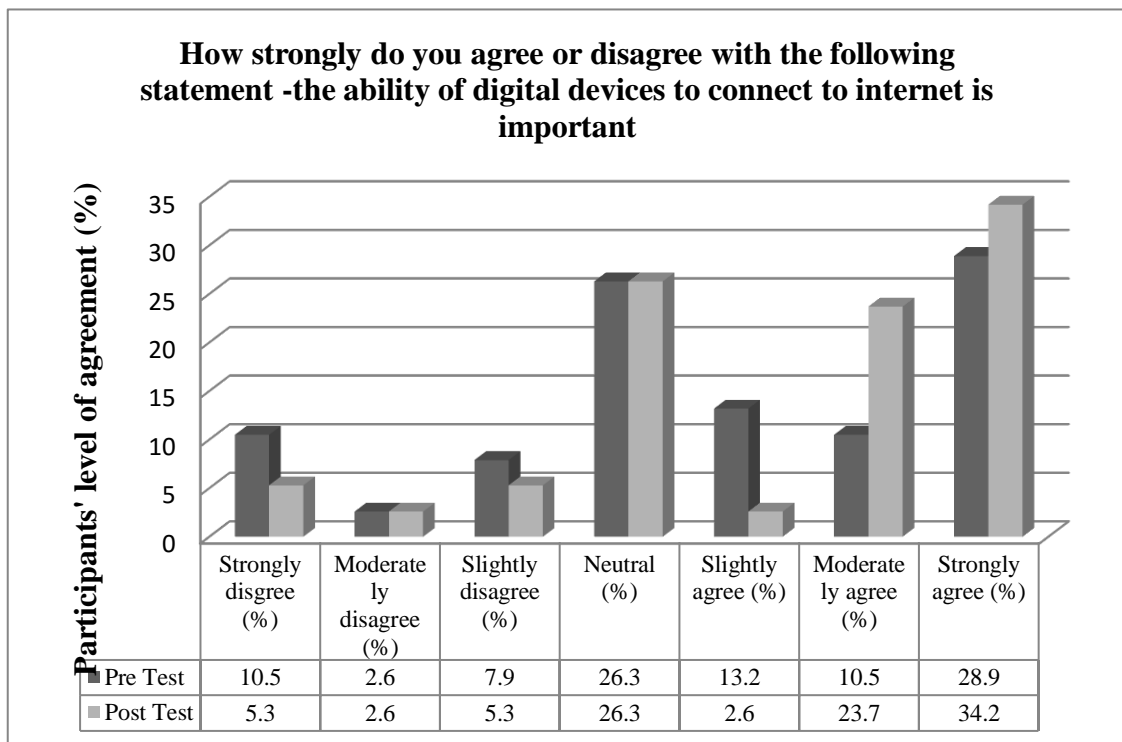
Figure 4.6 Participants' attitudes that use of digital devices and technology makes learning easy Pre and Post intervention

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[17] pre-test ($M = 5.05$, $SD = 1.74$ and post -test $M = 5.66$, $SD = 1.71$; $t(37) = -1.57$, $p = .125$)

7. <u>The ability of devices to connect to the internet</u>: Participants' attitudes towards the importance of having an internet connection for learning displayed gradual changes in the level of importance. However, there were still 26.3% of participants who were neutral towards this stance, post-intervention (see Figure 4.7). At the same time, there was also an increase in the number of participants disagreeing with the notion. A paired *t*-test revealed no significant difference post intervention[18]. The effect size of $r = 0.25$ suggested trivial practical significance towards the importance of internet availability.

How strongly do you agree or disagree with the following statement- Staying connected to internet is important to me

	Strongly disagree (%)	Moderately disagree (%)	Slightly disagree (%)	Neutral (%)	Slightly agree (%)	Moderately agree (%)	Strongly agree (%)
■ Pre Test	10.5	2.6	7.9	26.3	13.2	10.5	28.9
■ Post Test	5.3	2.6	5.3	26.3	2.6	23.7	34.2
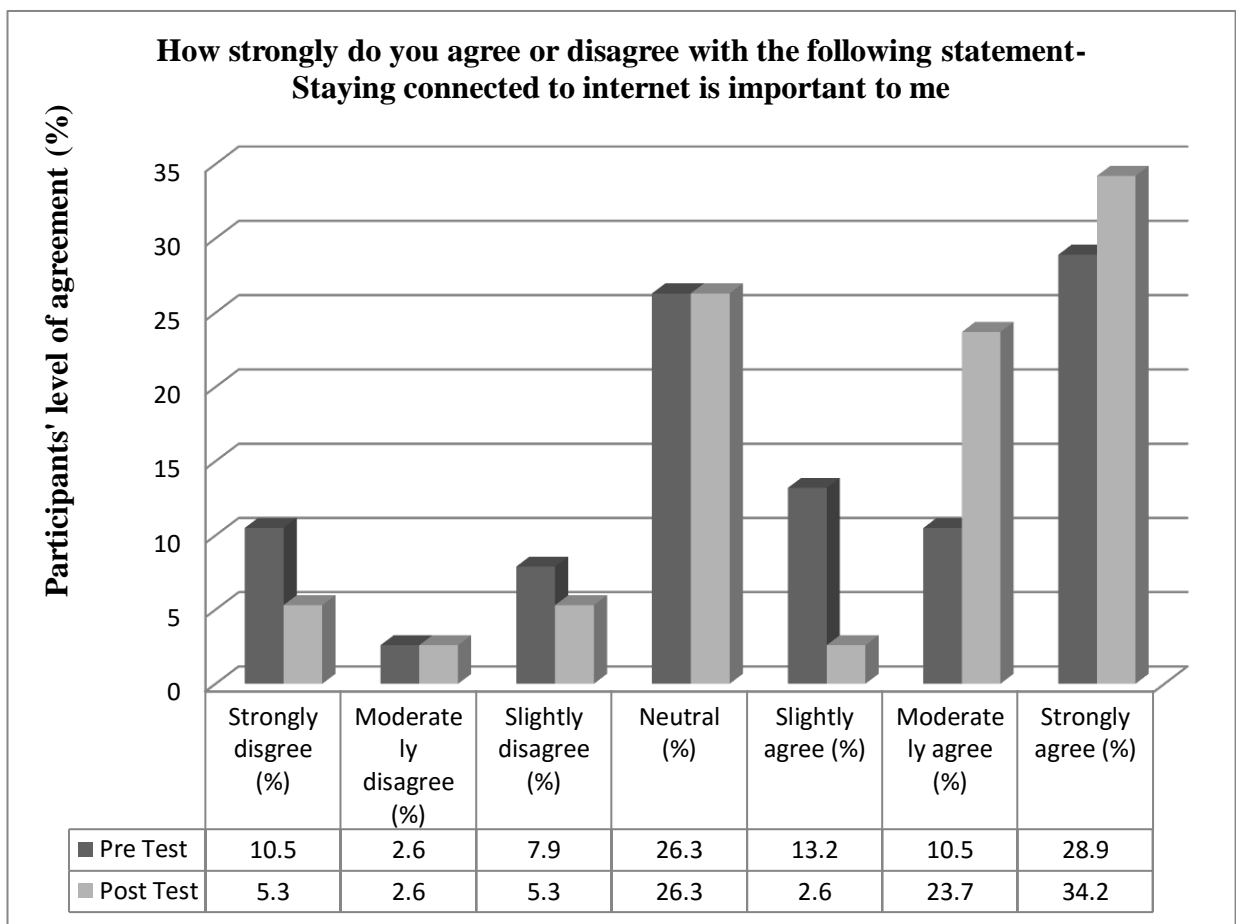
Figure 4.7 Participants' attitude towards staying connected to the internet Pre and Post intervention

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[18] (pre-test $M = 4.76$, $SD = 1.95$ and post -test $M = 5.26$, $SD = 1.78$; ($t(37) = -1.54$, $p = .131$)

8. <u>Usability of the digital device</u>: Similarly, the participants' responses indicated that the use of digital devices was not dependent on connectivity to the internet, and this was indicated by the nominal change of level in agreement among participants (see Figure 4.8). Paired *t*-test conducted to compare whether the digital devices have limited use depending on their connectivity to the internet found no significant difference post intervention[19]. The effect size of $r = 0.26$ suggested low practical significance.

How strongly do you agree or disagree with the following statement - use of digital device is dependent on its ability to connect to internet

	Strongly disgree (%)	Moderately disagree (%)	Slightly disagree (%)	Neutral (%)	Slightly agree (%)	Moderately agree (%)	Strongly agree (%)
■ Pre Test	15.8	10.5	5.3	18.4	10.5	15.8	23.7
■ Post Test	10.5	2.6	13.2	21.1	7.9	18.4	26.3
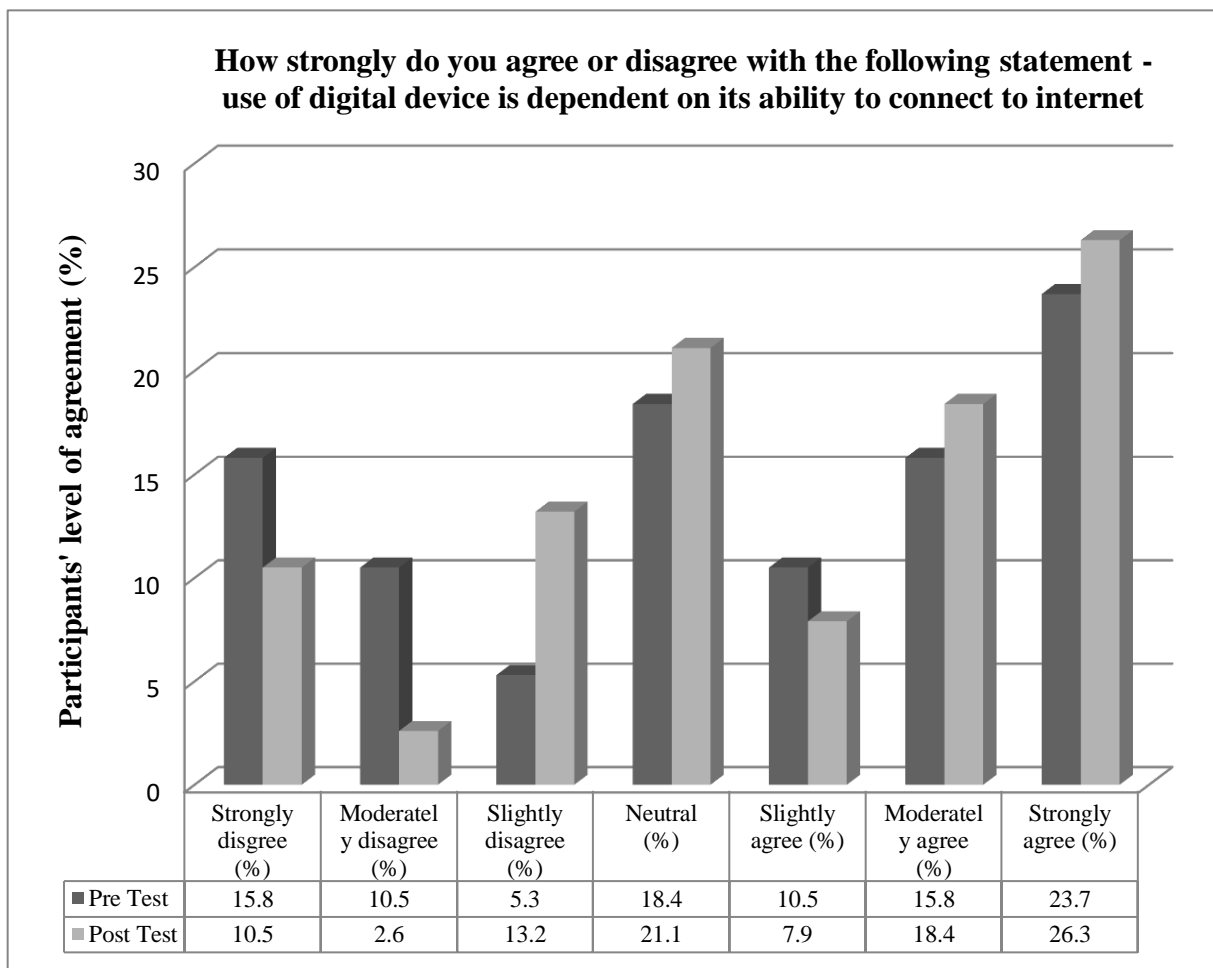
Figure 4.8 Participants' attitude about the ability of a Digital device to connect to the internet in relation to its usage Pre and Post intervention

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[19] (pre-test $M = 4.39$, $SD = 2.18$ and post -test $M = 4.74$, $SD = 1.98$; $t(37) = -0.70$, $p = .486$)

9. <u>Understanding how the technology works</u>: Prior to intervention, 52.6% of participants felt that technology could be used without understanding how it works (see Figure 4.9). Post-intervention there was a significant change in participants' understanding about this. Almost all (94.7%) of the participants agreed that the important aspect of using technology at school was to know how the technology works[20]. The effect size of $r = 0.76$ suggested high practical significance.

When using technology for learning at school, it is important for you - Understanding how the technology works

	Correct (%)	Incorrect (%)
Pre Test	47.4	52.6
Post Test	94.7	5.3
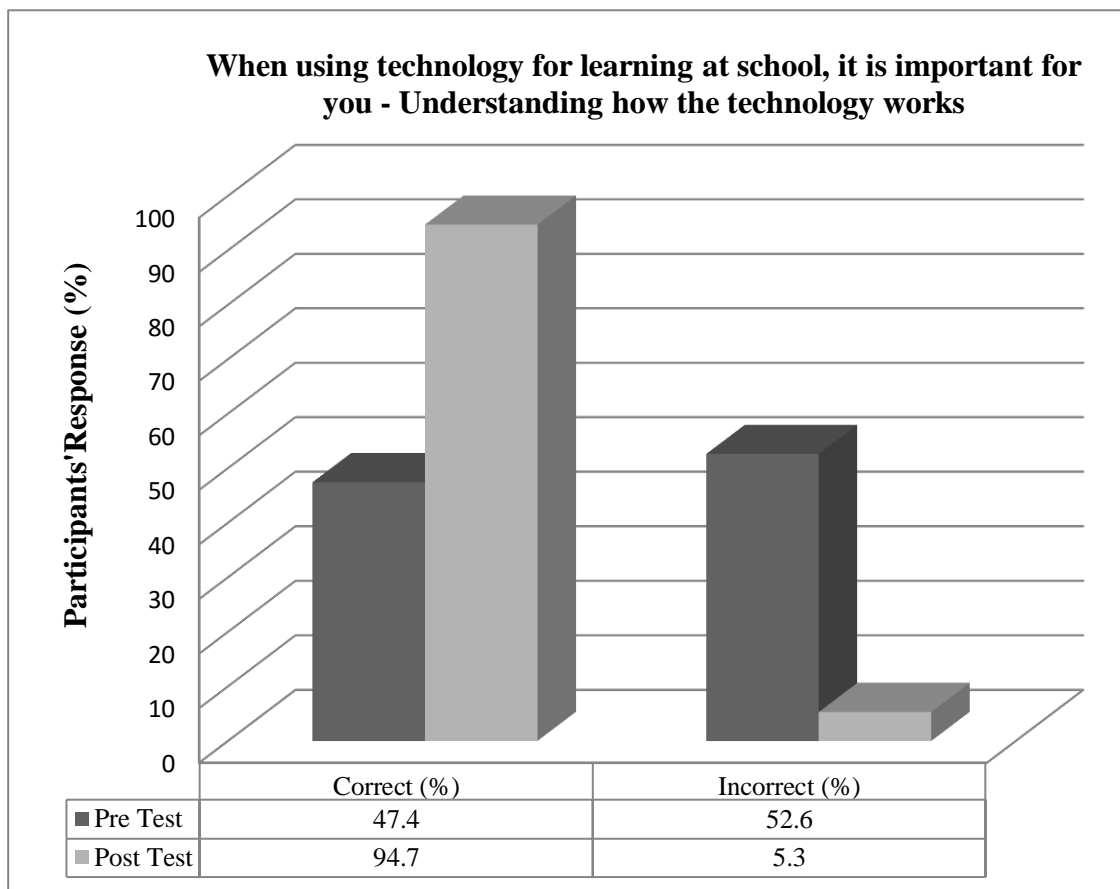
Figure 4.9 Participants' response about the importance of understanding how technology works Pre and Post intervention

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[20] (Wilcoxon signed rank test $Z = -4.43$, $p < .01$)

10. The difference between URL and Search bar: Post intervention there was significant change noted in the participants' understanding of the difference between a URL and a Search bar (see Figure 4.10). Post-intervention almost all participants (97.4%) were able to differentiate the purpose of a URL and a Search bar[21]. The effect size of $r = 0.80$ suggested high practical significance. Similarly, the results indicated a significant increase in participants' knowledge of the function of URLs and Search Bars (See Figure 4.11). All participants (100%) correctly defined a URL and a Search bar[22]. The effect size of $r = 0.88$ for URL and the effect size of $r = 0.86$ for search bar suggested high practical significance.

Do you know the difference between URL and Search Bar?

	Yes (%)	No (%)
■ Pre Test	39.5	57.9
■ Post Test	94.7	5.3
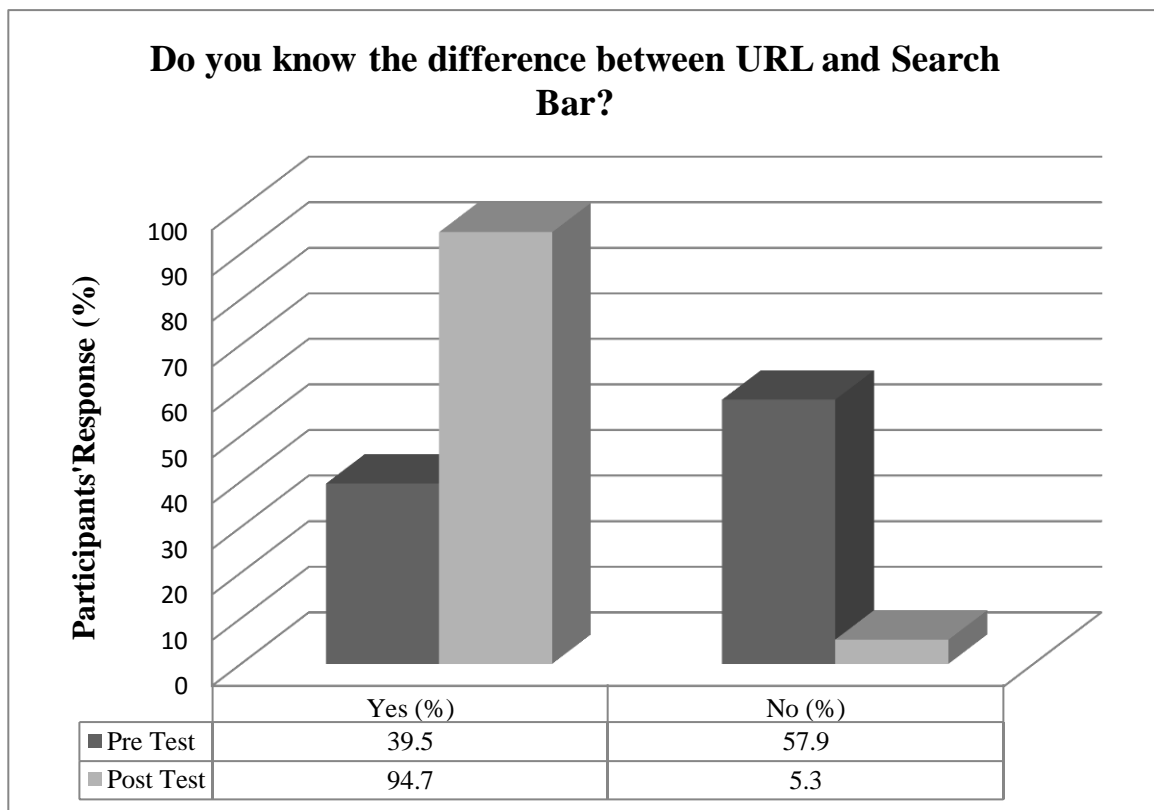
Figure 4.10 Participants' knowledge of URL and Search bar Pre and Post intervention

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[21] (Wilcoxon signed rank test $Z = -4.47$, $p < .01$)
[22] (Wilcoxon signed rank test for URL $Z = -4.90$ $p < .01$ and Search bar $Z = -4.80$ $p < .01$)

Describe the use of URL and Search Bar

	Correct (%)	Incorrect (%)
■ URL Pre Test	36.8	60.5
■ URL Post Test	100	0
■ Search Bar Pre Test	39.5	57.9
■ Search Bar Post Test	100	0
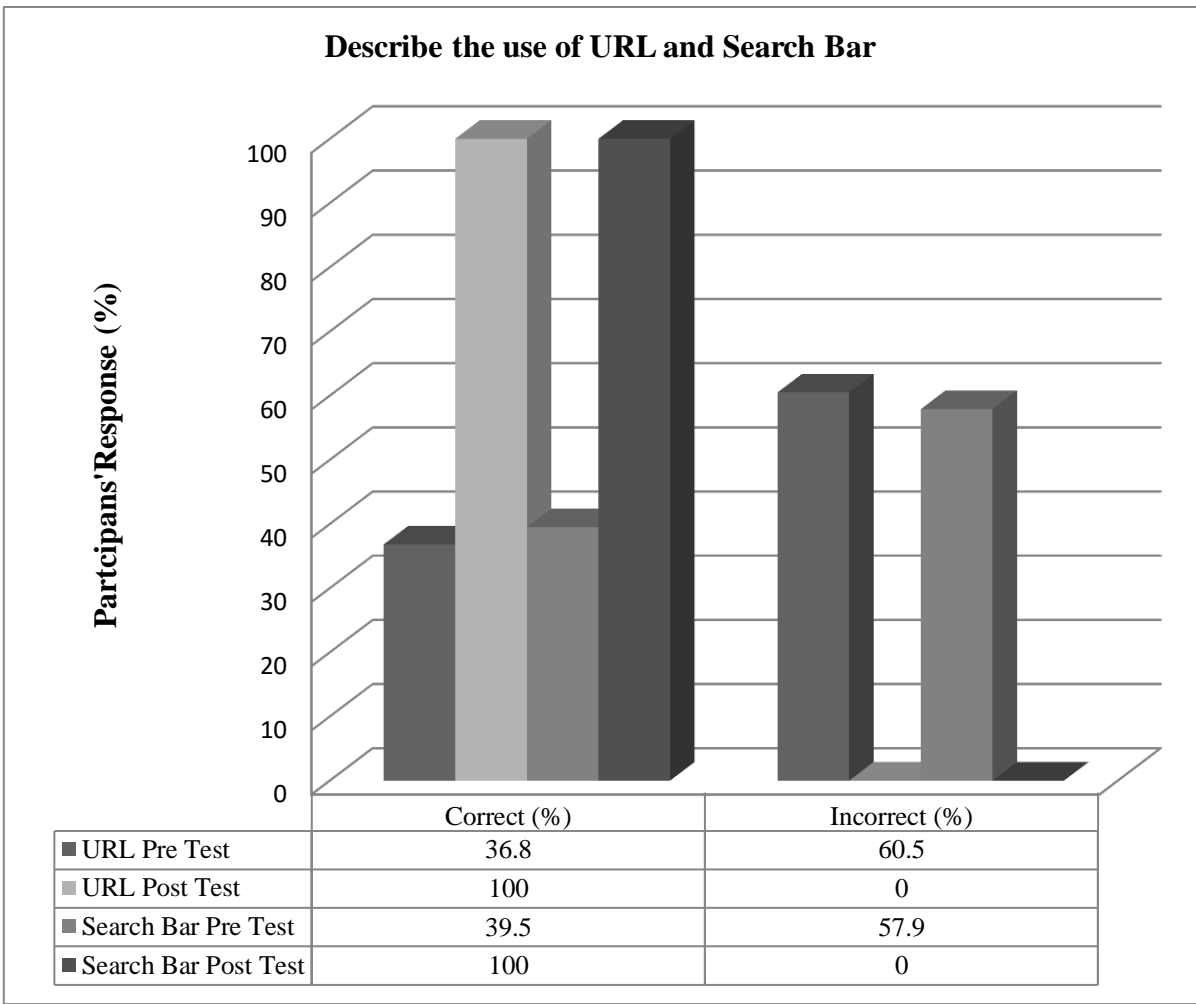
Figure 4.11 Participants' correct definition of URL and Search bar Pre and Post intervention

11. <u>E-Commerce website</u>: The significant change in the participants' knowledge about E- commerce websites was noted post intervention (See Figure 4.12). Post-intervention all (100%) participants were able to identify common E-commerce websites in Singapore compared to only 7.9% prior to the intervention. A Wilcoxon signed rank test was conducted to evaluate the change in the participants' knowledge base. The results indicated a significant increase in participants' knowledge of E-commerce websites[23]. The effect size of $r = 0.59$ suggested high practical significance.

Zaggora, E Bay, Group On and Amazon are examples of

	Correct (%)	Incorrect (%)
■ Pre Test	7.9	92.1
■ Post Test	100	0
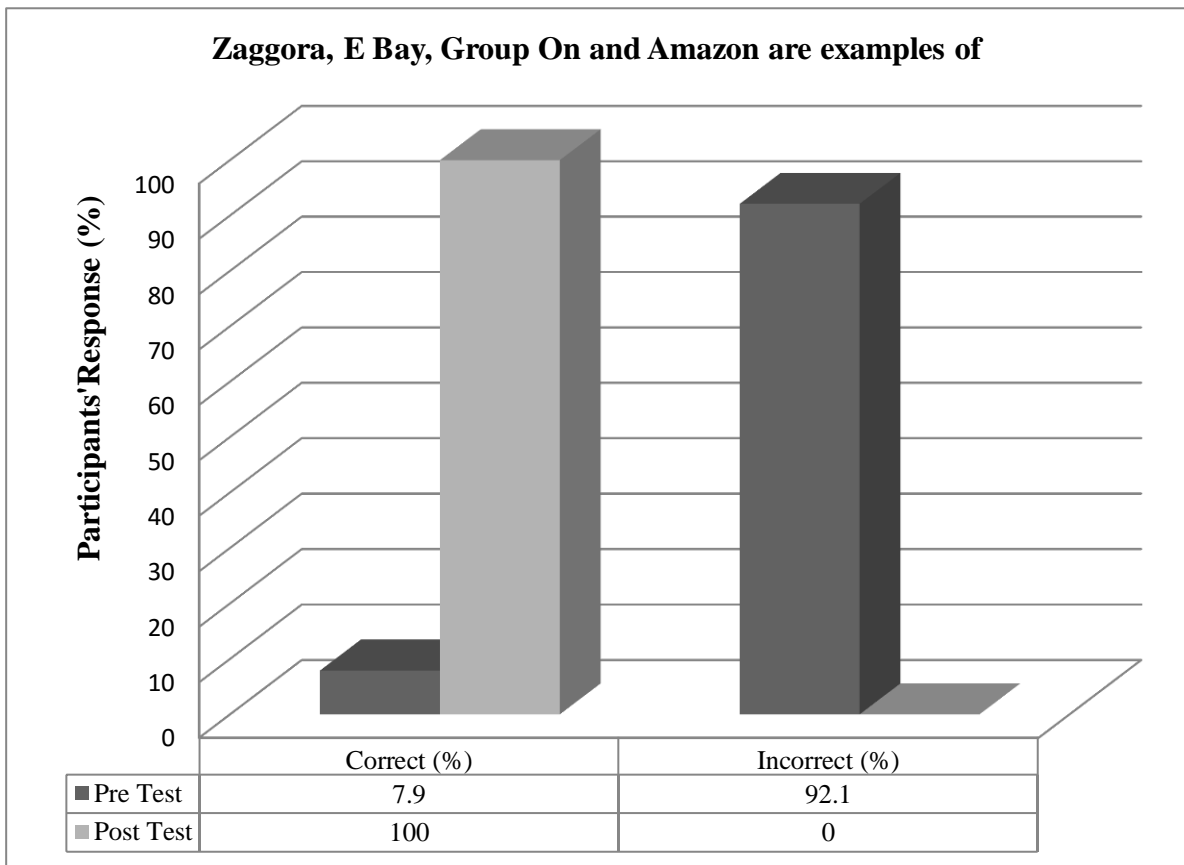
Figure 4.12 Participants' knowledge of E- Commerce Websites Pre and Post intervention

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[23] (Wilcoxon signed rank test $Z = -4.0$, $p < 0.0.5$)

4.2 DIGITAL CITIZENSHIP

4.2.1 Digital Access Findings

The participants were asked six questions to measure their knowledge and attitude towards having access to digital devices and the internet for others in school, the family, and the global community. The findings indicate a change in participants' knowledge and attitude post-intervention in each of the following cases

1. <u>Access to school internet network</u> - Post intervention 92.1% of participants indicated that everyone in school should have access to the school's internet connection and to the WIFI network (see Figure 4.13). A paired *t*-test results indicated that the change was associated with the intervention[24]. The effect size of $r = 0.06$ suggested trivial practical significance.

Do you think everyone in school should have the right to access internet through secured WIFI available in school?

	In aggreement to access for all (%)	Disaggreement to access for all (%)
■ Pre Test	81.6	18.4
■ Post Test	92.1	7.9

Participants'Response (%)
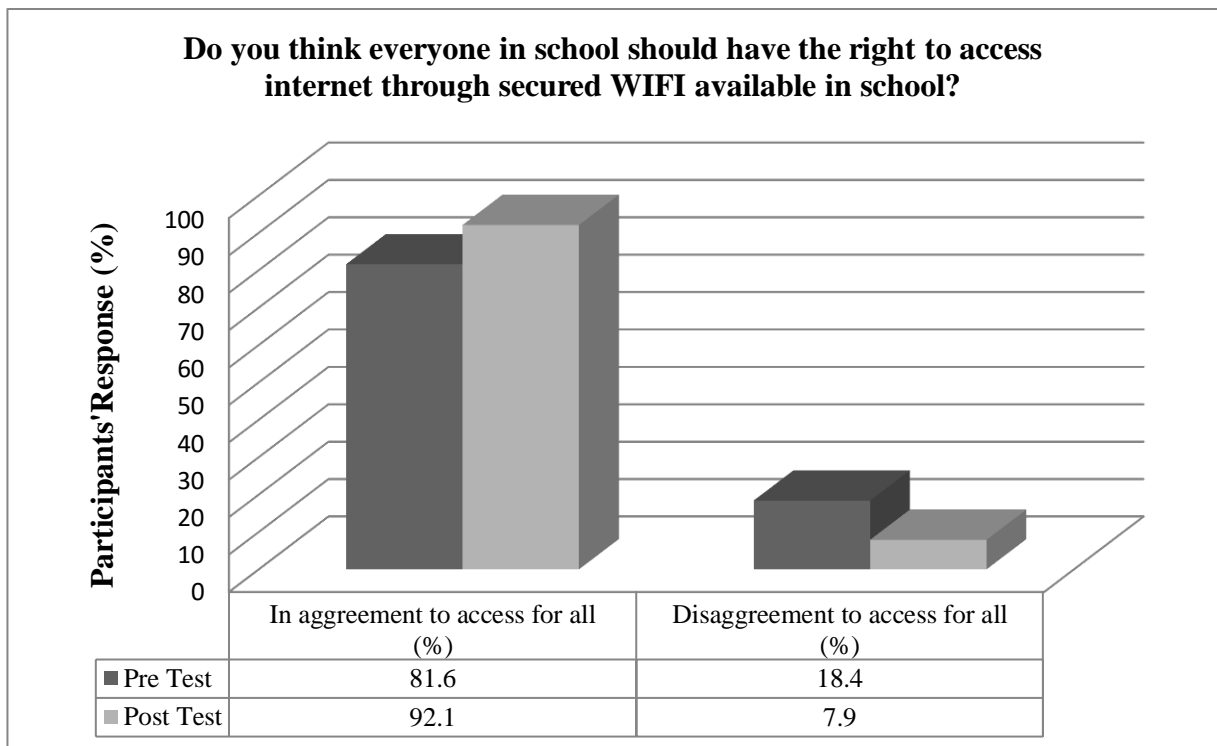
Figure 4.13 Participants' attitude about access to the school internet and the WIFI network for all the members Pre and Post intervention

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[24] ($t(38) = .36$, $p = .025$)

2. <u>Access to the computer in the Library and common areas</u> Post intervention

94.7% of participants agreed that computers in common areas of the school should be

accessible to everyone (see Figure 4.14). The Chi-square test results and the effect

size of φ = 0.34 indicated a medium practical significant[25].

The computer in the library and common areas of the school should be accessible to any member of the school community including support staff. What do you think?

	In agreement (%)	Disagreement (%)
Pre Test	68.4	31.6
Post Test	94.7	5.3
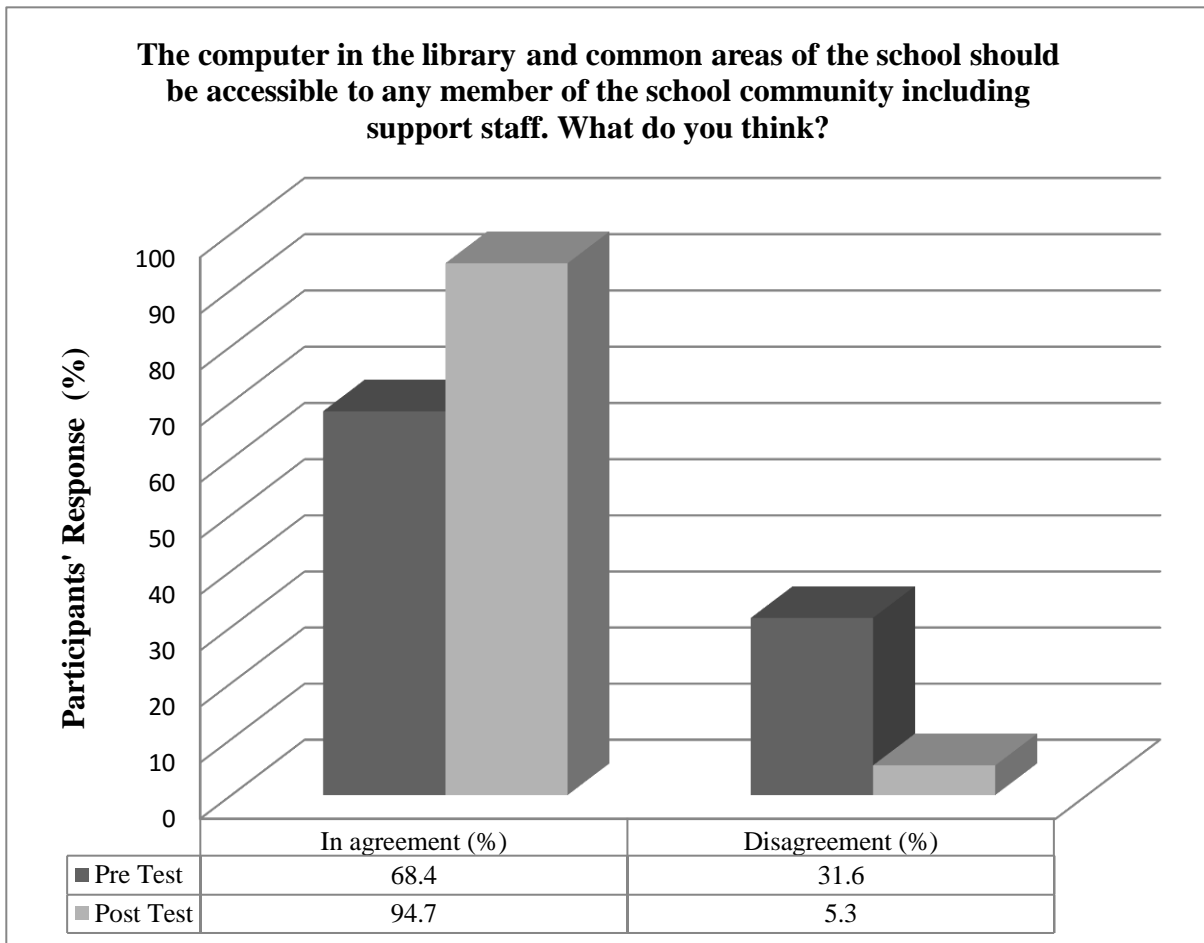
Figure 4.14 Participants' attitude about access to computers in Library and common areas
for everyone Pre and Post intervention

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[25] $(\chi^2 (1) = 4.57, p = .032)$

3. <u>Right to use technology</u> – Both before and after the intervention the same proportion (84.2%) of participants believed that everyone should have the right to use technology (see Figure 4.15).

Who has the right to use technology at school?

	Everyone (%)	Special people (%)
Pre Test	84.2	15.8
Post Test	84.2	15.8
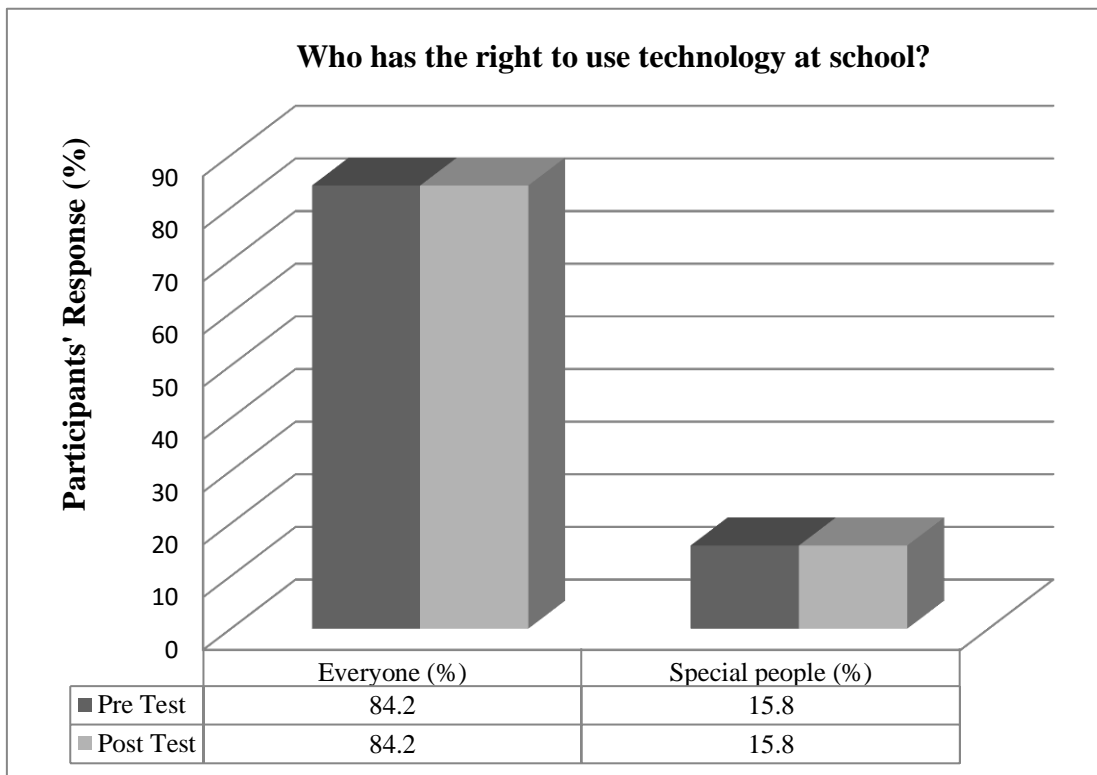
Figure 4.15 Participants' attitude about right to use technology Pre and Post intervention

4. <u>Right to access the computer and WIFI for every member of the family</u> –
Post intervention there was a significant change in participants' perception of the right
of every member of their family to use computers and a WIFI connection at home.
Post-intervention 84.2% very strongly agreed, whereas pre-intervention 39.5 % very
strongly agreed that every member of the family should have access to a computer
and WIFI at home (see Figure 4.16). This positive change in the level of the
agreement had an effect size of $r = 0.65$ suggesting high practical significance[26].

How strongly do you agree with the following statement? Every member of family has right to access computer and WIFI network.

	Very strongly disagree (%)	Strongly disagree (%)	Disagree (%)	Agree (%)	Strongly agree (%)	Very strongly agree (%)
■ Pre Test	0	2.6	5.3	36.8	10.5	39.5
■ Post Test	0	0	0	0	15.8	84.2
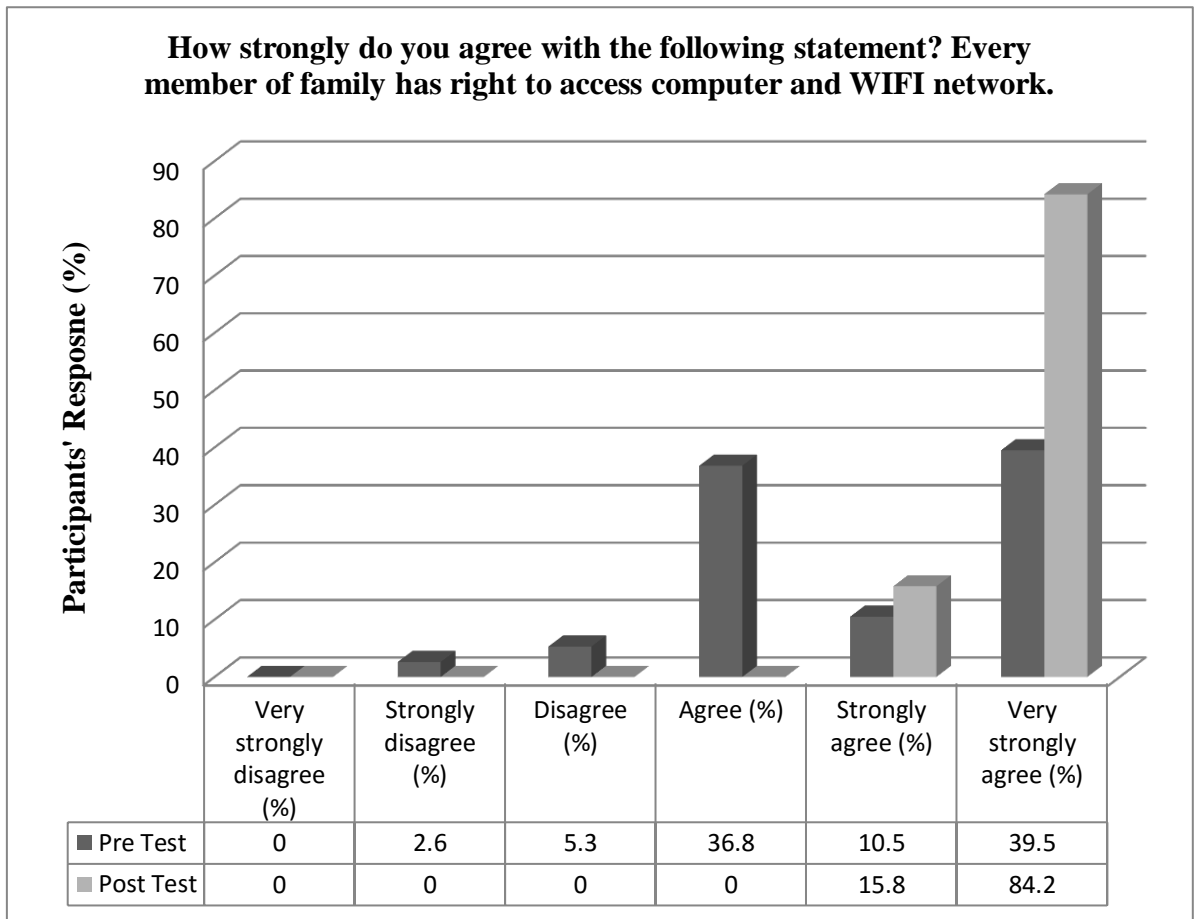
Figure 4.16 Participants level of agreement about right to access computer and WIFI for every member of the family Pre and Post intervention

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[26] pre-test $M = 4.83$, $SD = 1.13$ and post -test $M = 5.86$, $SD = 0.351$ scores; ($t(35) = -5.01$, $p < .0001$

5. <u>Access to technology for children around the world - </u>The majority of participants agreed that children around the world must have access to various technologies for learning (see Figure 4.17). While there was a change in the percentage of participants disagreeing with this notion a greater proportion of participants (21.1% pre vs. 60.5 % post) felt "very strongly" that access to technology for children around the world was important, post intervention. The indifference in participants' knowledge could be due to the availability of the internet and digital devices 24/7 in Singapore and an inability to understand the economical and political constraints in other parts of the world that might restrict access to technology for the people of any particular region[27]. The effect size of $r = 0.22$ suggested low practical significance.

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[27] pre-test $M = 4.53$, $SD = 1.21$ and post -test $M = 4.97$, $SD = 1.64$ scores; $t(33) = -1.28$, $p = .208$.

How strongly do you agree or disagree with following statement? Children around the world should have opportunities to work with technology and learn how to use digital devices for various learning activities.

	Very strongly disagree (%)	Strongly disagree (%)	Disagree (%)	Agree (%)	Strongly agree (%)	Very strongly agree (%)
■ Pre Test	5.3	0	0	42.1	21.1	21.1
■ Post Test	10.5	0	0	15.8	13.2	60.5

Participants' Prespective (%) (y-axis: 0, 10, 20, 30, 40, 50, 60, 70)
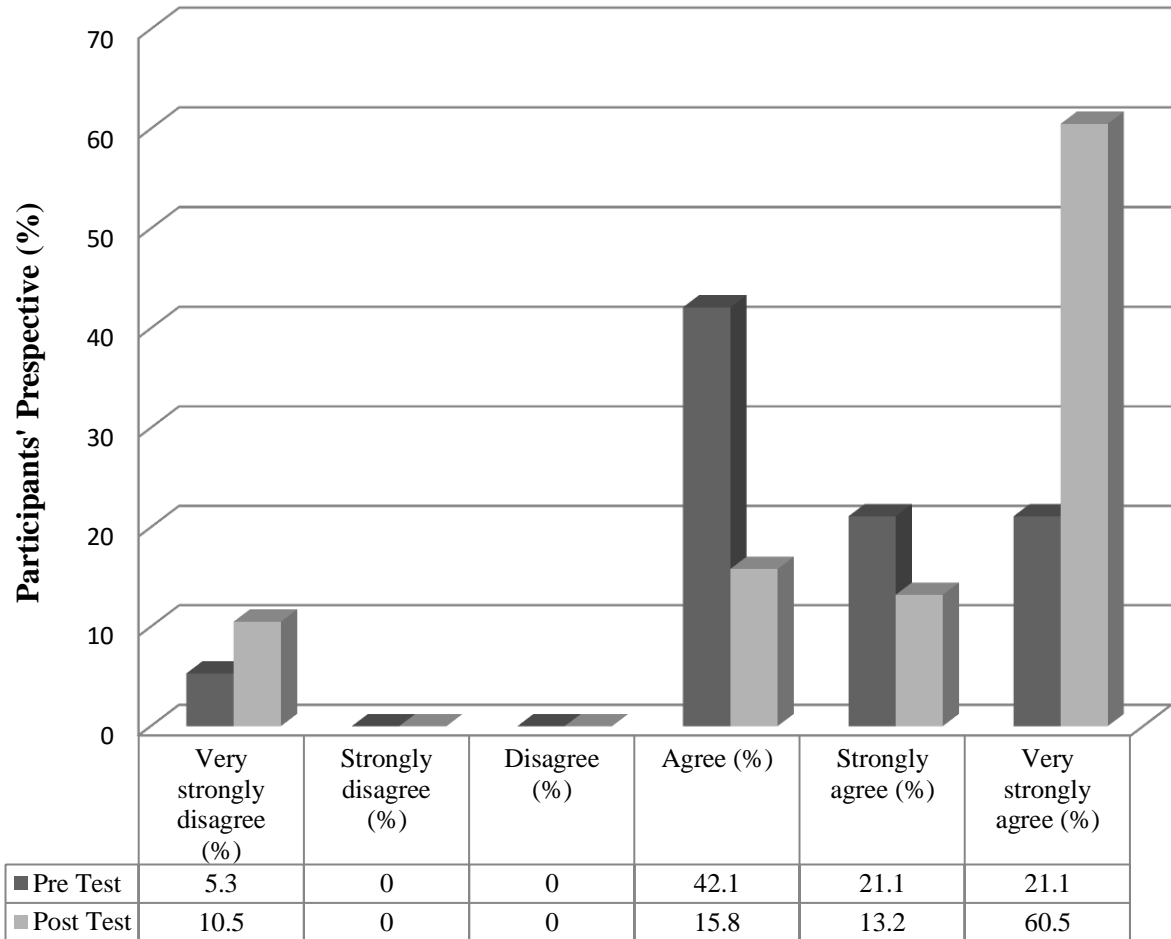
Figure 4.17 Participants' attitude about the access to technology for children around the world Pre and Post intervention

6. <u>Ownership of digital devices</u> - To understand participants accessibility to technology, participants were asked to indicate whether they owned a particular digital device or shared it with a family member. In response to a question about the personal access and ownership of digital devices post intervention, 26.3% of the participants owned a computer, 36.8% a laptop, 47.4% mobile phone, 36.8% an iPad / Tablet, 44.7%, an iPod and 13.2 % a GPS tracker (see Figure 4.18). Just over half (55.3 %) of the participants shared a computer with family, 52.6% shared a laptop, 26.3% shared a mobile phone, 34.2% shared an Ipad/ tablet, 18.4% shared an iPod and 23.7% GPS tracker. Most participants did not indicate a clear affinity towards one particular device.

Tick the device that you own or share with family

	Computer (%)	Laptop (%)	Mobile (%)	Ipad/ tablet (%)	Ipod (%)	GPS Tracker v
■ Own Pre Test	15.8	21.1	47.4	26.3	36.8	2.6
■ Own Post Test	26.3	36.8	47.4	36.8	44.7	13.2
■ Share Pre Test	65.8	60.5	21.1	57.9	18.4	34.2
■ Share Post Test	55.3	52.6	26.3	34.2	18.4	23.7
■ Like Pre Test	13.2	10.5	18.4	26.3	18.4	13.2
■ Like Post Test	15.8	13.2	2.6	34.2	18.4	15.8
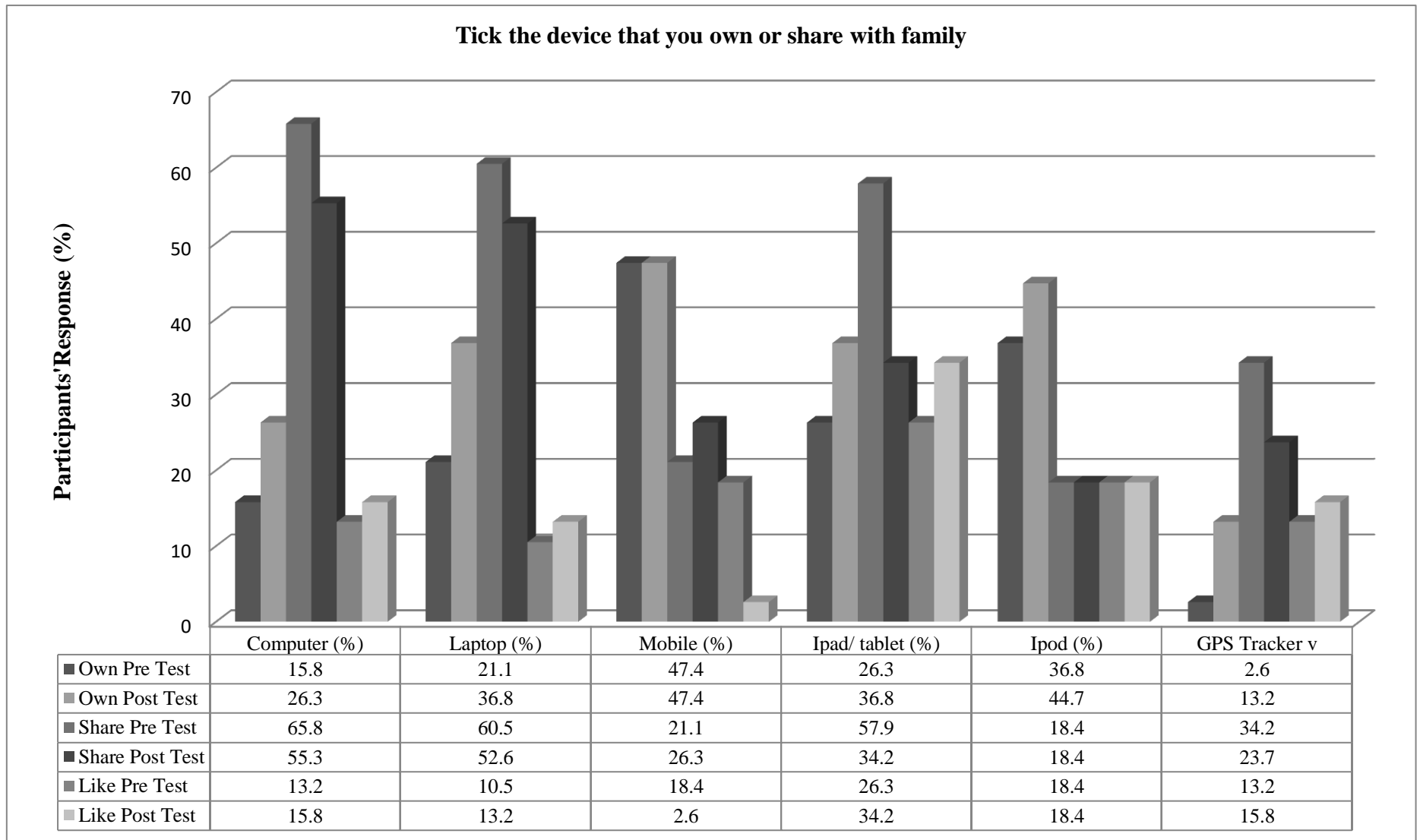
Figure 4.18 Participants' accessibility to digital device and the ownership of digital devices Pre and Post intervention

4.2.2 Digital Commerce Findings

Participants were asked three questions to measure their understanding of digital commerce and to compare any changes in their knowledge after the intervention.

1. <u>Selling of an old device</u>: A greater proportion of participants indicated that they had knowledge of digital commerce services post-intervention (71.1%) compared to pre-intervention (31.6%) (see Figure 4.19). The significant change in participants' knowledge was indicated by a Wilcoxon signed rank test[28]. The effect size of $r = 0.59$ suggested high practical significance.

Old unwanted devices can be sold using which of the following E Commerce services?

	Correct (%)	Incorrect
Pre Test	31.6	68.4
Post Test	71.1	28.9
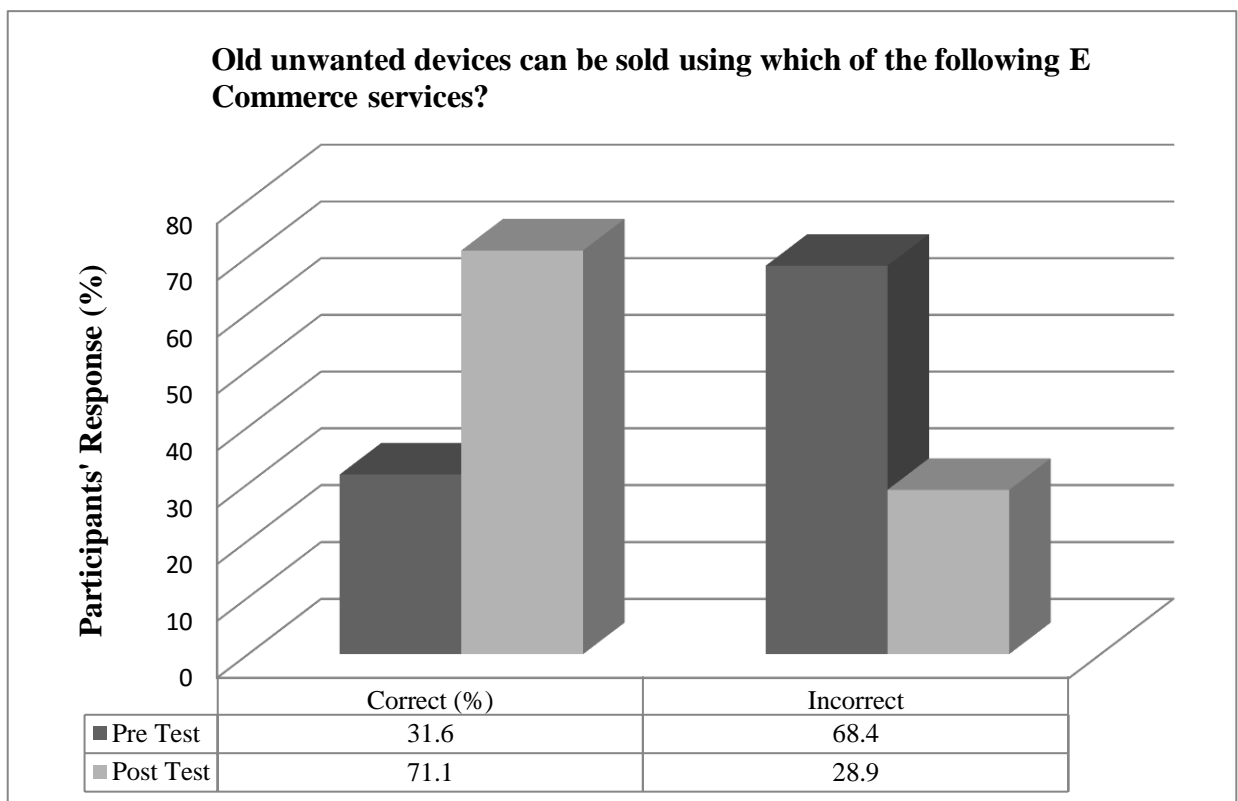
Figure 4.19 Participants' knowledge about buying and selling of old digital devices online Pre and Post intervention

---

[28] (Wilcoxon Signed rank test- Z = -3.27, $p \le .001$)

2. <u>Online Purchases</u>: There was a significant difference noted in responses to the question related to online purchases (see Figure 4.20). Post-intervention, 89.5% of participants, indicated that online purchases required a credit card to complete the purchase transaction compared to 55.3% of participants pre-intervention[29]. The effect size of $\varphi = 0.87$ indicated high practical significance, as $p < 0.05$ and $\varphi \geq 0.5$.

To purchase anything on the internet one needs

	Correct (%)	Incorrect
Pre Test	55.3	44.7
Post Test	89.5	10.5
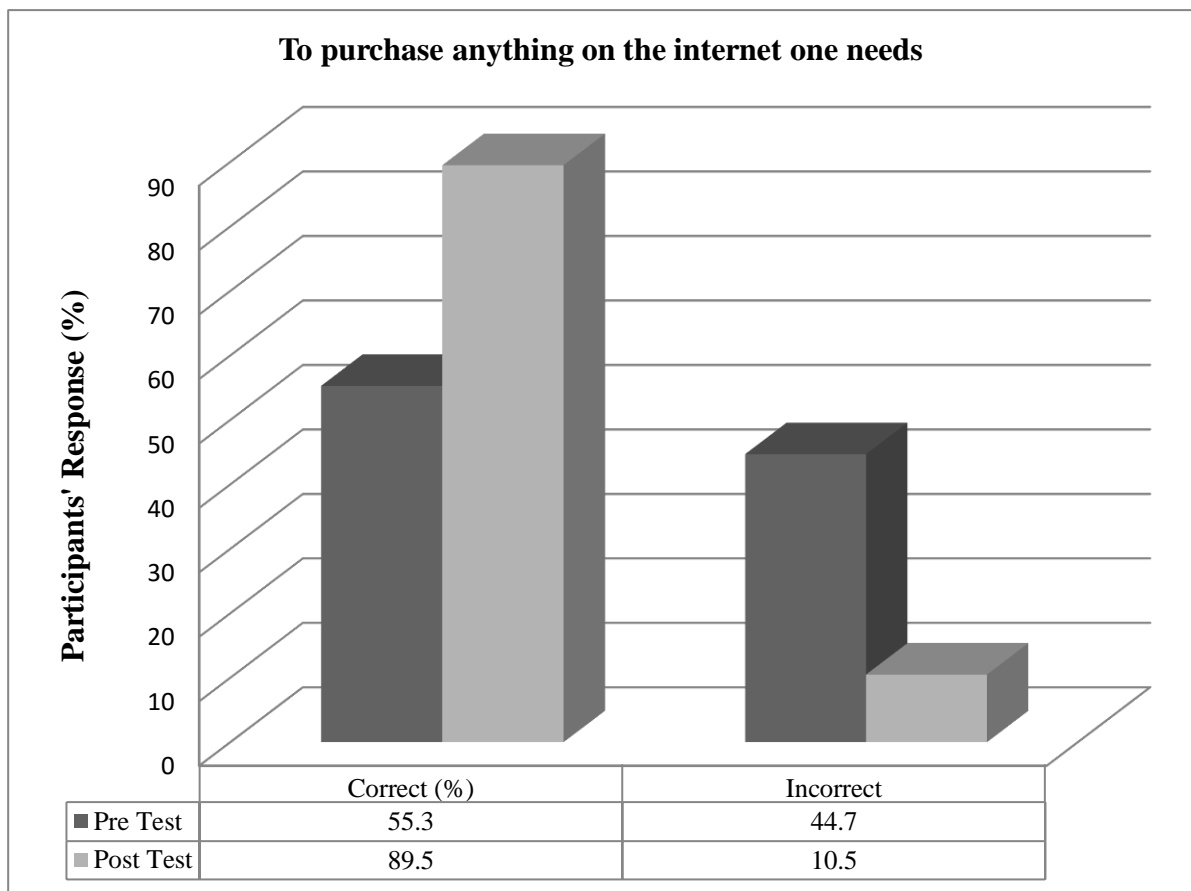
Figure 4.20 Pre and Post intervention participants' knowledge about the requirements for online transaction

---

[29] (Chi-square test $\chi2\ (6) = 28.54$, $p \leq .001$)

3. <u>In App Purchase of a new game module</u>: There was a substantial difference noted in participants' attitudes towards the online purchase of a new module for the most played games on digital devices (see Figure 4.21). Prior to the intervention 57.9% of participants would purchase the online module without their parents' knowledge. Post-intervention this changed significantly to 97.4% of participants who indicated that they would ask their parents to buy the new module. The significant change in participants' attitudes suggests that the intervention led to this positive change[30]. The effect size of $r = 0.43$ suggested moderate, practical significance.

While playing Minecraft / Angry birds / Club penguin there is a pop up saying you can buy a new module at a good price. What would you do?

	Correct (%)	Incorrect
Pre Test	42.1	57.9
Post Test	97.4	2.6
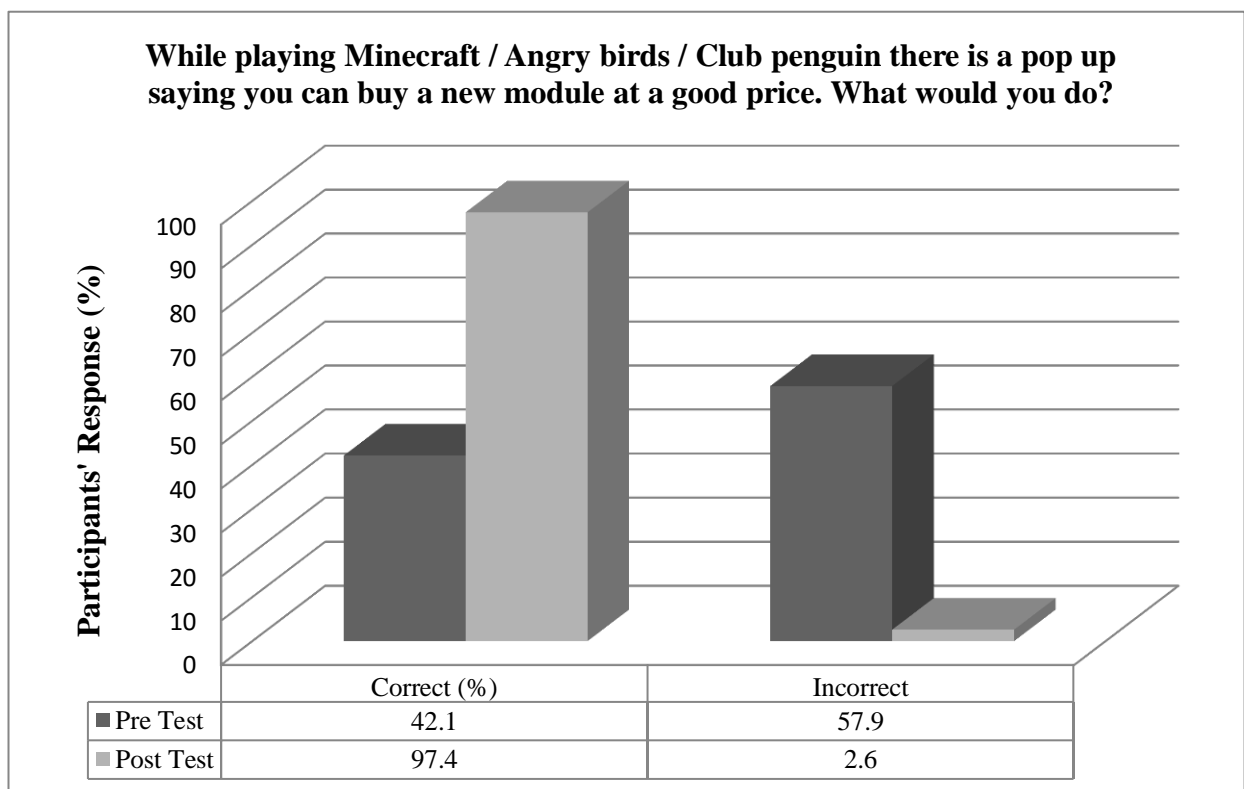
Figure 4.21 Pre and Post intervention participants' attitude about the In-App purchase of new module for the game on digital device

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[30] (Wilcoxon signed rank test $Z = -2.40$, $p = .016$)

4.2.3 Digital Communication Findings

Participants' knowledge and attitude were tested through seven questions which included some classroom scenarios.

1. Digital communication device: In response to the knowledge question ("Which of the following devices will facilitate digital communication") about the ability of devices to facilitate digital communication 92.1% of participants answered correctly post intervention compared to 73.7% pre-intervention (see Figure 4.22). The results indicated a change post intervention[31] with an effect size of $r = 0.16$ suggesting low practical significance. (See Appendix E for the list of digital devices)

Which of the following devices will facilitate digital communication?

	Correct (%)	Incorrect
■ Pre Test	73.7	26.3
■ Post Test	92.1	7.9
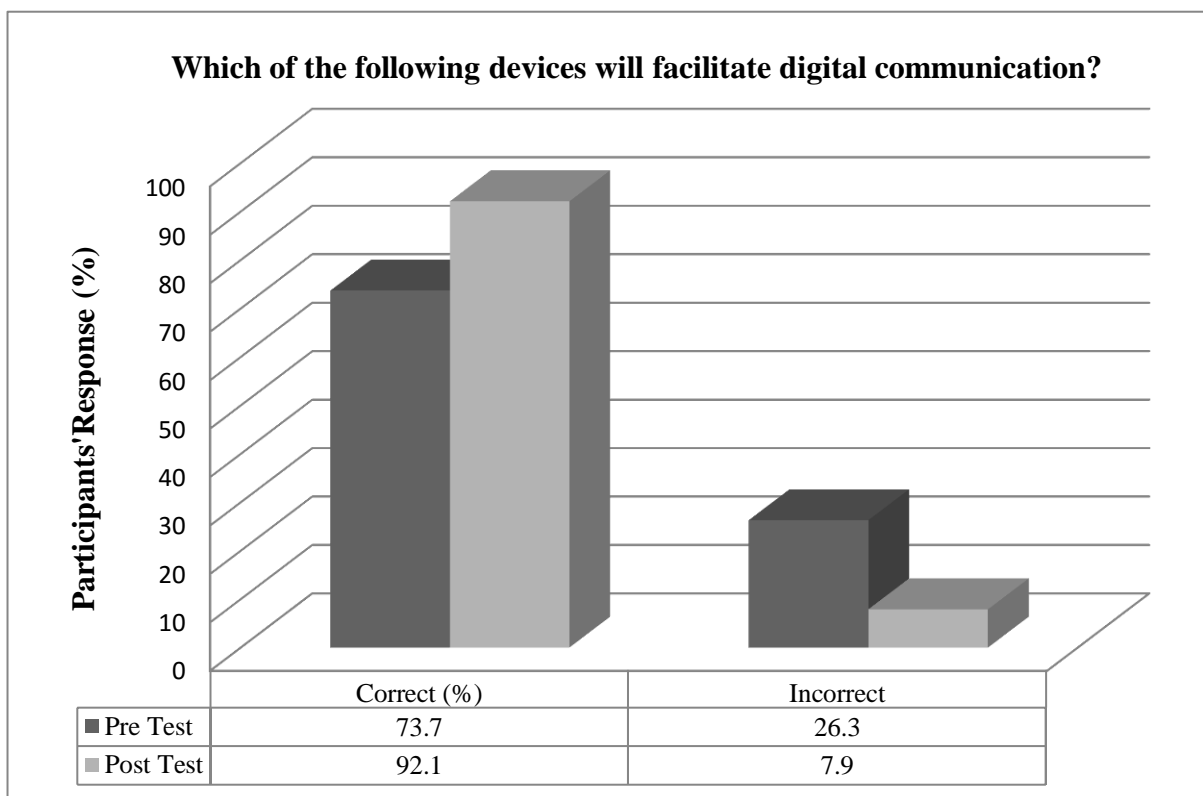
Figure 4.22 Pre and Post intervention participants' response for digital device that facilitates Digital Communication

---

[31] (Wilcoxon signed rank test $Z = -0.92$, $p = .036$)

2. <u>Appropriateness of mode of communication</u>: Participants' responses to the question about the appropriate technique while communicating through email ("While sending or answering an email you must (select one answer 1. Write the response and read before you click send, 2. Once written just click and send and 3. Think, write, read and send") showed slight variations in the participants' method of email communication post intervention (see Figure 4.23). Nearly all participants (89.5 %) indicated that they would think, write, and read before sending an email post-intervention compared to (76.3%) pre-intervention. The positive change in the participants attitudes post intervention[32] had an effect size of $r = 0.42$ suggesting moderate, practical significance.

While sending or answering an email you must (select one answer)

	Correct (%)	Incorrect
■ Pre Test	76.3	23.7
■ Post Test	89.5	10.5
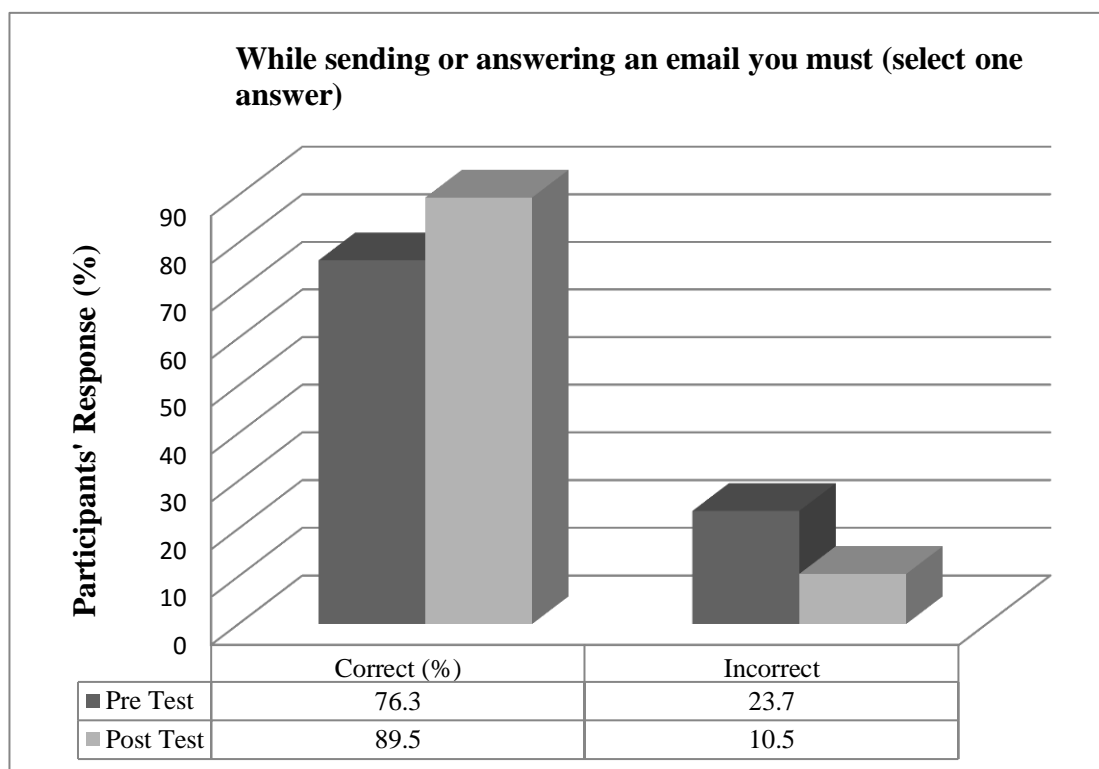
Figure 4.23 Pre and Post intervention participants' attitude about appropriate action while sending emails

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[32] (Wilcoxon signed rank $Z = -1.58$, $p = .114$)

3. <u>Interactions involving digital devices</u>: Participants were questioned about what type of interaction happens in relation to digital devices and social circles. There was a significant difference noted post intervention in participants' usage of digital devices for the purpose of communication and social interactions (see Figure 4.24). Post-intervention, the majority of participants, 73.7% had indicated that they used digital devices to communicate and socially interact compared to 57.9% pre-intervention[33]. The effect size of the change indicated high practical significant as $p < 0.05$ and φ ≥ 0.5.

Describe different ways in which you use digital devices for communication and social interaction.

	Pre Test (%)	Post Test (%)
■ Email, Call, Chat, Text, Blog publishing Socail networking and Gaming	57.9	73.7
■ Non interactive activities like research, documenting etc.	42.1	26.3
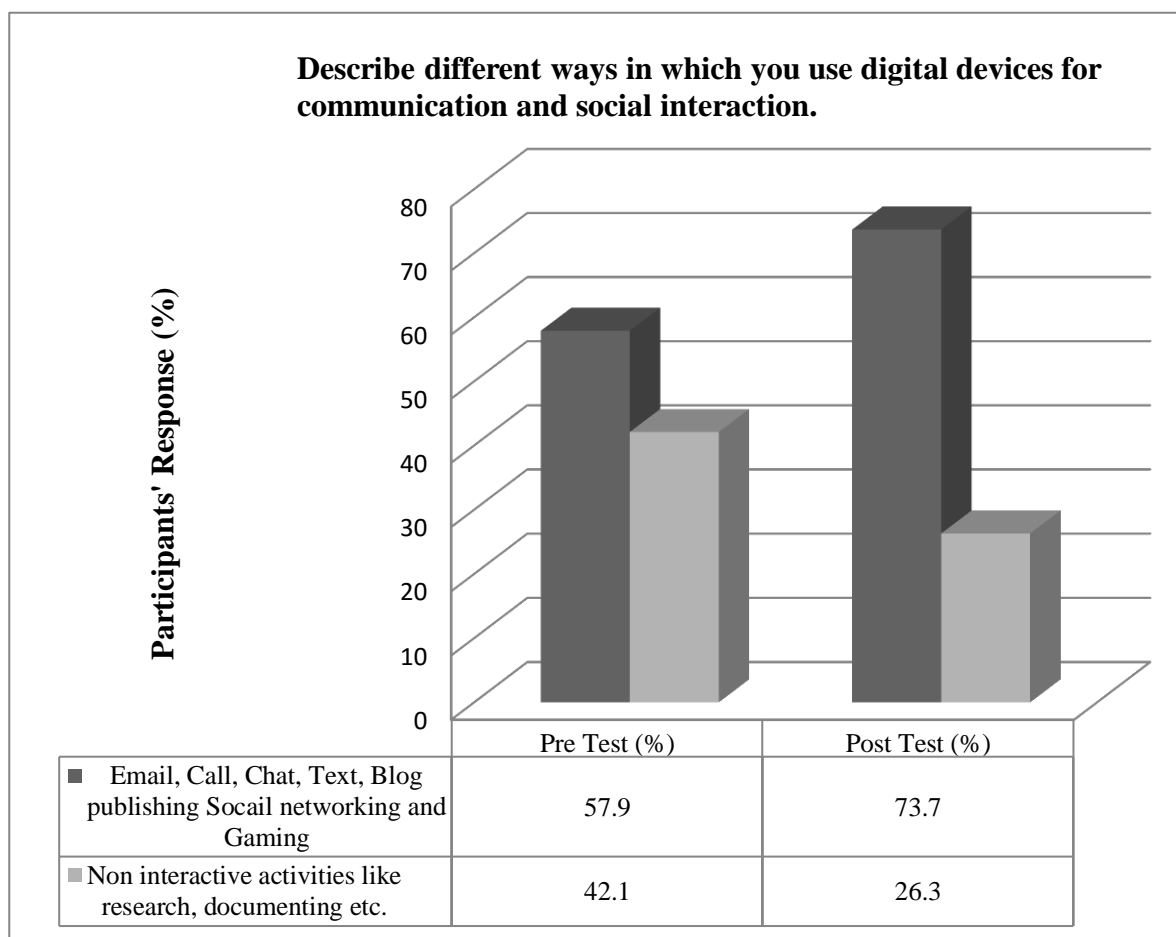
Figure 4.24 Pre and Post intervention participants' attitude about the use of digital devices for communication and social interactions

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[33] (Chi-square - χ^2 (9) = 17.92, p = .036)

4. <u>Classroom Scenario 1</u>: Based on the classroom scenario "Scolly had a fight with a friend. Scolly writes an email to tell the friend how upset he was, and he copies (cc) it to everyone in the class. How appropriate is Scolly's behaviour?". Participants were asked to rate the action of the student-Scolly on the scale of appropriateness. Prior to intervention 44.7% of participants rated Scolly's behaviour as absolutely inappropriate, 21.1% rated it neutral, and 21% rated it as appropriate (see Figure 4.25). There was a noticeable change in participants' ratings post-intervention where only 5.3% were neutral, and 2.6% rated it as absolutely appropriate. A significant difference was noted in the results[34]. The effect size of $r = 0.44$ suggested moderate, practical significance.

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[34] pre-test $M = 3.00$, $SD = 3.25$ and post -test $M = 1.79$, $SD = 1.07$; $t(37) = 2.94$, $p = .006$)

Scolly had a fight with a friend. Scolly writes an email to tell the friend how upset he was and he copies (cc) it to everyone in the class. How appropriate is Scolly's behaviour?

	Absolutely inappropriate (%)	Slightly inappropriate (%)	Inappropriate (%)	Neutral (%)	Appropriate (%)	Slightly appropriate (%)	Absolutely appropriate (%)
■ Pre Test	44.7	7.9	5.3	21.1	2.6	2.6	15.8
■ Post Test	55.3	21.1	15.8	5.3	0	0	2.6

Figure 4.25 Pre and Post intervention participants' attitude about sending an email while being angry in a situation

Students researched and created a comic book on cyberbullying to show their understanding of the topic (see Appendix G). The students watched the video link provided as a provocation for the lesson and read the articles on cyber bullying. Students borrowed books from the school library, including "Bully" by Patricia Polacco, "Cyber Bullying" by Rachel Stuckey and "Internet safety" to support their inquiry questions about cyberbullying. Moreover, extensive online research including real life videos of children being bullied and offline research through books and interviews led students to form an agreement within the class. Students agreed to look out for each other and not to be a cyberbully themselves by always displaying proper online and offline etiquette.

5. <u>Responding to a stranger online</u>: Participants' response to the question related to responding to an unknown sender ("You have received an email with an attachment from an unknown sender. What would you do?") showed a change in attitude following the intervention. Post-intervention, 86.8% of participants, indicated they would not respond to an email sent by unknown sender compared to 57.9% prior to the intervention (see Figure 4.26). The results indicated a significant difference and positive change in participants' action post intervention[35]. The effect size of $r = 0.51$ suggested moderate to high practical significance.

---

[35] (Wilcoxon signed rank test $Z = -2.84$, $p = .005$)

You have received an email with an attachment from an unknown sender. What would you do?

	Pre Test (%)	Post Test (%)
■ Appropriate reponse	57.9	86.8
■ Inappropriate response	42.1	13.2
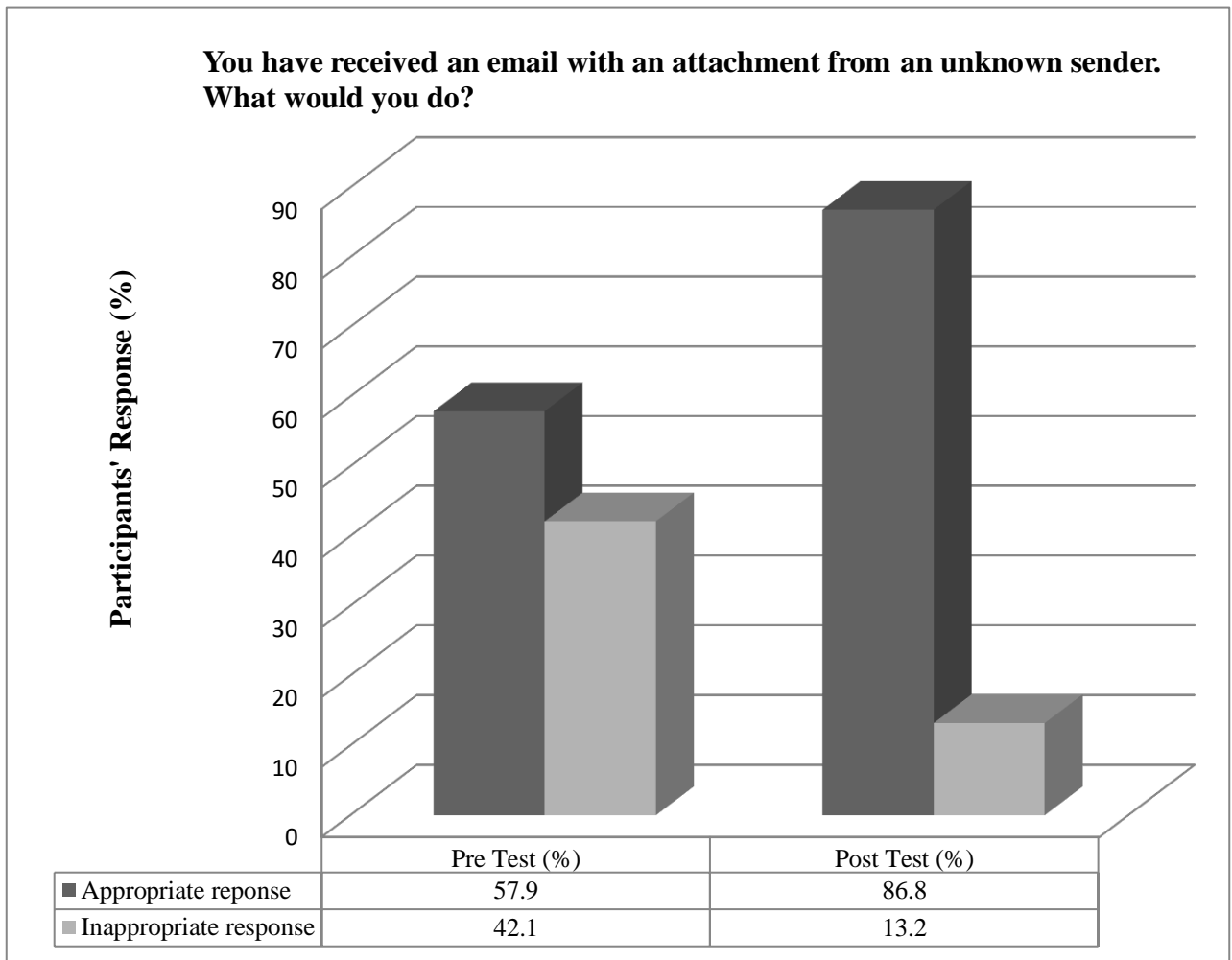
Figure 4.26 Pre and Post intervention participants' attitude towards responding to email from unknown sender

6. Connecting with strangers online: Participants' response to the question ("While communicating online using Skype, Gmail video, chat, etc. you would" 1. Be aware who you are talking to, 2. If you are not sure who you are talking to, tell an adult,3. Stop and report immediately if you feel uncomfortable and 4. All the above) about connecting with strangers through online services such as *Skype, Chat, and Gmail video client* displayed significant changes in participants' attitude post intervention. Prior to the intervention, 57.9 % of participants felt that talking to strangers online was acceptable. Pre-intervention the participants thought that by just having an awareness of with whom they were talking and continuing to chat was acceptable. However, there was a significant change in participants' perspective as nearly all participants (97.4%) agreed by the end of the intervention that talking to strangers was inappropriate (see Figure 4.27). The results indicated a statistically significant difference and a positive change in participants' response post intervention[36]. The effect size of $r = 0.82$ and suggested high practical significance.

---

[36] (Wilcoxon signed rank $Z = -4.58$, $p \leq .001$)

While communicating online using Skype, Gmail video, chat etc. you would (select one answer)

	Pre Test (%)	Post Test (%)
■ Correct	42.1	97.4
■ Incorrect	57.9	2.6
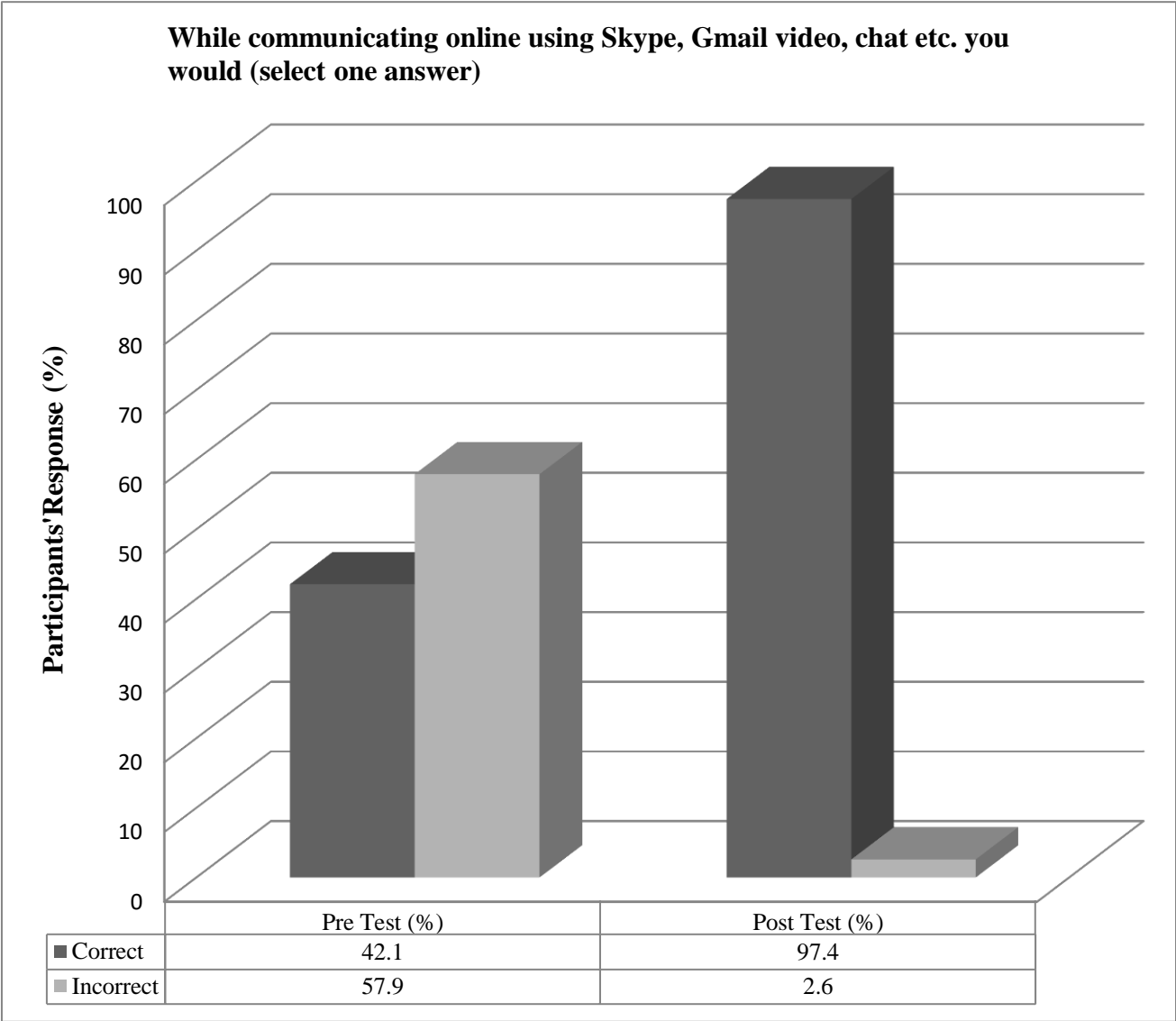
Figure 4.27 Pre and Post intervention participants' action while connecting with strangers online

7. <u>The language of communication with teachers</u>: Participants' attitude towards

    using short forms while communicating with the teacher for questions related

    to classroom learning changed significantly post intervention. Post-

    intervention nearly all participants (97.4%) agreed that it was inappropriate to

    use SMS abbreviation and language for formal communication compared to

    29% of participants prior to the intervention (see Figure 4.28). This is

    consistent with a significant difference in results[37]. The effect size of $r = 0.74$

    suggested high practical significance.

How appropriate is using the short form like CUL (see you later), ASAP (As soon as possible), etc. in your communication with your teacher regarding homework?

	Absolutely Inappropriate (%)	Slightly Inappropriate (%)	Inappropriate (%)	Neutral (%)	Appropriate (%)	Slightly Appropriate (%)	Absolutely Appropriate (%)
Pre Test	15.8	10.5	21.1	15.8	15.8	5.3	7.9
Post Test	71.1	21.1	5.3	0	2.6	0	0
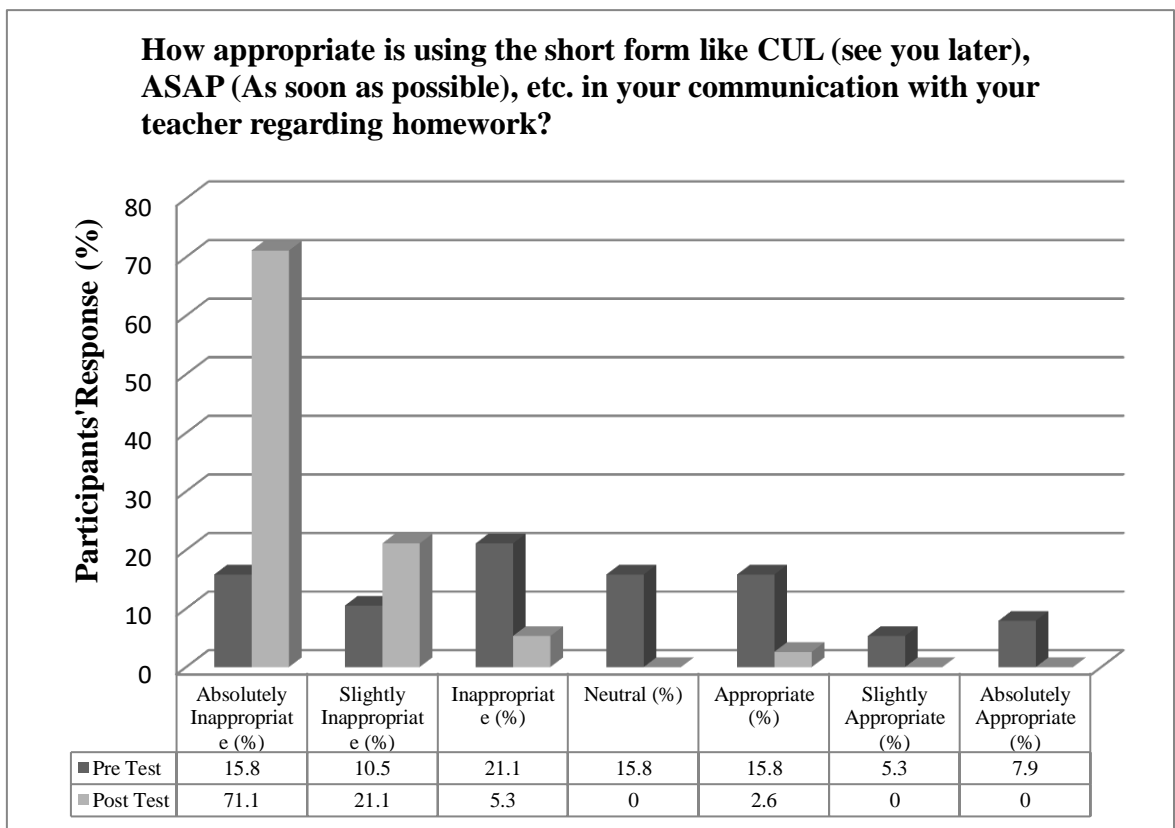
Figure 4.28 Pre and Post intervention partcipants' attitude about the use of appropriate language of communication with teacher

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[37] pre-test $M = 3.57$, $SD = 1.82$ and post -test $M = 1.46$, $SD = 0.85$; $t(34) = 6.46$, $p < .001$

4.2.4 Digital Literacy Findings

This section focuses on findings on Digital literacy skills and changes in participants' actions post interventions. Participants were asked six questions about their choices of the digital tools, elements of Digital literacy, copyright and their actions towards using materials under the copyright act.

1. <u>Usefulness of search engines:</u> Participants were asked to rate the usefulness of search engines based on their experience of research for a unit of Inquiry task. *Google* was rated as the most useful search engine both pre (68.4%) and post intervention (73.7%), compared to child-friendly *Google kids and Kids click* (see Figure 4.29). Paired *t*-tests found no significant difference between pre and post test results as noted below

- *Google* – The effect size of $r = 0.16$ suggested low practical significance [38].

- *Yahoo* - The effect size of $r = 0.07$ suggested trivial practical significance [39].

- *Google kids* -The effect size of $r = 0.10$ suggested low practical significance [40].

- *Kids Click* – The effect size of $r = 0.08$ suggested trivial practical significance [41].

- *Bing* – The effect size of $r = 0.10$ suggested low practical significance [42].

- *Ask* – The effect size of $r = 0.18$ suggested low practical significance [43].

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[38] pre-test $M = 67.79$ $SD = 45.06$ and post -test $M = 72.84$, $SD = 42.66$; $t(37) = -1.00$, $p = .324$

[39] pre-test $M = 16.61$, $SD = 33.17$ and post -test $M = 14.11$ $SD = 30.10$; $t(35) = .42$, $p = .676$

[40] pre-test $M = 29.52$, $SD = 42.60$ and post -test $M = 23.82$, $SD = 39.11$; $t(32) = .56$, $p = .575$

[41] pre-test $M = 14.07$, $SD = 29.64$ and post -test $M = 11.04$, $SD = 24.60$; $t(27) = .40$, $p = .696$

[42] pre-test $M = 15.47$, $SD = 31.72$ and post -test $M = 12.56$, $SD = 27.95$; $(t(31) = .56$, $p = .582$

[43] pre-test $M = 6.94$, $SD = 16.69$ and post -test $M = 12.91$, $SD = 27.85$; $t(31) = -1.01$, $p = .320$

How would you rate the usefulness of the following search engines for your research?

	Google Pre Test (%)	Google Post Test (%)	Yahoo Pre Test (%)	Yahoo Post Test (%)	Google Kids Pre Test (%)	Google Kids Post Test (%)	Kids Click Pre Test (%)	Kids click Post Test (%)	Bing Pre Test (%)	Bing Post Test (%)	Ask Pre Test (%)	Ask Post Test (%)
■ Excellent	68.4	73.7	13.2	10.5	23.7	18.4	7.9	7.9	10.5	10.5	2.6	10.5
■ Very good	21.1	18.4	18.4	18.4	10.5	13.2	13.2	7.9	21.1	15.8	18.4	18.4
■ Good	10.5	5.3	28.9	13.2	15.8	15.8	7.9	13.2	18.4	26.3	13.2	18.4
■ Okay	0	2.6	18.4	44.7	15.8	36.8	23.7	50	7.9	26.3	21.1	15.8
■ Not very good	0	0	10.5	7.9	15.8	7.9	7.9	5.3	18.4	7.9	13.2	13.2
■ Bad	0	0	2.6	2.6	5.3	0	13.2	7.9	5.3	7.9	10.5	15.8
■ Really bad	0	0	2.6	2.6	0	7.9	0	7.9	2.6	5.3	7.9	5.3

Figure 4.29 Pre and Post intervention participants' attitude about the usefulness of search engines

Some unplanned qualitative research was undertaken in the form of anecdotal evidence which was recorded as participants' conversations and in-class discussions during the intervention.

Participants expressed sentiments such as

"These search tools are supposed to make research easier because the search engines are for kids, but it does not even give us the information we need. Videos and photos are not so good as they are on Google".

Such sentiments were not only reflected by the study participants but also from other students across other year levels when the default search engine for the ICT lab computers was changed to the kids friendly version *Google kids* and *Kids click* for the week. The researcher observed that students opened up a new tab and used *Google* for their research. This observation provides an insight into participants' attitudes towards the child-friendly internet browsers.

2. <u>Preference towards presentation application:</u> In response to the question ("Which of the following services / programs do you use for the project presentation?") on preferred choice of application for presentations, a significant change was noted post intervention (see Figure 4.30). Participants were well versed with available programs and services, to facilitate the project presentations. A paired *t*-test was conducted to compare participants' usage of different programs for presentation and

Significant changes were found post-intervention for the following

- *Prezi* – The effect size of $r = 0.93$ suggested high practical significance [44].

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[44] $(t(37) = -15.63, p < .001)$

- *Cartoon Strip* – The effect size of $r = 0.78$ suggested high practical significance [45].

- *Blogs* – The effect size of $r = 0.35$ suggested moderate practical significance [46].

However, no significant differences were found post-intervention in terms of

- *Slide Share*– The effect size of $r = 0.06$ suggested trivial practical significance [47].

- *PowerPoint* –The effect size of $r = 0.28$ suggested low practical significance [48].

- *Animation* – The effect size of $r = 0.22$ suggested low practical significance [49].

- *Videos* – The effect size of $r = 0.09$ suggested trivial practical significance [50].

- *Mind maps* - The effect size of $r = 0.29$ suggested low practical significance [51].

- *Glogs* – The effect size of $r = 0.09$ suggested trivial practical significance [52].

[45] ($t(37) = -7.53, p < .001$)
[46] ($t(37) = -2.25, p = .031$)
[47] ($t(37) = 0.37, p = .711$)
[48] ($t(37) = -1.78, p = .083$)
[49] ($t(37) = -1.40, p = .169$)
[50] ($t(37) = -0.53, p = .600$)
[51] (t(37) = -1.87, p = .070)
[52] ($t(37) = .57, p = .57$)

Which of the following services / programs do you use for the project presentation? Tick all the ones that you have used

	Slide Share (%)	PowerPoint (%)	Prezi (%)	Animation (%)	Video (%)	Cartoon Strip (%)	Mind Maps (%)	Blogs (%)	Glogs (%)
■ Pre Test	13.2	68.4	10.5	13.2	57.9	5.3	50	55.3	5.3
▤ Post Test	10.5	84.2	97.4	26.3	63.2	65.8	68.4	76.3	2.6
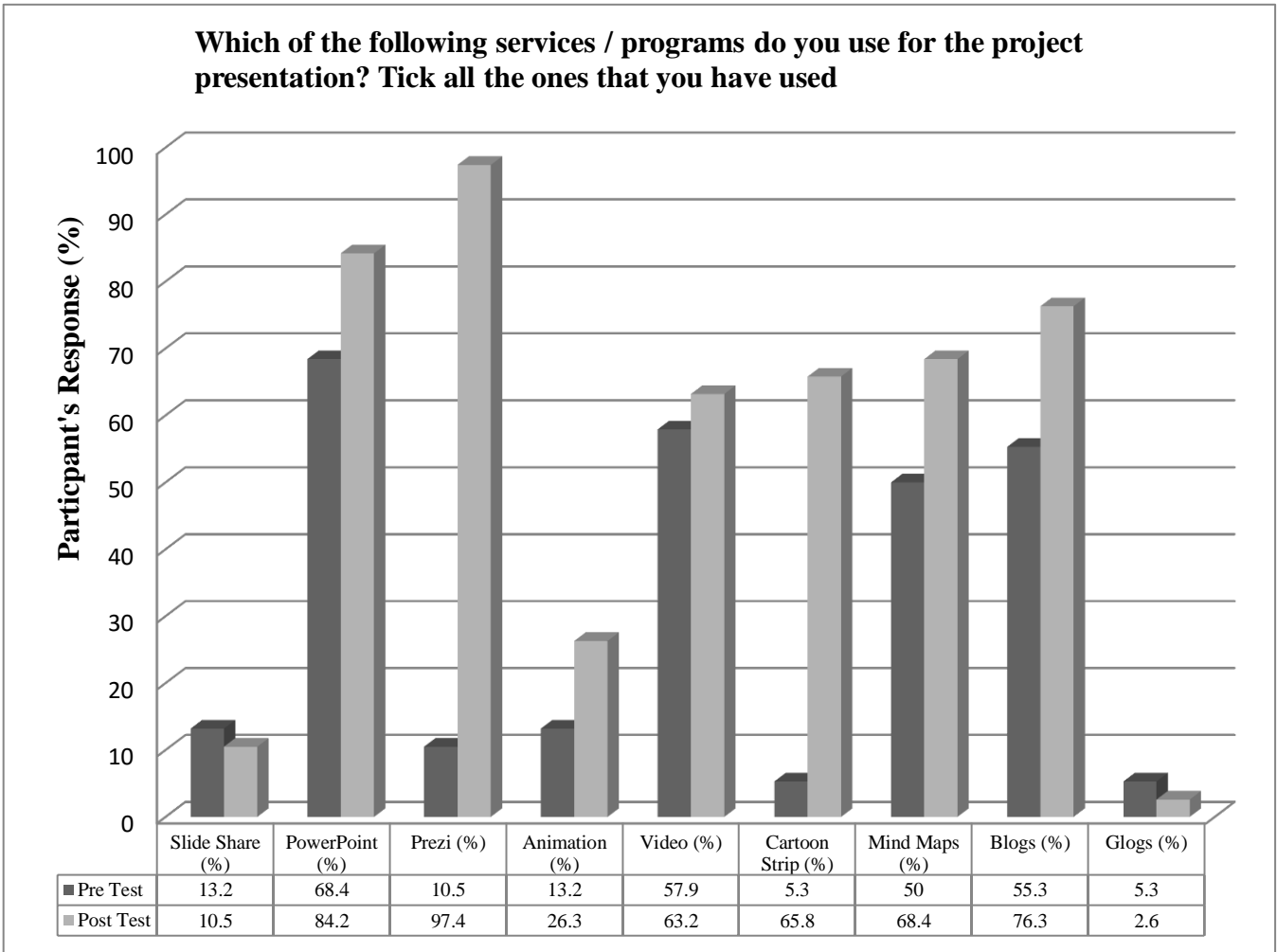
Figure 4.30 Pre and Post intervention participants' choice of programs and application used by participants for presentation

3. <u>Preference for note taking</u>: Similarly, there were significant differences noted in participants' responses to their choice of a note taking application. A paired *t*-test was conducted to compare participants' usage of different programs for the purpose of research and for note taking. Post-intervention a significant difference in usage by participants was found especially for the use of *Pages* and *Wiki*, which was preferred by almost double the number of participants for note taking post intervention (see Figure 4.31).

No significant differences were found post-intervention in terms of

- *Microsoft Word* - The result indicated Microsoft Word as a most preferred application for note taking[53]. The effect size of $r = 0.18$ suggested low practical significance.

- *Evernote* – The effect size of $r = 0.16$ suggested low practical significance[54] .

- *Notestar* – The effect size of $r = 0.00$ suggested negligible practical significance [55].

- *Notepad* – The effect size of $r = 0.09$ suggested trivial practical significance [56].

However, significant changes post-intervention were found in the following

- *Wiki* – The result indicated an increased preference for *Wiki* post-intervention [57]. The effect size of $r = 0.35$ suggested moderate practical significance.

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[53] ($t(37) = -1.14$, $p = .262$)
[54] ($t(37) = 1.00$, $p = .324$)
[55] ($t(37) = 0.00$, $p = .1.000$)
[56] ($t(37) = -0.53$, $p = .600$)
[57] ($t(37) = -2.30$, $p = .027$)

- Pages – The result indicated an increased preference for *Pages* post-intervention [58]. The effect size of $r = 0.43$ suggested moderate practical significance.

Which of the following programs / services do you use for note taking and research? Tick all the ones that you have used.

	Microsoft word (%)	Pages (%)	Evernote (%)	Notestar (%)	Wiki (%)	Notepad (%)
Pre Test	86.8	13.2	2.6	2.6	47.4	26.3
Post Test	94.7	42.1	0	2.6	71.1	31.6
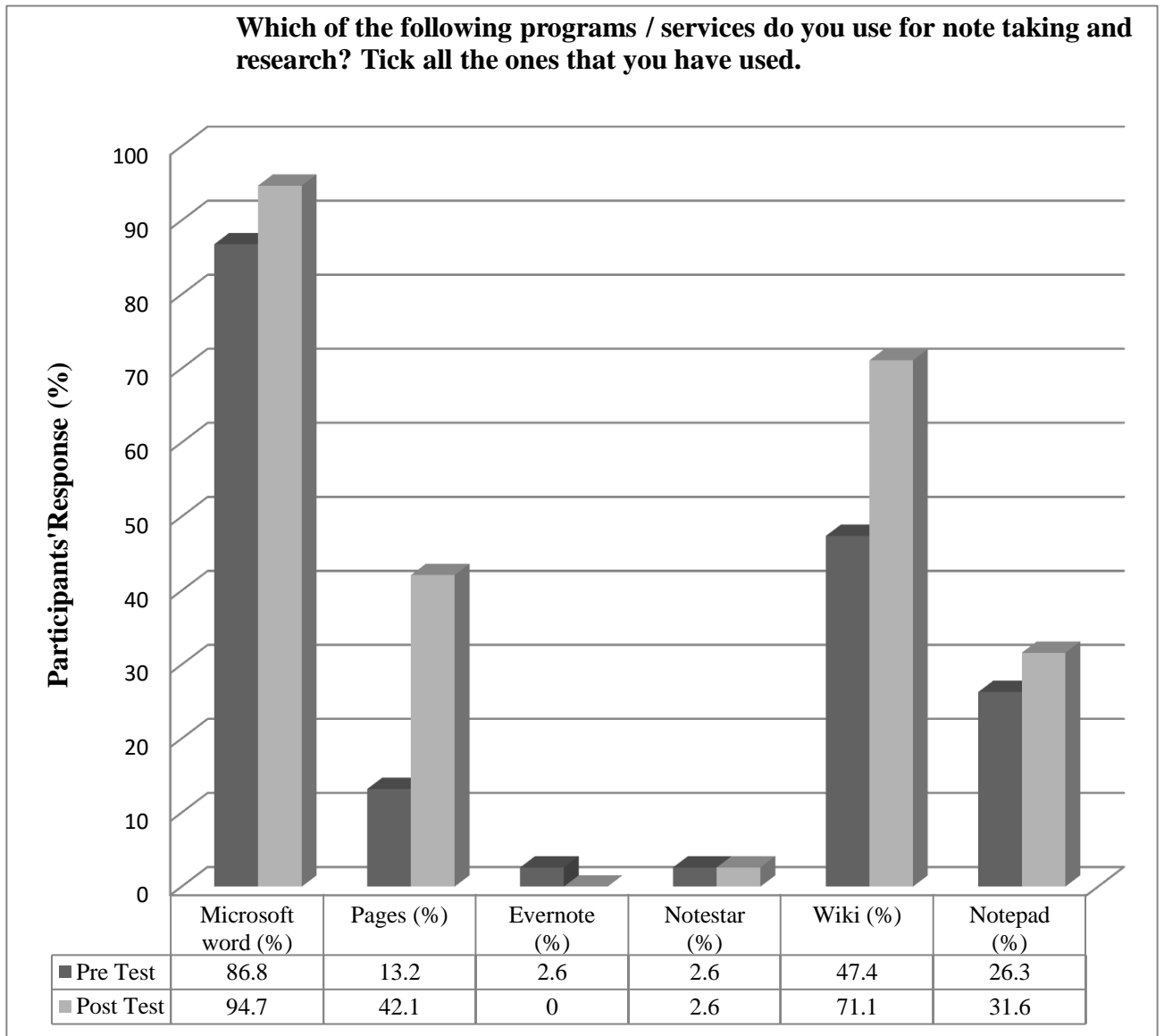
Figure 4.31 Pre and Post intervention participants' preferred application for note taking and research

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[58] ($t(37) = -2.92$, $p = .006$)

4. Exploring new tools of self-expression: In response to a scenario ("Chang has been given a task to create a diary using normal word processing software. He would like to try something new for creating the diary. What should Chang do?") about the appropriate approach to explore a new tool for a class assignment the participants' attitude changed positively after the intervention. Post-intervention, 94.7% of participants, suggested that the student should discuss tools to be used with the teacher regarding the assignment, although pre-intervention 76.3% of participants had believed the same (see Figure 4.32). The change in attitude is consistent with a significant difference in the results[59] and effect size of $\varphi = 0.42$. The result indicated moderate, practical significant as $p < 0.05$ and $\varphi \geq 0.5$.

Chang has been given a task to create a diary using normal word processing software. He would like to try something new for creating the diary. What should Chang do?

	Correct (%)	Incorrect (%)
Pre Test	76.3	23.7
Post Test	94.7	5.3
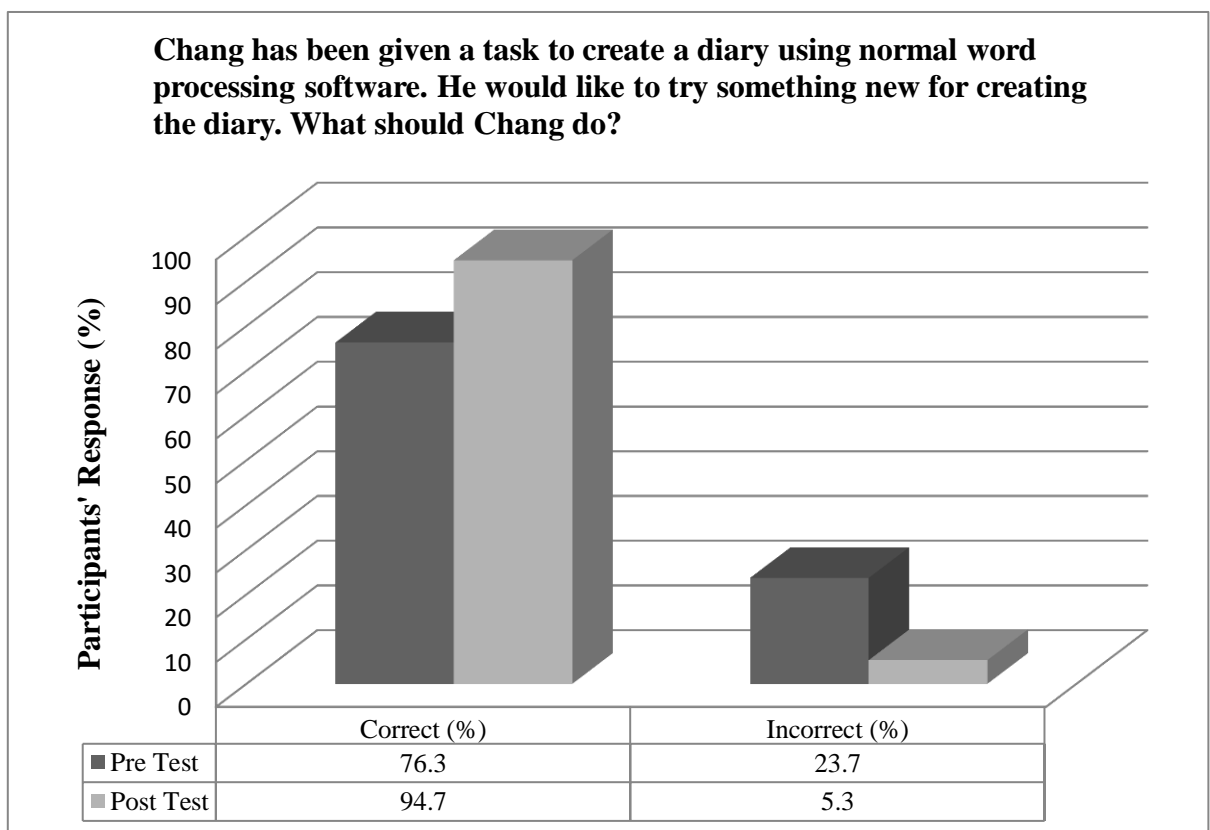
Figure 4.32 Pre and Post intervention participants' attitude about exploring Digital literacy tools

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[59] (Chi-square test - $\chi2$ (1) = 6.80, p = .009

5. Elements of Digital Literacy: Participants were asked to rate according to the level of importance the different elements of Digital literacy tools while expressing their thoughts and views on the topic (i.e. "Which of the following elements of Digital literacy are important to you for the expression of your views and thoughts on a topic."). Prior to intervention, participants were unaware of the role that different elements play in publishing work in the digital format. However, post-intervention participants rated Text (39.5%), Alignment (26.3%), Colour, and size of font (36.8%), Pictures and Tables (39.5%), Audio (36.8%) and Video (31.6%) as extremely important (see Figure 4.33).

 Significant changes post-intervention were found for the following

- Text related to the topic – The results indicated increased importance post-intervention[60]. The effect size of $r = 0.62$ suggested high practical significance.

- Alignment of document – The results indicated increased importance post-intervention[61]. The effect size of $r = 0.64$ suggested high practical significance.

- Colour and size of fonts- The results indicated a change in the level of importance st-intervention [62]. The effect size of $r = 0.46$ suggested moderate practical significance.

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[60](pre-test $M = 3.58$, $SD = 1.62$ and post -test $M = 5.85$, $SD = 1.15$; $t(32) = -4.50$, $p < .001$)

[61] (pre-test $M = 4.09$, $SD = 1.75$ and post -test $M = 5.34$, $SD = 1.72$; $t(27) = -4.35$, $p < .001$)

[62] (pre-test $M = 3.84$, $SD = 1.48$ and post -test $M = 3.87$, $SD = 1.42$; $t(31) = -2.89$, $p = .007$)

- Pictures and Tables – The results indicated a change in the level of importance post-intervention[63]. The effect size of $r = 0.46$ suggested moderate practical significance.

- Audio – The results indicated a change in the level of importance post-intervention [64]. The effect size of $r = 0.30$ suggested moderate practical significance.

However, no significant change post intervention was recorded for

- Video – The result indicated no significant change in the level of importance post-intervention[65]. The effect size of $r = 0.20$ suggested low practical significance.

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[63] (pre-test $M = 4.22$, $SD = 1.68$ and post -test $M = 5.56$, $SD = 1.59$; $t(31) = -2.9$, $p = .005$)

[64] (pre-test $M = 4.61$, $SD = 1.56$ and post -test $M = 5.16$, $SD = 1.92$; $t(30) = -1.73$, $p = .094$)

[65] ($M = 5.00$, $SD = 1.66$ and post -test $M = 5.37$, $SD = 1.47$; $t(29) = -1.08$, $p = .291$)

Which of the following elements of Digital literacy are important to you for the expression of your views and thoughts on a topic.
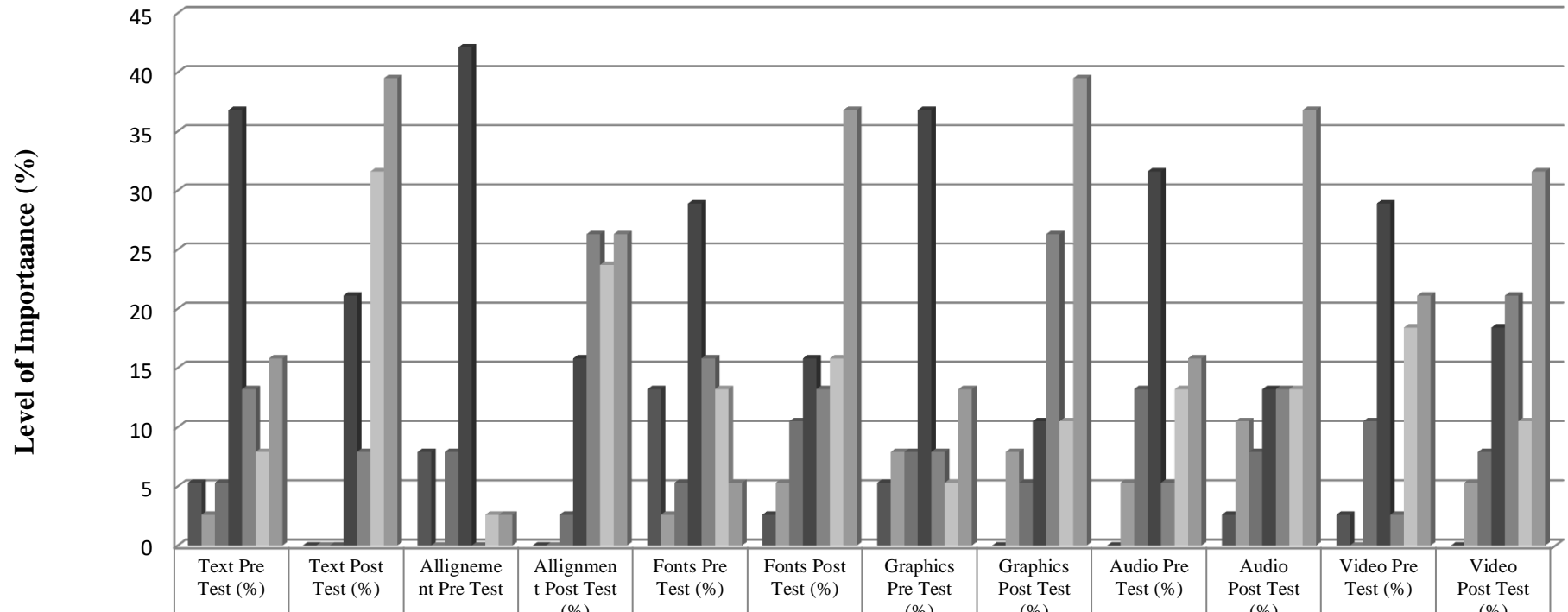
	Text Pre Test (%)	Text Post Test (%)	Allignement Pre Test	Allignment Post Test (%)	Fonts Pre Test (%)	Fonts Post Test (%)	Graphics Pre Test (%)	Graphics Post Test (%)	Audio Pre Test (%)	Audio Post Test (%)	Video Pre Test (%)	Video Post Test (%)
■ Not at all important	5.3	0	7.9	0	13.2	2.6	5.3	0	0	2.6	2.6	0
■ Somewhat important	2.6	0	0	0	2.6	5.3	7.9	7.9	5.3	10.5	0	5.3
■ Slightly important	5.3	0	7.9	2.6	5.3	10.5	7.9	5.3	13.2	7.9	10.5	7.9
■ Neutral	36.8	21.1	42.1	15.8	28.9	15.8	36.8	10.5	31.6	13.2	28.9	18.4
■ Moderately important	13.2	7.9	0	26.3	15.8	13.2	7.9	26.3	5.3	13.2	2.6	21.1
■ Very important	7.9	31.6	2.6	23.7	13.2	15.8	5.3	10.5	13.2	13.2	18.4	10.5
■ Extremely important	15.8	39.5	2.6	26.3	5.3	36.8	13.2	39.5	15.8	36.8	21.1	31.6

Figure 4.33 Pre and Post intervention participants' attitude about the important elements of digital literacy

6. <u>Copyright 1</u>: There was a significant change in participants' attitude post-intervention in response to a question related to work being qualified for protection under copyright law. The majority (76.3%) of participants felt that the original work was eligible for copyright post-intervention compared to 39.5% participants pre-intervention (see Figure 4.34). There was a significant and positive change in participants' attitude towards copyright law and originality of work post intervention[66]. The effect size of $r = 0.51$ suggested high practical significance.
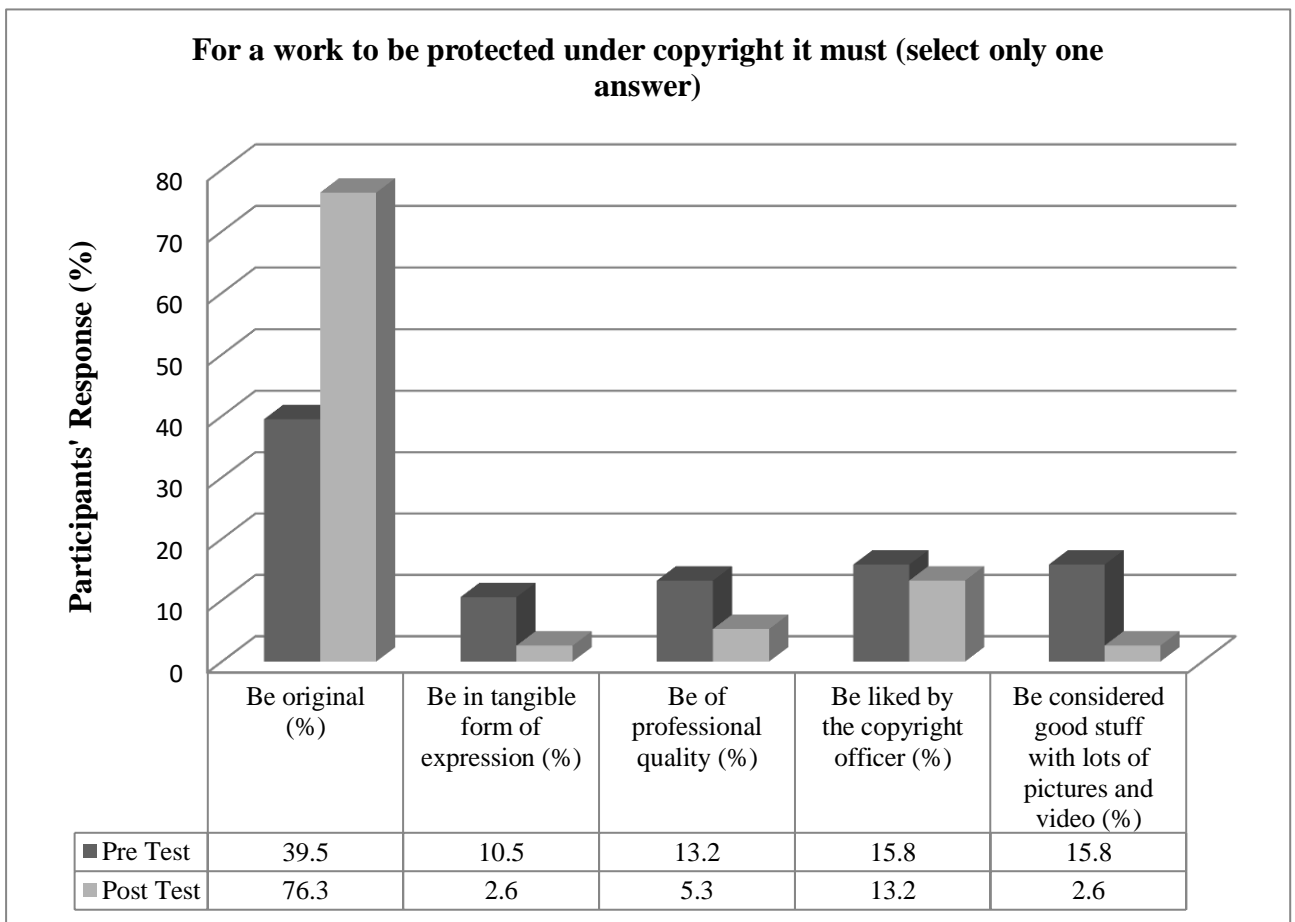
Figure 4.34 Pre and Post intervention participants' knowledge of the criteria for copyright

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[66] (Wilcoxon signed rank test $Z = -2.86$, $p = .004$)

7. <u>Copyright 2</u>: Similarly, in response to the scenario "Rini has found a cool music album, and she wants to extract the background music using music editing software for her school project. What should Rini do?" there was a significant difference in participants' attitude post intervention in regards to the educational use of materials protected by copyright law for school projects (see Figure 4.35). Post-intervention, 86.8% of participants, responded that students should seek permission from the original creator of music to use it for their projects. The results indicated a noteworthy difference and constructive change in participant's attitude[67]. The effect size of $r = 0.55$ suggested high practical significance.

Rini has found a cool music album and she wants to extract the background music using music editing software for her school project. What should Rini do?

	Correct (%)	Incorrect (%)
Pre Test	57.9	42.1
Post Test	86.8	13.2
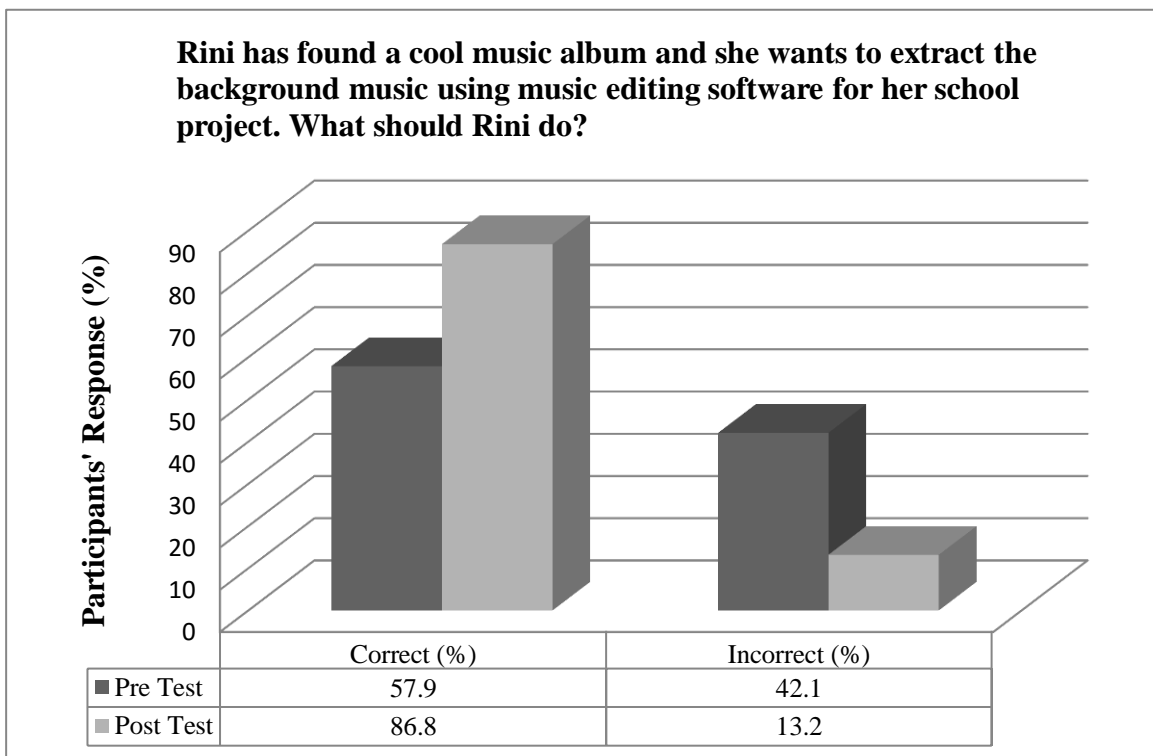
Figure 4.35 Pre and Post intervention participants' attitude about appropriate use of music for the class project

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[67] (Wilcoxon Signed rank test $Z = -3.05$, $p = .002$)

4.2.5 Digital Etiquette Findings

Participants were asked six questions about digital etiquette, including classroom scenarios to gauge their understanding of digital etiquette skills pre and post intervention.

1. <u>Digital Etiquette online:</u> Participants responded positively to questions about device connected to online services, and they were more likely to display digital etiquette post-intervention (see Figure 4.36). Prior to the intervention, 52.6% of participants felt that devices connecting to online services did not require users to display net etiquette skills. Chi-square failed to reveal any statistically significant results[68]. However, by the end of the intervention, there was a significant and positive change in participants' views as nearly all participants' (97.4%) agreed that digital etiquette was required. The effect size of $r = 0.16$ suggested low practical significance.

Does any device connecting to online services require users to display net etiquette skills?

	Correct (%)	Incorrect (%)
■ Pre Test	47.4	52.6
■ Post Test	97.4	2.6
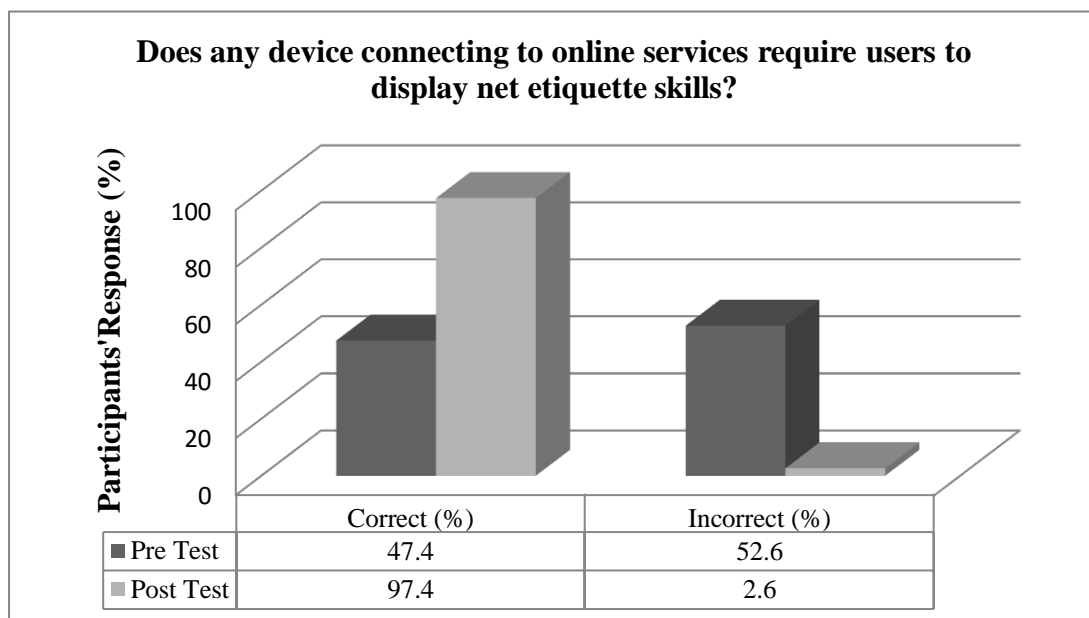
Figure 4.36 Pre and Post intervention participants' knowledge of requirements for

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[68] Chi- Square test ($\chi^2 (1) = 0.92$, $p = .34$)

2. <u>Personal Digital Etiquette</u>: Participants were asked the importance of digital/net etiquette skills while working on digital devices. Pre- intervention just over one-quarter (26.3 %) of participants rated this as not at all important, 7.9% of participants rated its slightly important and 23.7% of participants were indifferent towards net etiquette skills (see Figure 4.37). Post-intervention there was a significant difference and positive change in participants' attitudes as 41.7% of participants indicated that net etiquette skills were extremely important, 28.9% felt they were very important, 18.4 % thought they were moderately important, and 5.3% rated them as slightly important[69]. The effect size of $r = 0.75$ suggested high practical significance.

How important are net etiquette skills for you?

	Not at all important (%)	Somewhat important (%)	Slightly important (%)	Neutral (%)	Moderately important (%)	Very important (%)	Extremely important (%)
Pre Test (%)	26.3	7.9	0	23.7	23.7	18.4	0
Postest (%)	0	0	5.3	0	18.4	28.9	41.7

Figure 4.37 Pre and Post intervention participants' attitude about the importance of digital etiquette skills

[69](pre-test $M = 3.66$, $SD = 1.91$ and post -test $M = 6.13$, $SD = 1.07$; $t(37) = -7.0$, $p < .000$)

3. <u>Digital Etiquette for others in society</u>: Similarly, participants were questioned about the importance of Digital Citizenship skills for anyone using the digital devices, a frequent user of the internet, Tech expert, Adults and celebrity (i.e., "How important is it for following people to display good Digital Citizenship skills?" see Figure 4.38). The findings in each category indicated significant differences in participant's perceptions about the importance of being a good Digital Citizen irrespective of who they were.

Significant changes post-intervention were found for the following in regards to the level of importance of Digital Citizenship skills.

- Anyone using digital devices - 47.4 % of participants rated it as extremely important, 26.3 % of participants rated as very important, 7.9 % of participants as moderately important and 15.8% of participants rated as neutral [70]. The effect size of $r = 0.68$ suggested high practical significance.
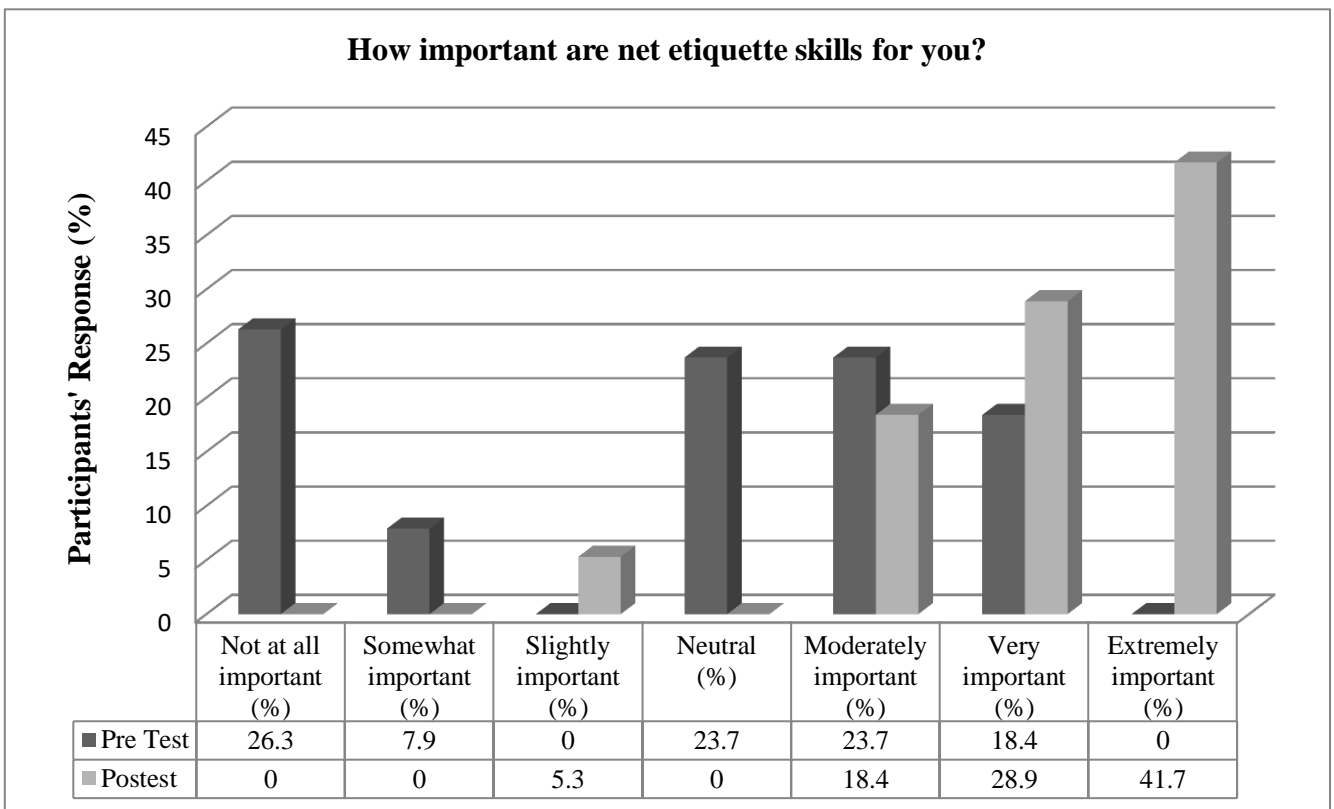
- Frequent internet user - 47.4 % of participants rated it as extremely important, 26.3 % of participants as very important, 13.2 % of participants rated as moderately important and 5.3% of participants rated as neutral [71]. The effect size of $r = 0.58$ suggested high practical significance.

- Tech Expert -55.3 % of participants rated it as extremely important, 18.4 % of participants rated as very important, 2.6 % of participants rated as moderately

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[70] (pre-test $M = 4.03$, $SD = 1.91$and post -test $M = 6.00$, $SD = 1.2$; t (37) = -5.63, $p <$ .0001)
[71](pre-test $M = 4.34$, $SD = 1.91$ and post -test $M = 5.95$, $SD = 1.39$; $t(37)$ = -4.35, $p <$ .0001)

important and 18.4% of participants rated as neutral [72]. The effect size of $r = 0.20$ suggested moderate practical significance.

- An adult - 55.3 % of participants rated it as extremely important, 15.8 % of participants rated as very important, 13.2 % of participants rated as moderately important and 10.5% of participants as neutral [73]. The effect size of $r = 0.55$ suggested high practical significance.

- Celebrity -57.9 % of participants rated it as extremely important 10.5 % of participants rated as very important, 13.2 % of participant rated as moderately important and 10.5% of participants rated as neutral[74]. This is indicated by the effect size of $r = 0.55$ suggested high practical significance.

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[72](pre-test $M = 4.76$, $SD = 2.16$ and post -test $M = 5.95$, SD = 1.48; $t(37) = -2.88$, $p <$ .0009)

[73] (pre-test $M = 4.42$, $SD = 1.84$ and post -test $M = 5.95$, $SD = 1.51$; $t(37) = -4.02$, $p <$ .0001)

[74] (pre-test $M = 4.47$, $SD = 1.96$ and post -test $M = 6.05$, $SD = 1.27$; $t(37) = -4.05$, $p <$ .0001)

How important is it for following people to display good Digital Citizenship skills?

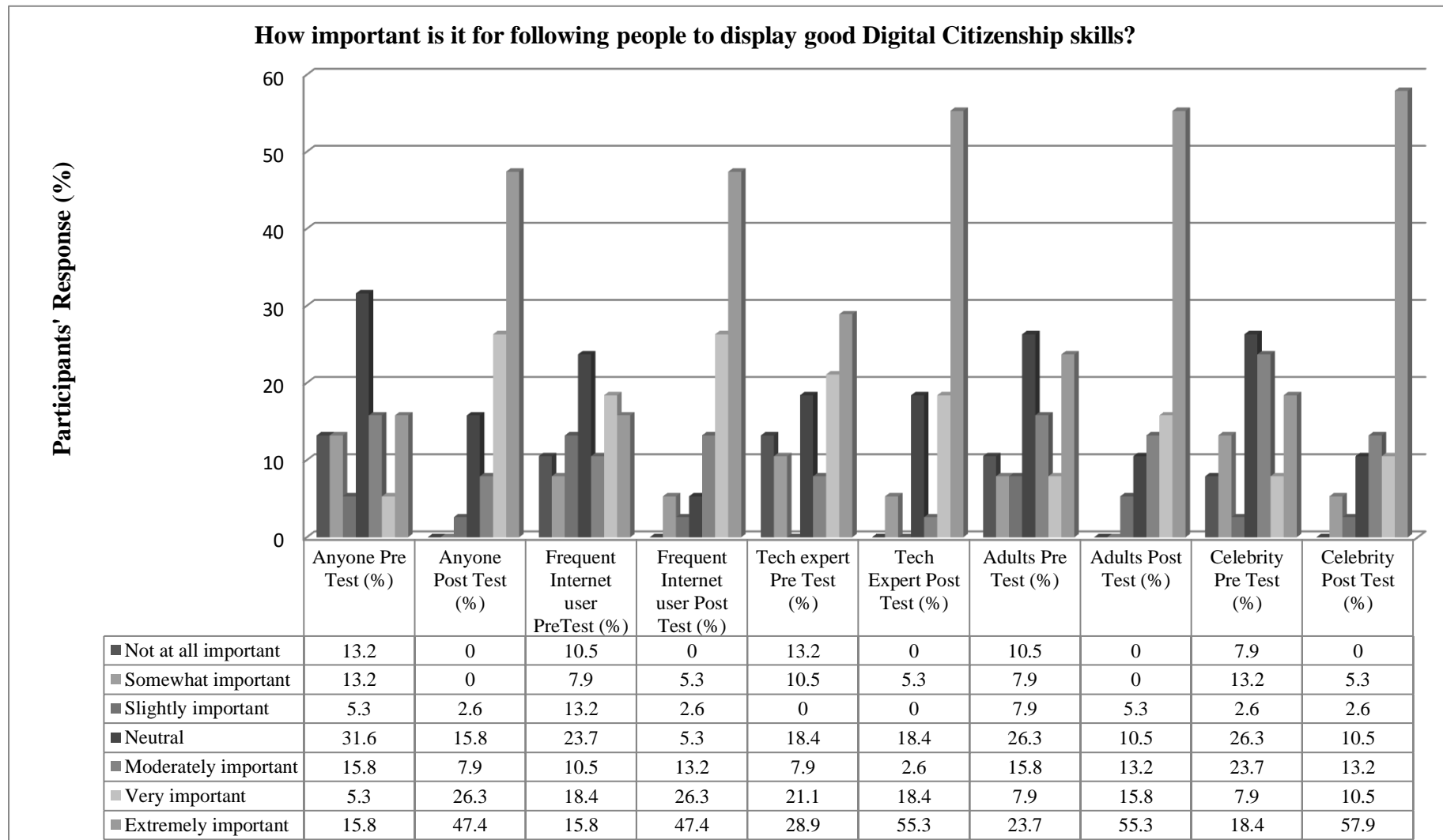|	Anyone Pre Test (%)	Anyone Post Test (%)	Frequent Internet user PreTest (%)	Frequent Internet user Post Test (%)	Tech expert Pre Test (%)	Tech Expert Post Test (%)	Adults Pre Test (%)	Adults Post Test (%)	Celebrity Pre Test (%)	Celebrity Post Test (%)
■ Not at all important	13.2	0	10.5	0	13.2	0	10.5	0	7.9	0
■ Somewhat important	13.2	0	7.9	5.3	10.5	5.3	7.9	0	13.2	5.3
■ Slightly important	5.3	2.6	13.2	2.6	0	0	7.9	5.3	2.6	2.6
■ Neutral	31.6	15.8	23.7	5.3	18.4	18.4	26.3	10.5	26.3	10.5
■ Moderately important	15.8	7.9	10.5	13.2	7.9	2.6	15.8	13.2	23.7	13.2
■ Very important	5.3	26.3	18.4	26.3	21.1	18.4	7.9	15.8	7.9	10.5
■ Extremely important	15.8	47.4	15.8	47.4	28.9	55.3	23.7	55.3	18.4	57.9

Figure 4.38 Pre and Post intervention participants' understanding about display of a good Digital Citizenship skills by members of our society

During the intervention, participants had a brainstorming session before they began their individual research on digital etiquette. Participants debated whether digital or net etiquette was limited to online behaviour or was also required to be displayed offline. One noteworthy comment made by a participant in response to whether helping others working on the computer was or was not an appropriate etiquette; "You should only help others when they ask for it, not just go and do things for them if you see them struggling". The quote and discussion by participants indicated that participants were conscious of their etiquette both online and offline and they wanted to ensure that they were using appropriate etiquette at all times.

4. <u>Digital Etiquette in the class 1</u>: Post-intervention there was a significant change noted in participants' attitude in response to the Digital Etiquette scenario "John's cell phone rings during the lesson, so he should choose an appropriate action, 1. Pick up the phone and answer the call in the class, 2. Excuse himself to pick up the phone, 3. Ignore the ringing phone and 4.Switch off the phone".   Post-intervention, 63.2% of participants', responded that they would not pick up the phone during the lesson and so would display good digital etiquette compared to 42.1% prior to the intervention (see Figure 4.39). The positive change in participants' attitude[75] and the effect size of $\varphi = 0.54$ indicated high practical significant as $p < 0.05$ and $\varphi \geq 0.5$.

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[75] (Chi-square $\chi^2(1) = 11.12$, $p \leq .001$)

John's cell phone rings during the lesson, so he should

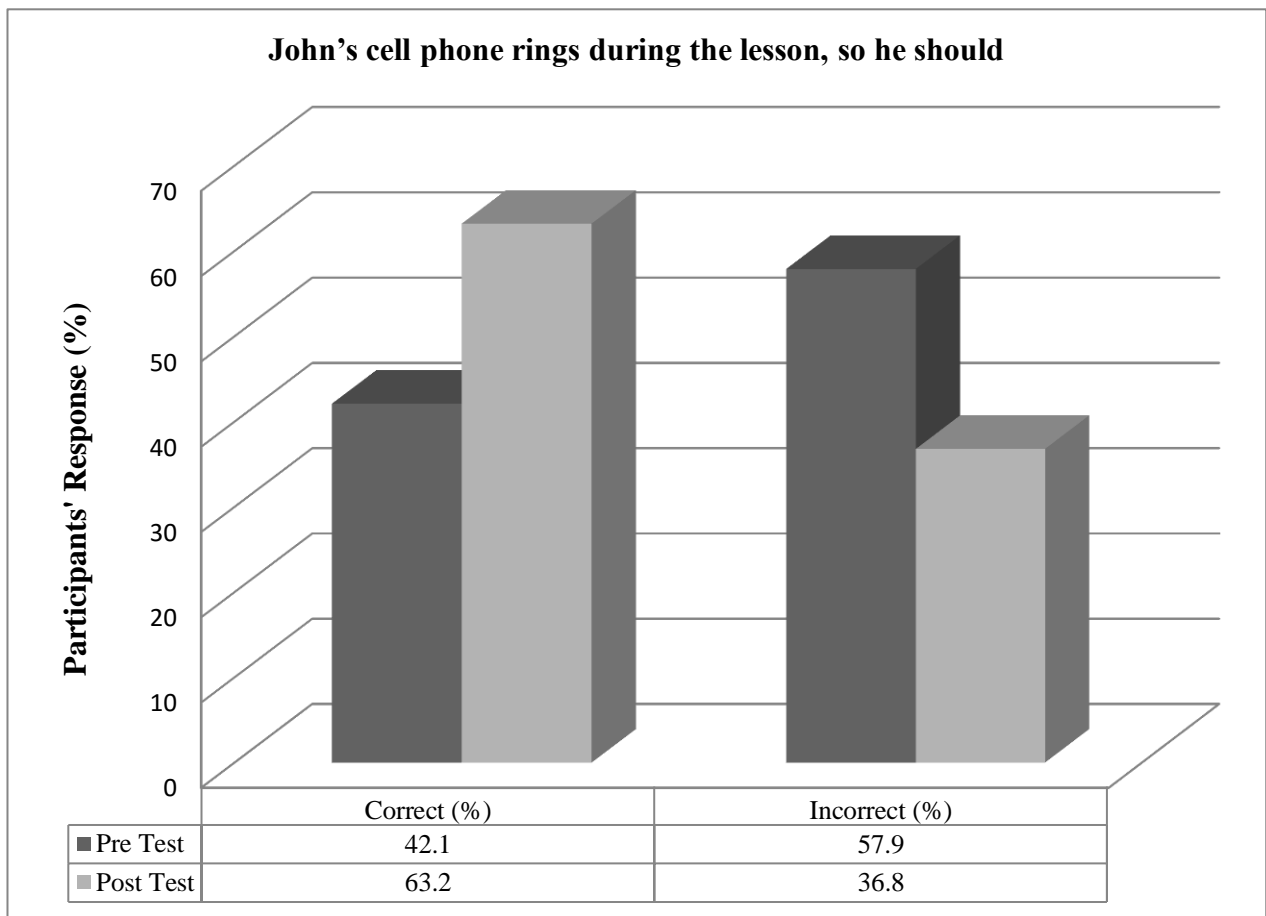|	Correct (%)	Incorrect (%)
■ Pre Test	42.1	57.9
■ Post Test	63.2	36.8

Figure 4.39 Pre and Post intervention participants' attitude about the action taken by participant if the phone is ringing during lesson

5. Digital Etiquette in the class 2: In response to the scenario "Anthony has a camera phone, and he would like to use it for learning in class, so he should 1. Secretly takes the photos of instruction given in class for later use, 2.uses the phone keyboard to type the instruction, 3. Request permission from the teacher to allow him to use the camscanner functions to digitize the instruction, 4. Offers to email scanned images of instruction to his friends so that they do not need to write them down." In response, 97.4% of participants post intervention thought that Anthony should use the right digital etiquette skill and ask for permission from a teacher before using a smartphone for learning (see Figure 4.40). The positive change in participants' attitude post-intervention is indicted by a significant difference in the pre- and post-intervention results[76]. The effect size of $r = 0.60$ suggested high practical significance.

Anthony has a camera phone and he would like to use it for learning in class, so he should

	Pre Test (%)	Post Test (%)
■ Appropriate Digital Etiquette	68.4	97.4
■ Inappropriate Digital Etiquette	31.6	2.6

Participants' Response (%)

Figure 4.40 Pre and Post intervention participants' attitude about the use of smartphone for learning

[76] (Wilcoxon signed rank test $Z = -3.32$, $p \leq .001$)

4.2.6 Digital Law Findings

1. <u>Accessing unattended email account</u>: There was a significant change in participants'
   responses to the scenario "A family member forgot to log out of his/ her Gmail
   account, and you would like to check your emails - What would you do 1. first check
   his/her Gmail account to see who he/she has been communicating with, 2. Log
   him/her out and Login using your account and check the emails and 3. Change his/her
   password to teach him/her a lesson".   Prior to the intervention, 36.8% of participants
   responded with an inappropriate action, such as checking the email received by a
   family member and would operate their email. However, this changed post
   intervention as 100% of participants indicated they would log the family member out
   of the email account (see Figure 4.41). The positive change in participants' responses
   is indicated by a significant difference in the pre- and post-intervention results[77]. The
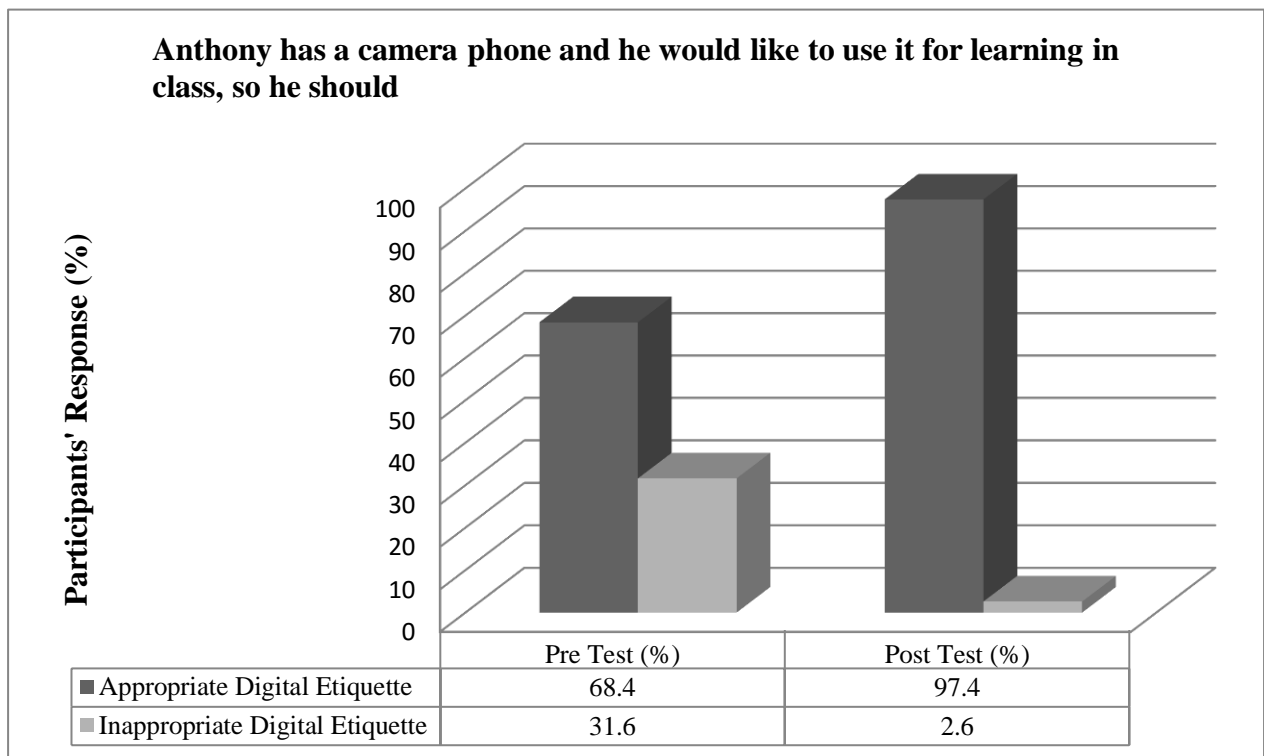   effect size of $r = 0.67$ suggested high practical significance.

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[77] (Wilcoxon signed rank test $Z = -3.74$, $p \leq .001$)

A family member forgot to log out of his/her Gmail account and you would like to check your emails- What would you do

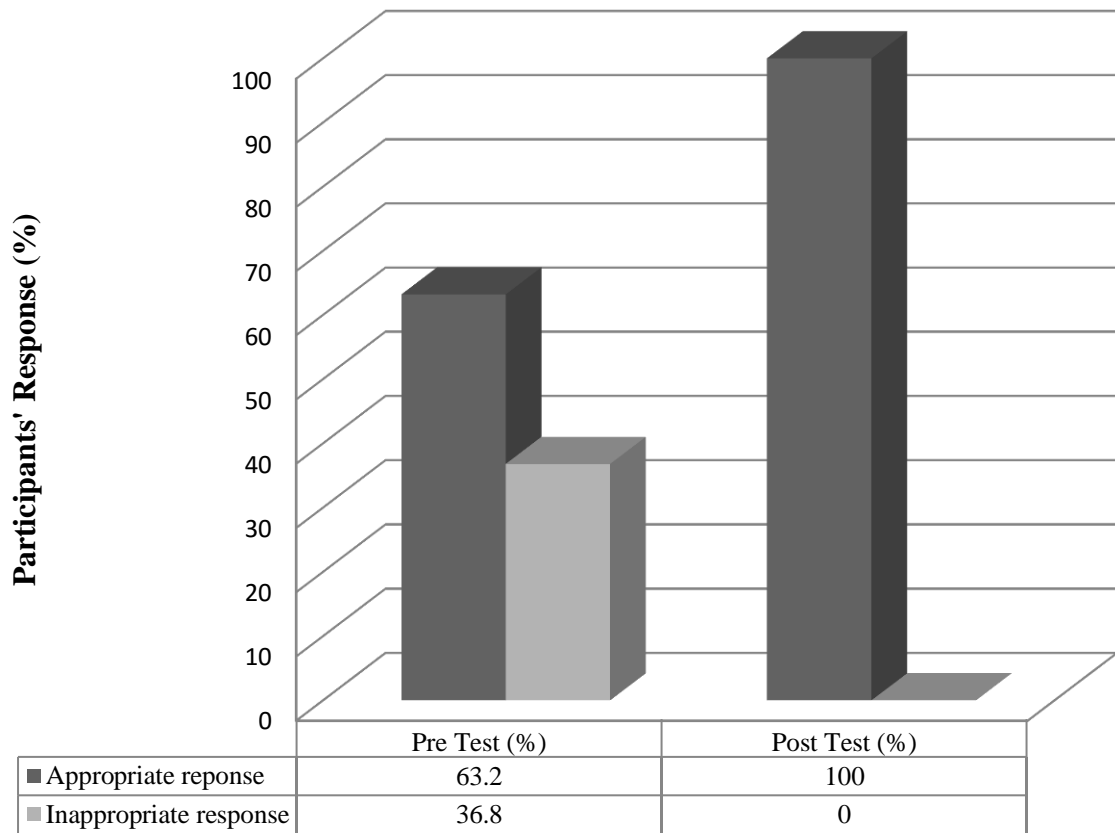|	Pre Test (%)	Post Test (%)
■ Appropriate reponse	63.2	100
■ Inappropriate response	36.8	0

Figure 4.41 Pre and Post intervention participants' action towards the unattended Gmail account

2. Child protection law: The participants' understanding of online child protection law did not change significantly post intervention. However, post intervention 52.6% of participants agreed that children are protected by the child protection law (see Figure 4.42). A paired samples *t*-test failed to reveal a statistically reliable difference in knowledge levels pre and post-intervention[78]. This may have been related to the noticeable change in the number of participants (13.2%) disagreeing with this statement post intervention. The effect size of $r = 0.19$ suggested low practical significance.
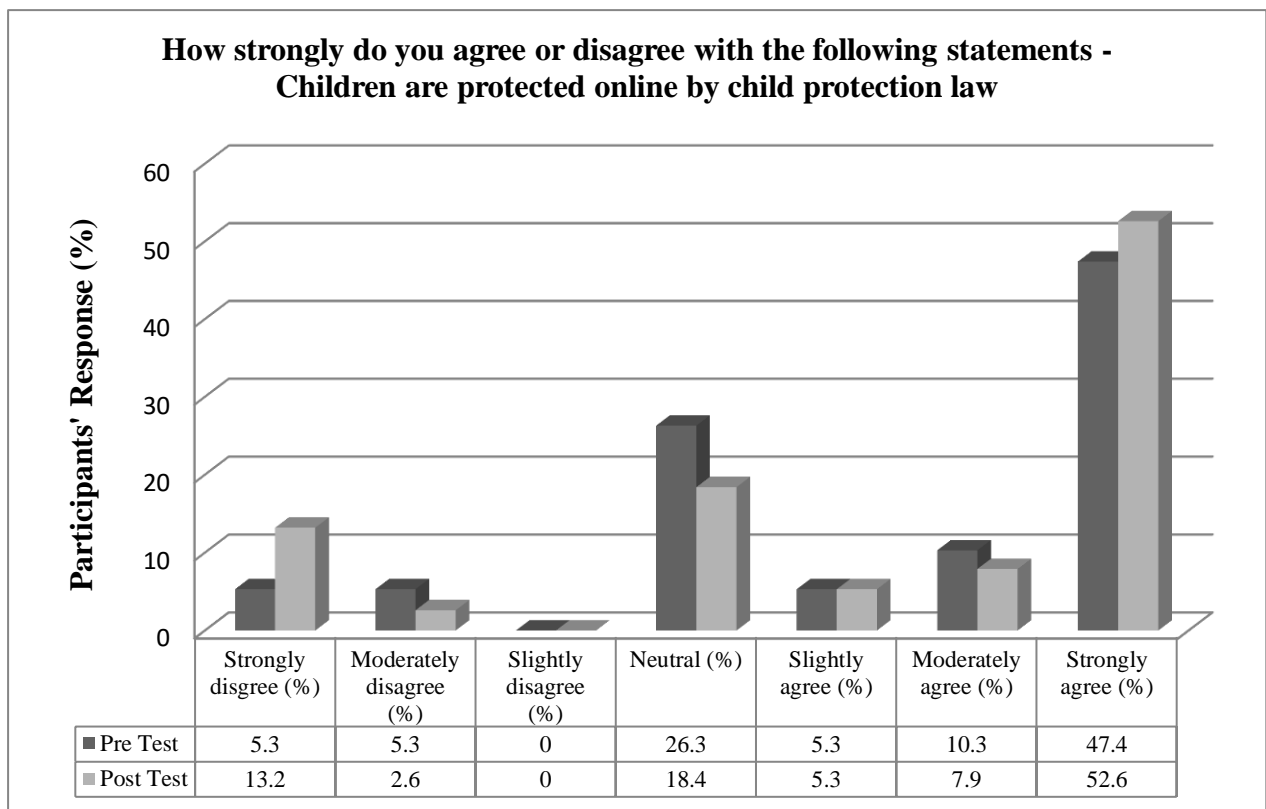
How strongly do you agree or disagree with the following statements - Children are protected online by child protection law

	Strongly disgree (%)	Moderately disagree (%)	Slightly disagree (%)	Neutral (%)	Slightly agree (%)	Moderately agree (%)	Strongly agree (%)
Pre Test	5.3	5.3	0	26.3	5.3	10.3	47.4
Post Test	13.2	2.6	0	18.4	5.3	7.9	52.6

Figure 4.42 Pre and Post intervention participants' knowledge of the child protection law

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[78] (pre-test $M = 5.42$, $SD = 1.87$ and post –test $M = 5.32$, $SD = 2.17$; $t(38) = .22$, $p = .829$)

4.2.7 Digital Rights and Responsibilities Findings

This section covers the findings based on participants' responses to seven questions targeting appropriate use, responsible actions, and copyright law.

1. <u>Frustration with the digital device</u>: Participants' responses to the scenario "Jerry is not sure how the mouse works, and he becomes upset when he tries to click open a program. What would Jerry do? 1. Ask for help, 2. Bang the mouse as it is not doing what he wants it to, 3. Stop using the mouse and 4. Complain that nothing works " changed post-intervention. Prior to the intervention, 10.5% of participants did agree with Jerry's frustrated reaction while working with the mouse (see Figure 4.43). However, post-intervention all the participants' (100%) were in agreement that the best option in such a situation was to ask for help. The change in participants' attitude was significant[79] and the effect size of $r = 0.36$ suggests moderate practical significance.

Jerry is not sure how the mouse works and he becomes upset when he tries to click open a program. What would Jerry do?

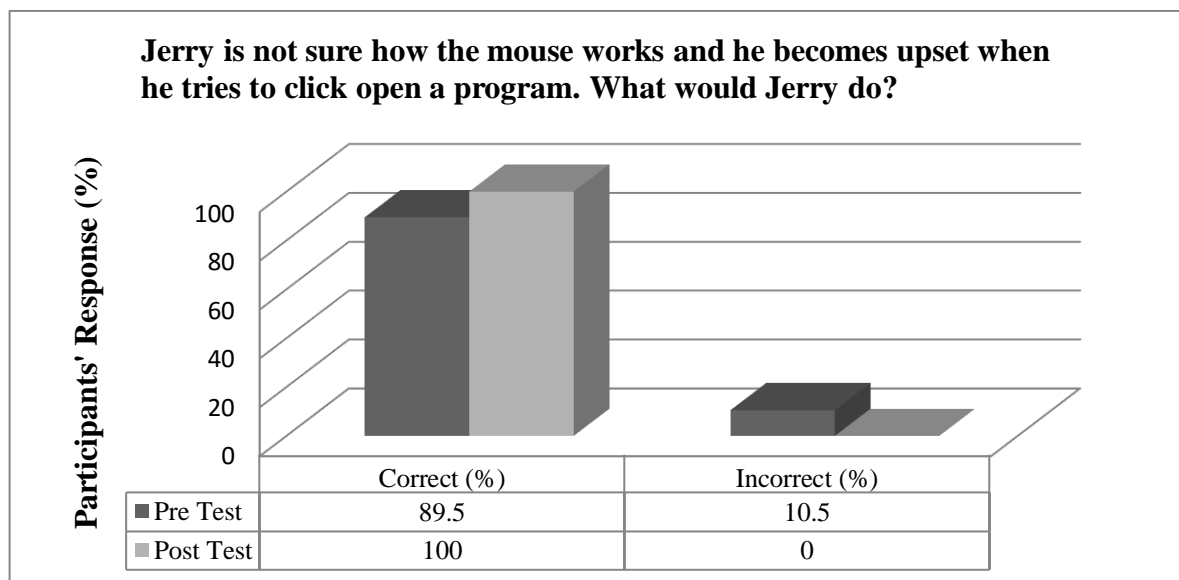|	Correct (%)	Incorrect (%)
Pre Test	89.5	10.5
Post Test	100	0

Figure 4.43 Pre and Post intervention participants' attitude about being frustrated when digital device does not work

[79] (Wilcoxon signed rank test $Z = -2.00$, $p = .046$)

2. Appropriate / Inappropriate online activity: Post-intervention, all participants in response to the scenario "You are researching on your UOI topic, and something inappropriate turns up when you click on a website that showed up in the searches. What would you do? 1. Quietly tell your friends to check it out, 2. Tell the teacher or adult and report the website as a security breach, 3. Close the website and explore it later and 4. Keep quiet about it", indicated that they would take an appropriate action. Post intervention 100 % of participants indicated that they would close the inappropriate website if it pops up accidentally while working on the computer (see Figure 4.44). A significant difference and positive change in participants' decisions[80] had an effect size of $r = 0.54$ and suggested high practical significance.
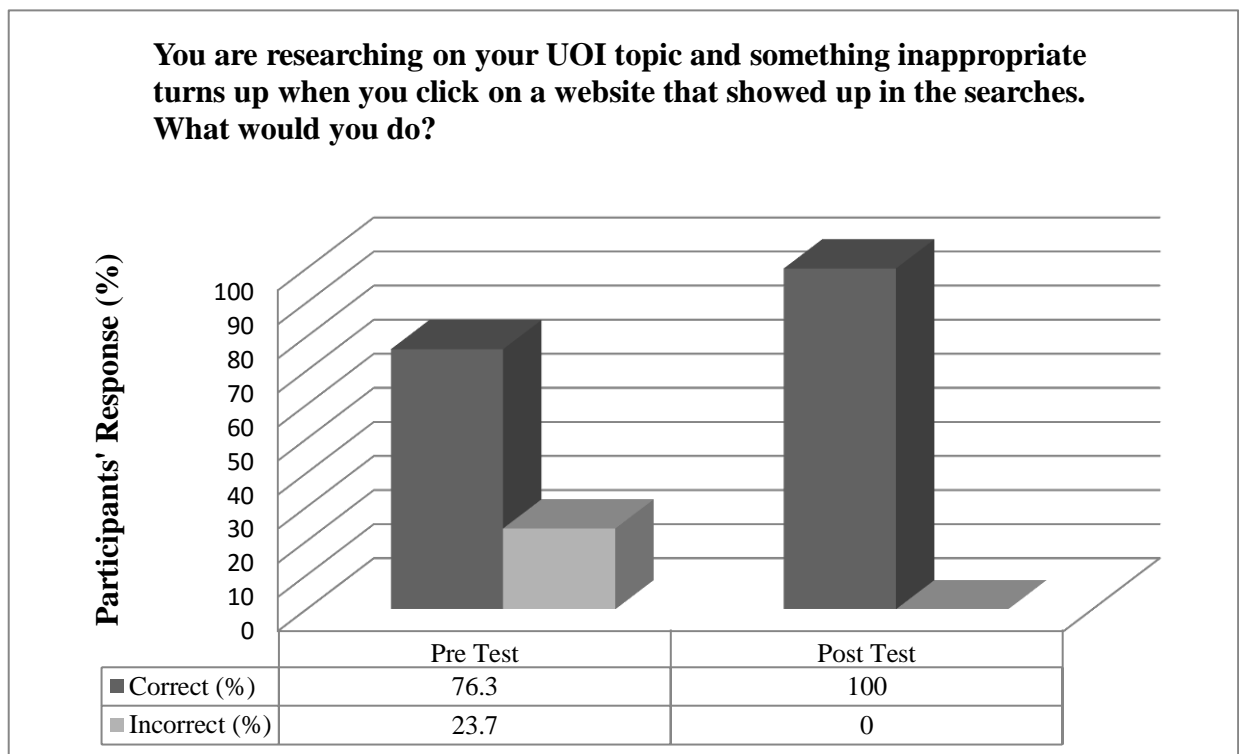

You are researching on your UOI topic and something inappropriate turns up when you click on a website that showed up in the searches. What would you do?

	Pre Test	Post Test
■ Correct (%)	76.3	100
■ Incorrect (%)	23.7	0

Figure 4.44 Pre and Post intervention participants' attitude about the action taken upon accidental encounter with inappropriate websites

_____

[80] (Wilcoxon signed rank test $Z = -3.00$, $p = .003$)

3. Antivirus Notification: Post-intervention in response to the scenario "An antivirus

    software message pops up while watching online video saying that the Antivirus has

    stopped working due to a security threat. What would be your next step? 1. Ignore

    the message and keep watching the video, 2.Delete the message, 3.Report it to your

    teacher or an adult and 4. Try and explore the situation yourself" participants

    indicated that they would take appropriate action if antivirus software on the computer

    that they were working on had stopped protection. Post-intervention 89.5% would

    notify the teacher about the antivirus notification compared to 60.5% prior to

    intervention (see Figure 4.45). The change in participants attitude post-intervention

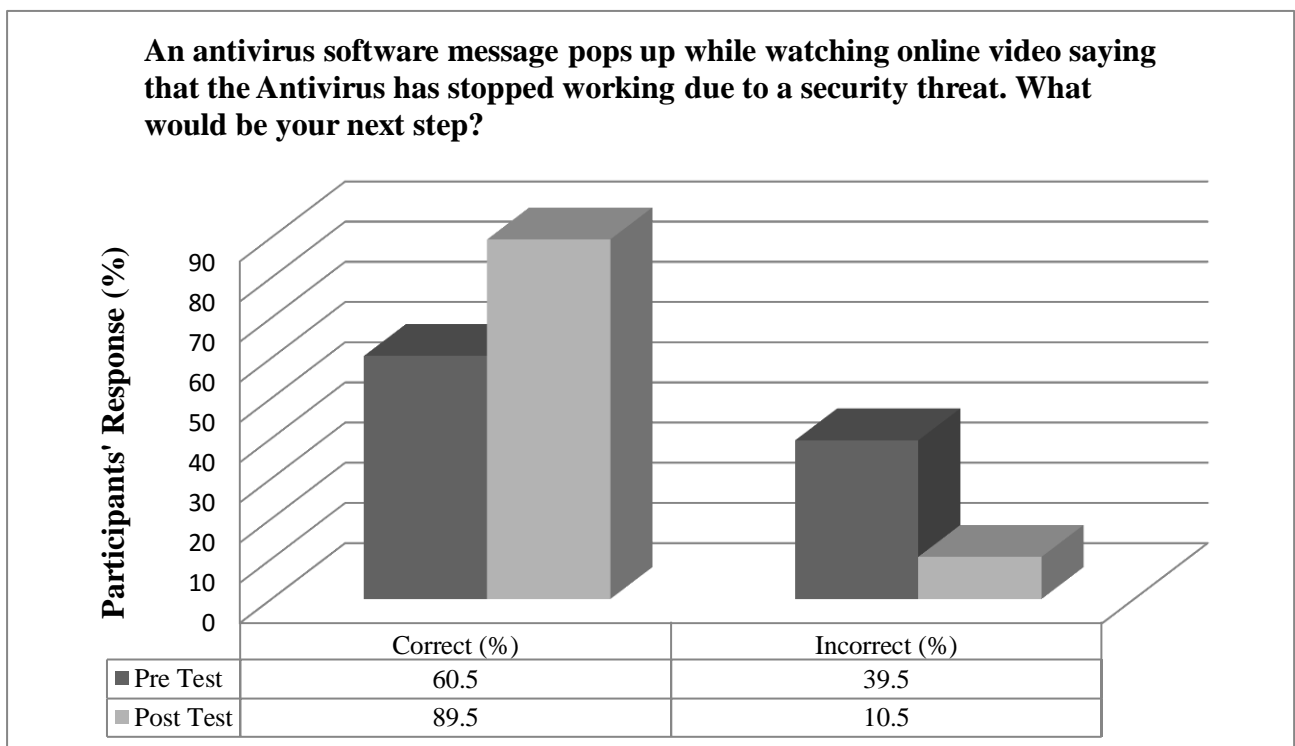   was a significant[81]. The effect size of $r = 0.51$ suggested high practical significance.

An antivirus software message pops up while watching online video saying that the Antivirus has stopped working due to a security threat. What would be your next step?

	Correct (%)	Incorrect (%)
Pre Test	60.5	39.5
Post Test	89.5	10.5

Figure 4.45 Pre and Post intervention participants' attitude about the Antivirus notification

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[81] (Wilcoxon signed rank test $Z = -2.84$, $p = .005$)

4. <u>Work on public domain</u>: Participants' responses to questions about the work in the
    public domain did not show that there were any significant changes in the
    participants' understanding of copyright related to work in the public domain pre- and
    post-intervention. Though there was a difference in the participants' understanding of
    work in the public domain post intervention, it was not major as 71.1% of participants
    were still unclear about what public domain means (see Figure 4.46). A paired *t*-test
    failed to reveal any significant difference for change in participants' understanding[82].
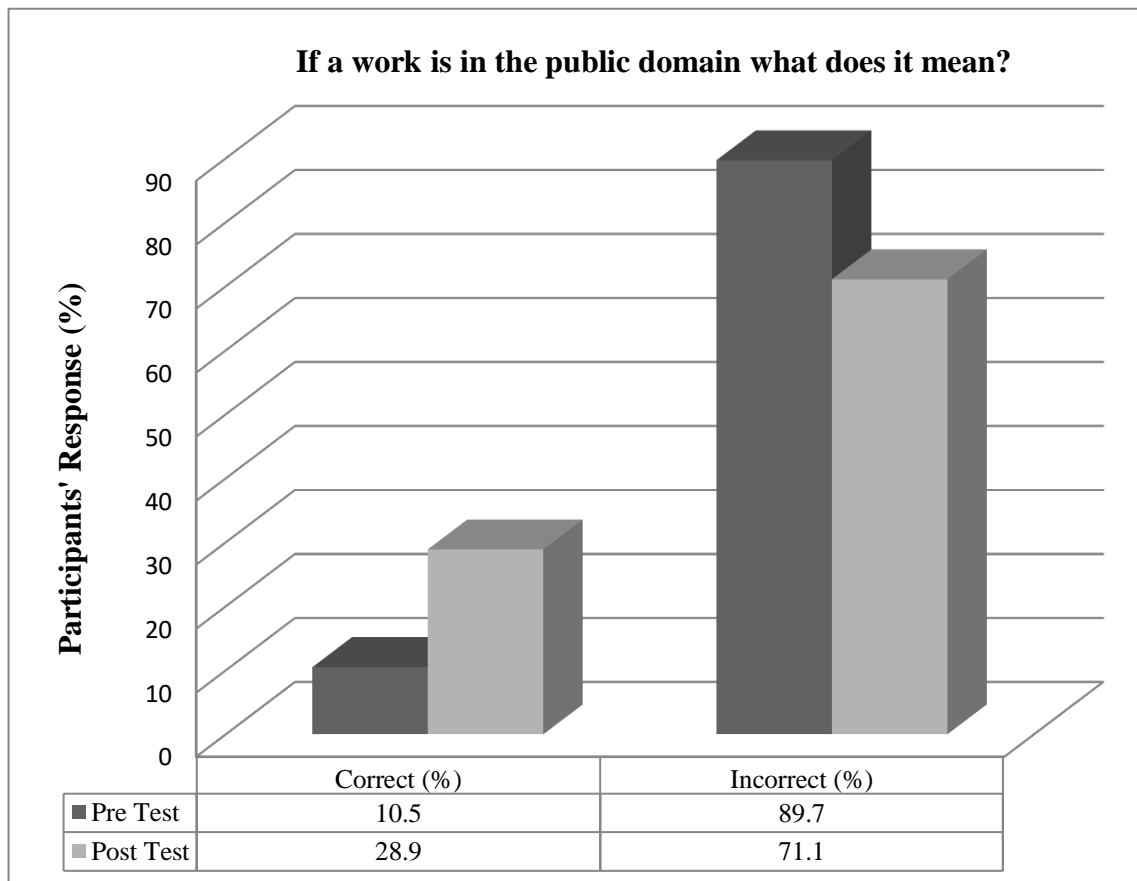   The effect size of $r = 0.13$suggested low practical significance.

If a work is in the public domain what does it mean?

	Correct (%)	Incorrect (%)
Pre Test	10.5	89.7
Post Test	28.9	71.1

Figure 4.46 Pre and Post intervention participants' knowledge of the work on public
domain

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[82] ($t(29) = -.68$, $p = .500$)

5. <u>Right to publish</u>: Post-intervention, there was a significant change in participants' responses to the question "Who owns the rights to publish a book written by a child? Select one answer 1. Parent, 2. The school, 3. Child, 4. The publishing company and 5. The person who pays for publishing the book'' regarding the rights to publish. Nearly all (92.1%) of participants post-intervention agreed that the child owns the right to publish his or her work by the end of the intervention compared to 15.8% prior to the intervention (see Figure 4.47). An increased understanding of participants' knowledge about copyright was significant[83]. The effect size of $r = 0.97$ suggested high practical significance.
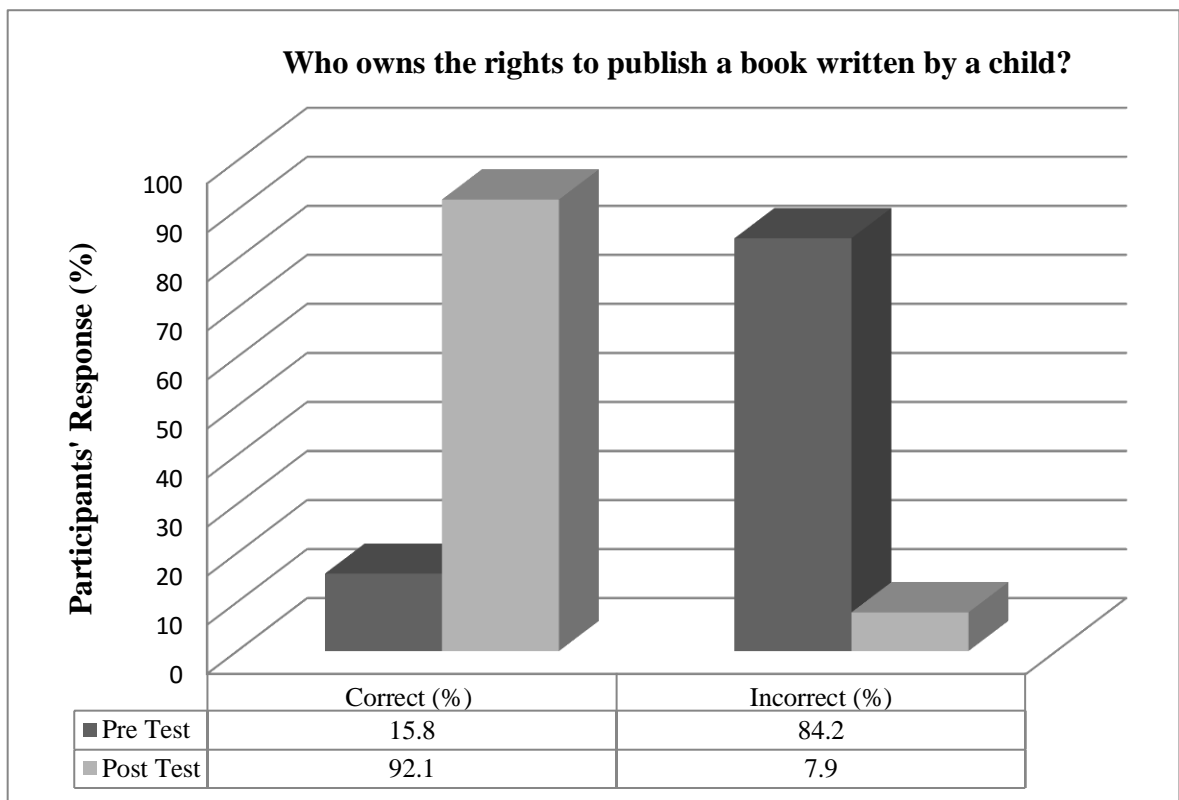
Who owns the rights to publish a book written by a child?

	Correct (%)	Incorrect (%)
■ Pre Test	15.8	84.2
■ Post Test	92.1	7.9

Figure 4.47 Pre and Post intervention participants' knowledge of the Rights to publish the book written by the child

[83] (Wilcoxon signed rank test $Z = -5.39$, $p \leq .001$)

6. <u>Responsibility towards copyrighted material</u>: Participants' were asked to anticipate the action taken by them in if they were the owner of the latest edition of the most popular children's series such as *Harry Potter* or *Dairy of Whimpy kid.* Prior to the intervention, participants felt that photocopying or renting a book for personal gain was an appropriate action (see Figure 4.48). However, by the end of the intervention, 71.1% of participants indicated that they were not likely to photocopy and distribute it for free. Nearly half (44.7%) of participants indicated that they were not likely to photocopy and sell it.Similarly, 36.8% of participants indicated that they would not rent a book for monetary gain.

In summary, there were significant differences pre- and post- intervention noted for

- Photocopy and distribute it for free – There was a significant change as half of (50%) participants indicated that they would not photocopy and distribute the book for free[84]. The effect size of $r = 0.41$ suggested moderate, practical significance.

No Significant difference was noted for

- Photocopy and sell it – There was no significant change nearly half (44.7%) participants indicated they would not photocopy and sell it for profit[85]. The effect size of $r = 0.10$ suggested low practical significance.

- Rent it at $2/ day –There was no change as the almost same number of participants indicated that would not rent to other students[86]. The effect size of $r = 0.11$ suggested low practical significance

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[84] (pre-test $M = 3.16$, $SD = 1.56$ and post -test $M = 3.89$, $SD = 1.45$; $t(36) = -2.73$, $p = .010$)
[85] (pre-test $M = 3.34$, $SD = 1.49$ and post -test $M = 3.51$, $SD = 1.60$; $t(34) = -.60$, $p = .552$)
[86] (pre-test $M = 3.21$, $SD = 1.53$ and post -test $M = 3.39$, $SD = 1.57$ scores; $t(34) = -.63$, $p = .535$)
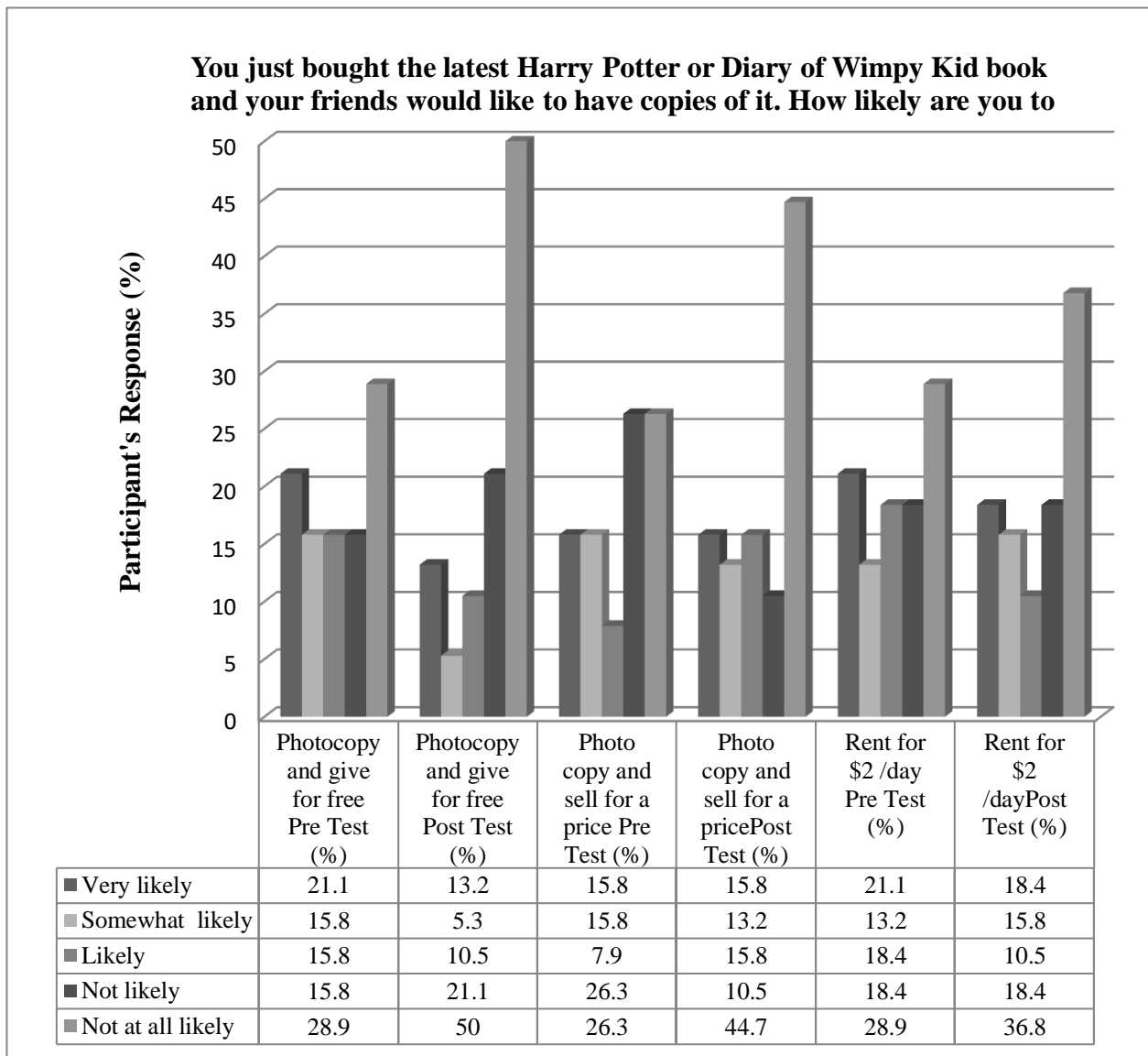
You just bought the latest Harry Potter or Diary of Wimpy Kid book and your friends would like to have copies of it. How likely are you to

	Photocopy and give for free Pre Test (%)	Photocopy and give for free Post Test (%)	Photo copy and sell for a price Pre Test (%)	Photo copy and sell for a pricePost Test (%)	Rent for $2 /day Pre Test (%)	Rent for $2 /dayPost Test (%)
■ Very likely	21.1	13.2	15.8	15.8	21.1	18.4
■ Somewhat likely	15.8	5.3	15.8	13.2	13.2	15.8
■ Likely	15.8	10.5	7.9	15.8	18.4	10.5
■ Not likely	15.8	21.1	26.3	10.5	18.4	18.4
■ Not at all likely	28.9	50	26.3	44.7	28.9	36.8

Figure 4.48 Pre and Post intervention participants' attitude about the responsibility as owner of the latest popular book

7. <u>Responsible use of digital media</u>: Participants indicated that they would take an appropriate action in response to the question "You would like to watch a new movie, and it is not available yet on cable TV, so you would 1. Ask a friend to make a copy of the DVD for you, 2. Download it from a Torrent Website and 3. Buy the DVD " related to copyright law for the multimedia product. More than half (63.2%) of participants prior to the intervention indicated that they would use digital media responsibly and buy a DVD to watch a new movie. However, there was a significant change in participants' views as nearly all participants (97.4%) agreed buying the DVD is a better option than copying and downloading it from a Torrent website (see Figure 4.49). The positive change in participants' perspectives was significant[87]. The effect size of $r = 0.65$ suggested high practical significance.
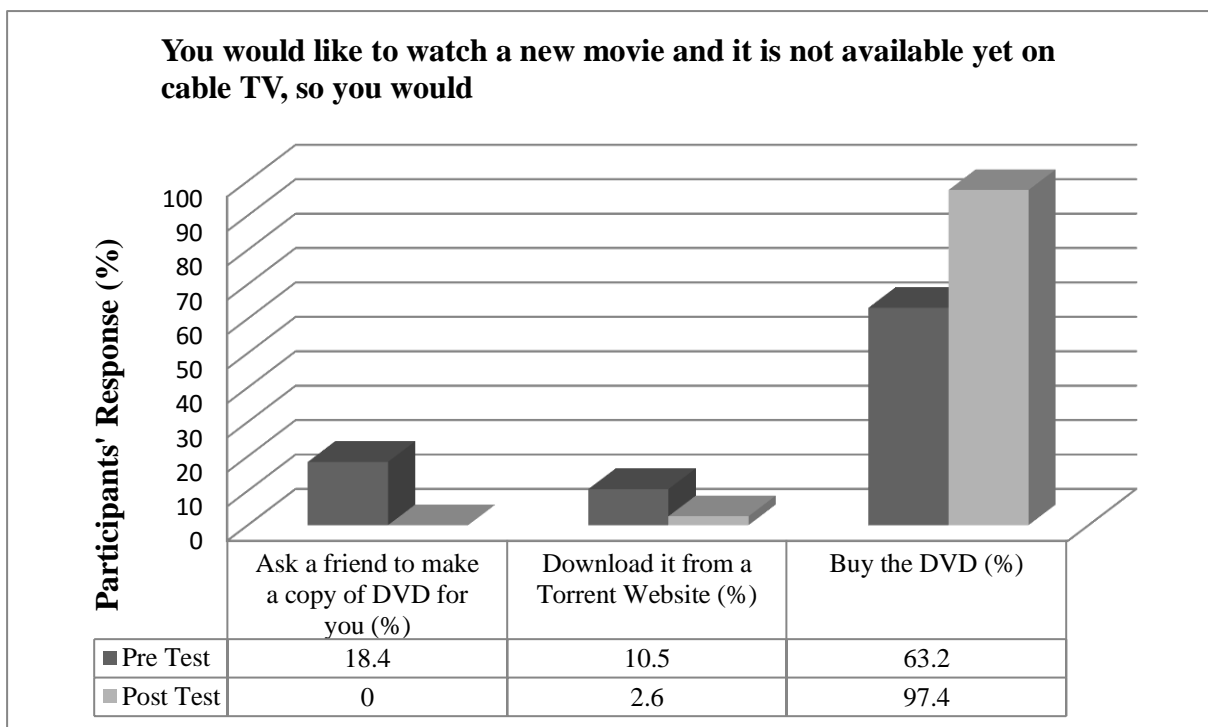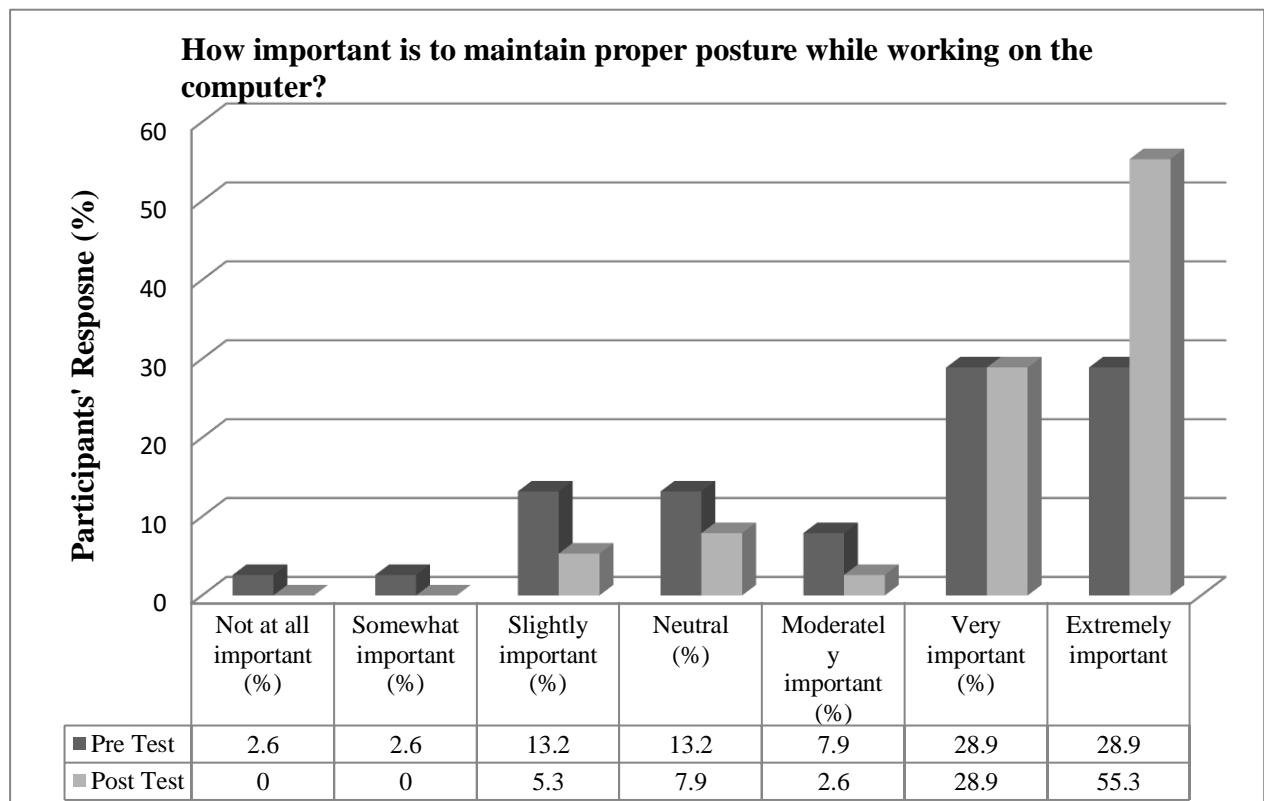
You would like to watch a new movie and it is not available yet on cable TV, so you would

	Ask a friend to make a copy of DVD for you (%)	Download it from a Torrent Website (%)	Buy the DVD (%)
Pre Test	18.4	10.5	63.2
Post Test	0	2.6	97.4

Participants' Response (%) — axis: 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Figure 4.49 Pre and Post intervention participants' attitude about the Responsible way of watching the latest movie

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[87] (Wilcoxon signed rank test $Z = -3.61$, $p \leq .001$)

4.2.8 Digital Health and Wellness Findings

This section reports findings on the change in participants' attitudes towards the use of digital devices in relation to personal health and wellness.

1. <u>Right posture while working on digital devices</u>: Prior to the intervention, 57.8% of participants felt that keeping the right posture while working on digital devices was very important. However, there was a significant change in participants' views as 84.2% agreed that keeping the right posture was very important by the end of the intervention (see Figure 4.50). The change in participants' perspective was significant[88]. The effect size of $r = 0.63$ suggested high practical significance.

How important is to maintain proper posture while working on the computer?

	Not at all important (%)	Somewhat important (%)	Slightly important (%)	Neutral (%)	Moderately important (%)	Very important (%)	Extremely important
■ Pre Test	2.6	2.6	13.2	13.2	7.9	28.9	28.9
■ Post Test	0	0	5.3	7.9	2.6	28.9	55.3

Figure 4.50 Pre and Post intervention participants' knowledge about maintaining proper posture while working on computers

[88] (pre-test $M = 5.30$, $SD = 1.68$ and post –test $M = 6.27$, $SD = 1.12$; $t(36) = -4.16$, $p < .0001$)

2. Reporting physical discomfort: There was a significant change in participants' response to reporting the discomfort while working on computers. Post-intervention, 84.2% of participants' responded that reporting discomfort while working on the computer would be an appropriate action related to their health compared to 63.2% before the intervention (see Figure 4.51). The change in participants' attitude towards the health was significant[89] with the effect size of $\varphi = 0.38$ moderate, practical significant as $p < 0.05$ and $\varphi \geq 0.5$.

If a student is experiencing discomfort while working on the computer the student should

	Continue working (%)	Report to teacher or an adult who is around (%)	Just rest for a while and then continue working (%)	Look on the internet for a solution (%)
Pre Test	5.3	63.2	23.7	5.3
Post Test	5.3	84.2	7.9	2.6
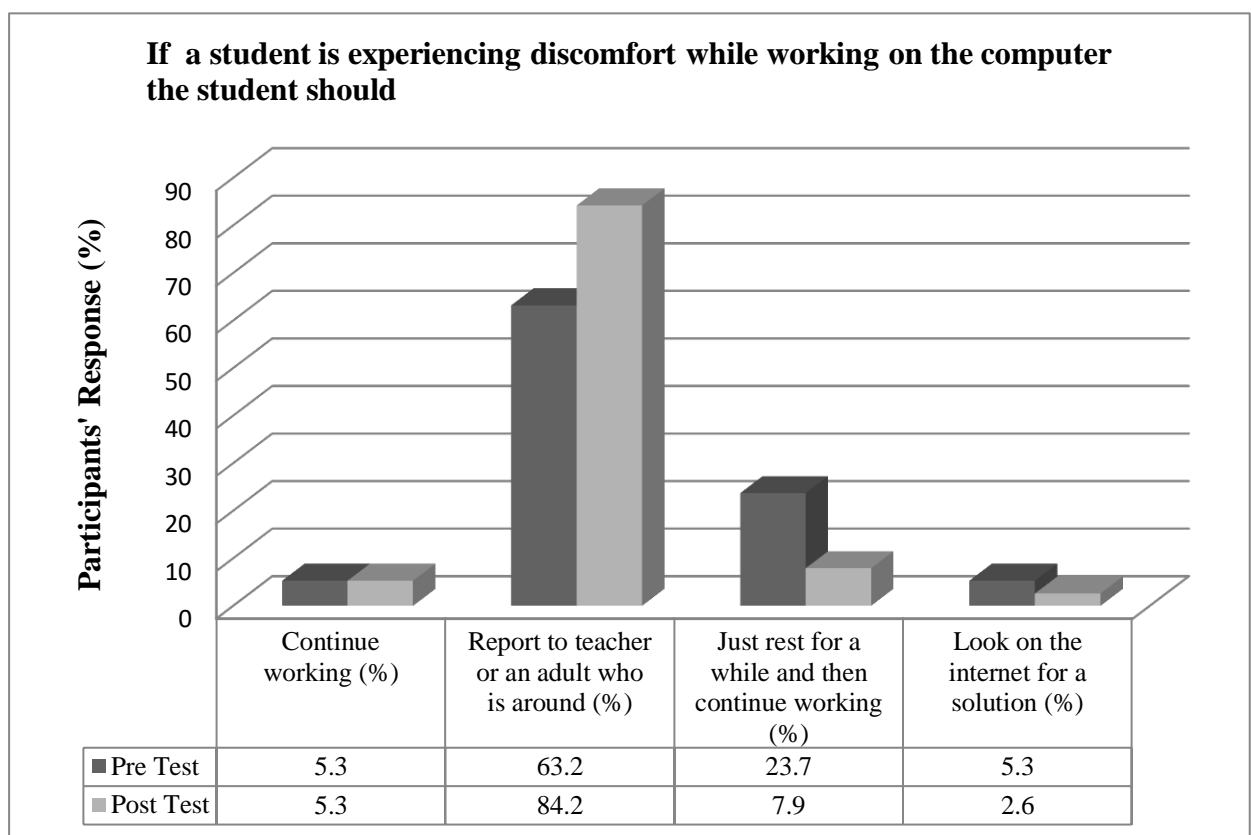
Figure 4.51 Pre and Post intervention participants' attitude about reporting physical discomfort while working on computer

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[89] (Chi-square test $\chi^2 (1) = 5.58$, $p \leq .018$)

3. <u>Physical wellbeing</u>: Participants were asked to rate the level of agreement for certain styles of working on digital devices such as taking breaks, the volume of the music, and temperature of the device. Prior to intervention 31.6 % participants disagreed that taking a break was important, and 13.2% were indifferent. Post-intervention, there was a positive change in participants' beliefs as 94.8% of participants considered taking breaks as important aspects of working on digital devices compared to 52.7% pre-intervention[90]. Similarly, post intervention all the participants (100%) agreed that loud music harms the ears and that the temperature of digital devices must be maintained, compared to only 60.6% of participants agreeing that loud music harms the ears[91] and 60.6% of participants agreeing that the temperature of digital devices must be maintained pre-intervention[92] (see Figure 4.52). A significant difference and positive changes were indicated by the paired *t* test.

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[90] (pre-test $M = 4.46$, $SD = 2.14$ and post -test $M = 1.97$, $SD = 0.164$; $t(36) = 6.94$, $p < .0001$) The effect size of $r = 0.76$ suggested high practical significance
[91] (pre-test $M = 5.11$, $SD = 1.70$ and post -test $M = 6.49$, $SD = 0.837$; $t(36) = -4.66$, $p < .000$) The effect size of $r = 0.61$ suggested high practical significance
[92] (pre-test $M = 5.03$, $SD = 1.61$ and post -test $M = 6.43$, $SD = .801$; $t(36) = -5.50$, $p < .0001$) The effect size of $r = 0.68$ suggested high practical significance
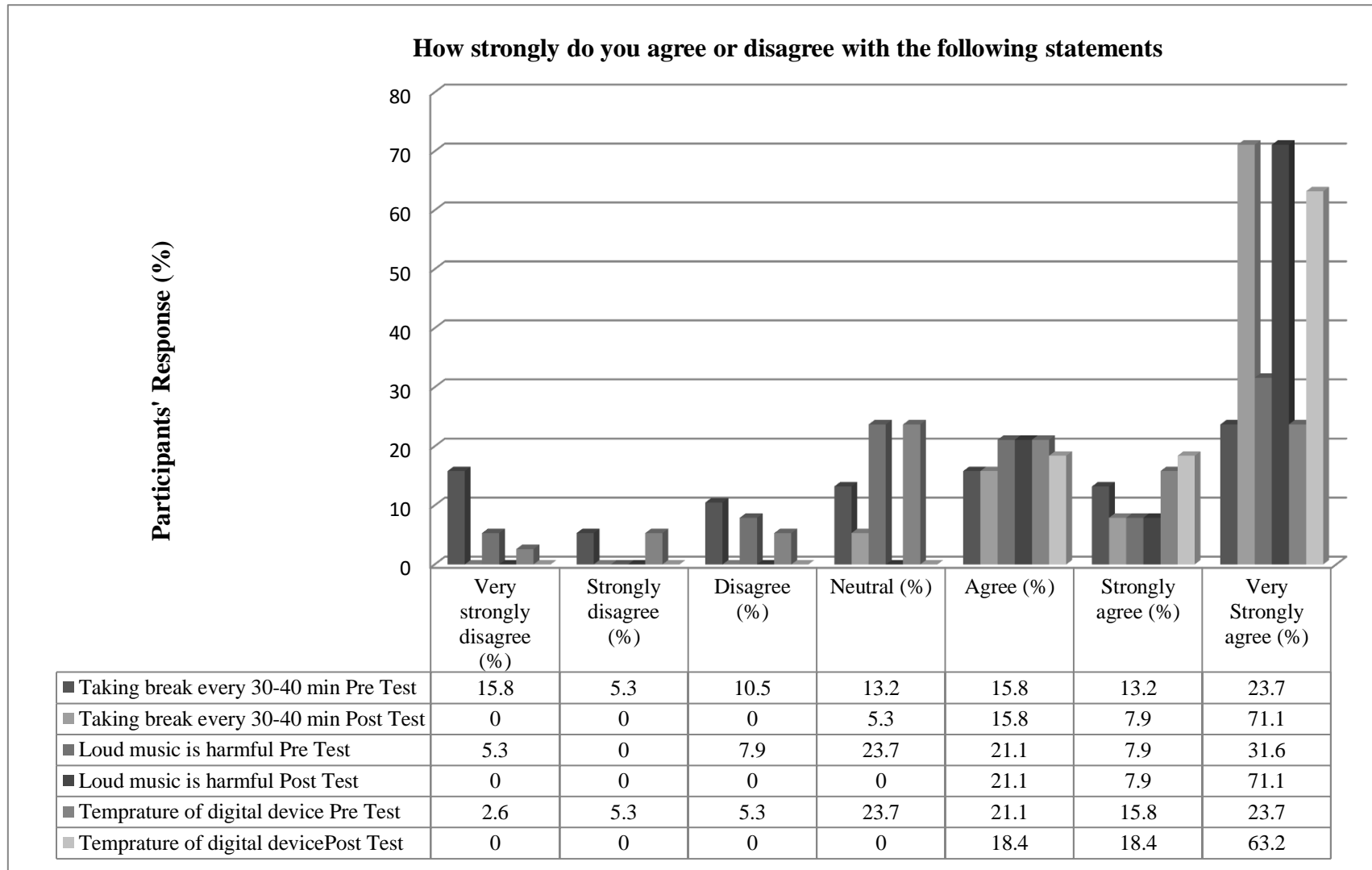
How strongly do you agree or disagree with the following statements

	Very strongly disagree (%)	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Very Strongly agree (%)
■ Taking break every 30-40 min Pre Test	15.8	5.3	10.5	13.2	15.8	13.2	23.7
■ Taking break every 30-40 min Post Test	0	0	0	5.3	15.8	7.9	71.1
■ Loud music is harmful Pre Test	5.3	0	7.9	23.7	21.1	7.9	31.6
■ Loud music is harmful Post Test	0	0	0	0	21.1	7.9	71.1
■ Temprature of digital device Pre Test	2.6	5.3	5.3	23.7	21.1	15.8	23.7
■ Temprature of digital devicePost Test	0	0	0	0	18.4	18.4	63.2

Figure 4.52 Pre and Post intervention participants' attitude about the appropriate use of Digital device and health

4. <u>Proper lighting</u>: Similarly, post intervention 84.2% of participants agreed that proper lighting is extremely important while working on digital devices compared to 21.1% prior to the intervention (see Figure 4.53). The positive change in participants' understanding was significant[93]. The effect size of $r = 0.74$ suggested high practical significance.

How important is it to have proper lighting while working on a digital device?

	Not at all important (%)	Somewhat important (%)	Slightly important (%)	Neutral (%)	Moderately important (%)	Very important (%)	Extremely important (%)
■ Pre Test	0	7.9	7.9	23.7	10.5	23.7	21.1
■ Post Test	0	0	0	0	7.9	7.9	84.2

Participants' Response (%)
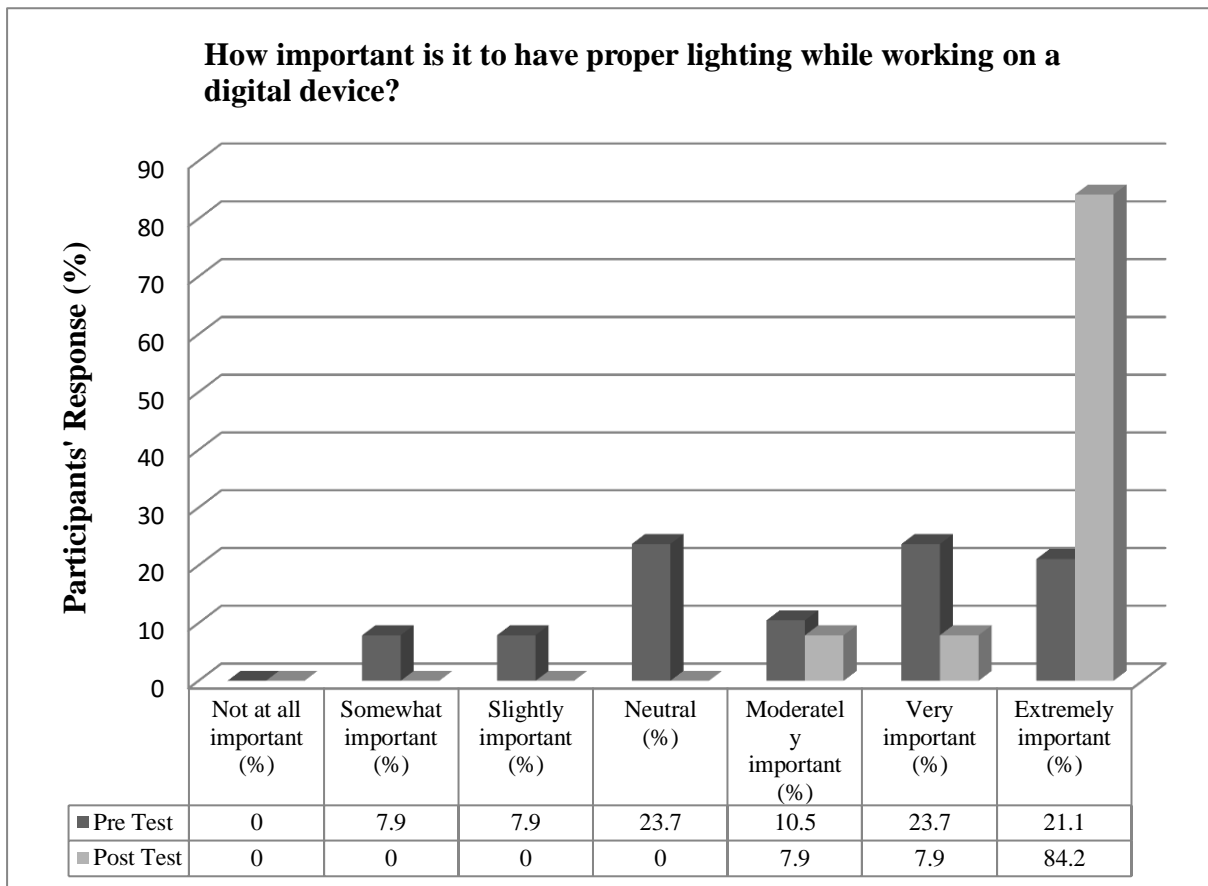
Figure 4.53 Pre and Post intervention participants' attitude about the importance of proper lighting while working on digital devices

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[93] (pre-test $M = 5.03$, $SD = 1.59$ and post -test $M = 6.75$, $SD =0 .604$; (35) = -6.55, $p < .0001$)

4.2.9 Digital Security Findings

Findings related to participants' responses to questions based on personal and data security are reported in this section.

1. <u>Sharing information online</u>: Participants understanding changed post-intervention in response to the question "List the types of private information that should not be posted on internet sites?" Post-intervention the participants' response reflected that 68.4% would not post contact details, 26.3 % would not post personal details, and 5.3% would upload an inappropriate post online (see Figure 4.54). The statistical result indicated an increased understanding among participants regarding personal information shared online[94]. The effect size of $r = 0.47$ suggested moderate, practical significance.

List the types of private information that should not be posted on internet sites?

	Contact Details (%)	Personal Details (%)	Inappropriate online communication (%)	Not sure (%)
Pre Test	50	18.4	13.2	18.4
Post Test	68.4	26.3	5.3	0
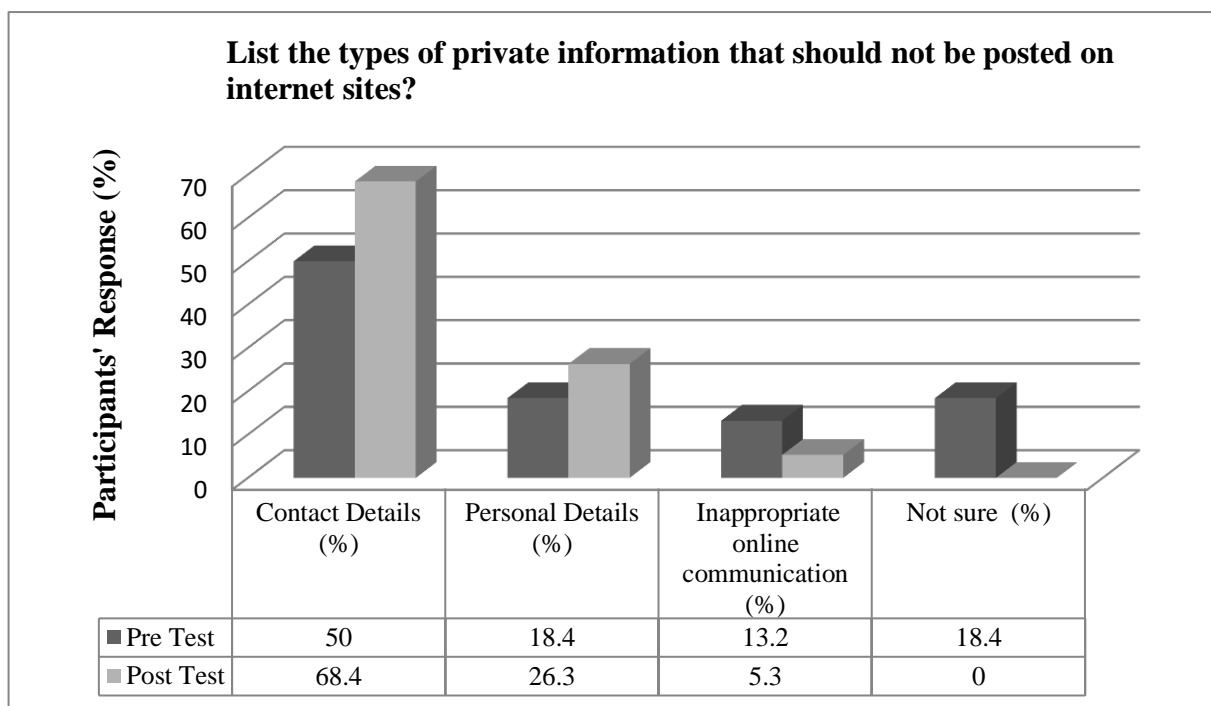
Figure 4.54 Pre and Post intervention participants' attitude about sharing information online

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[94] (Wilcoxon signed rank test $Z = -2.64$, $p = .008$)

2. Secured Password: In response to the scenario "Rini needs to create a password for her online portfolio portal login. Which of the following would be the most secure password? (Select one answer) 1. Her Birthdate, 2. Her pet's name,3.1234567890, 4.0987654321 5. A combination of capital and small letters and a number, 6. A phrase like "I am the smartest" and 7. A Condo name ". Pre-intervention participants selected an answer that was not significantly different from a "chance" response, i.e. participants were guessing (hence a significant level of $p > 0.05$). Post-intervention the responses were clearly different from chance (hence a $p < .001$). Pre-intervention, 39.5% of participants, selected the correct answer, while post intervention, 76.3% (nearly twice as many) selected the correct response (see Figure 4.55).

Rini needs to create a password for her online portfolio portal login. Which of the following would be the most secure password? (Select one answer)

	Correct (%)	Incorrect (%)
■ Pre Test	39.5	60.5
■ Post Test	76.3	23.7
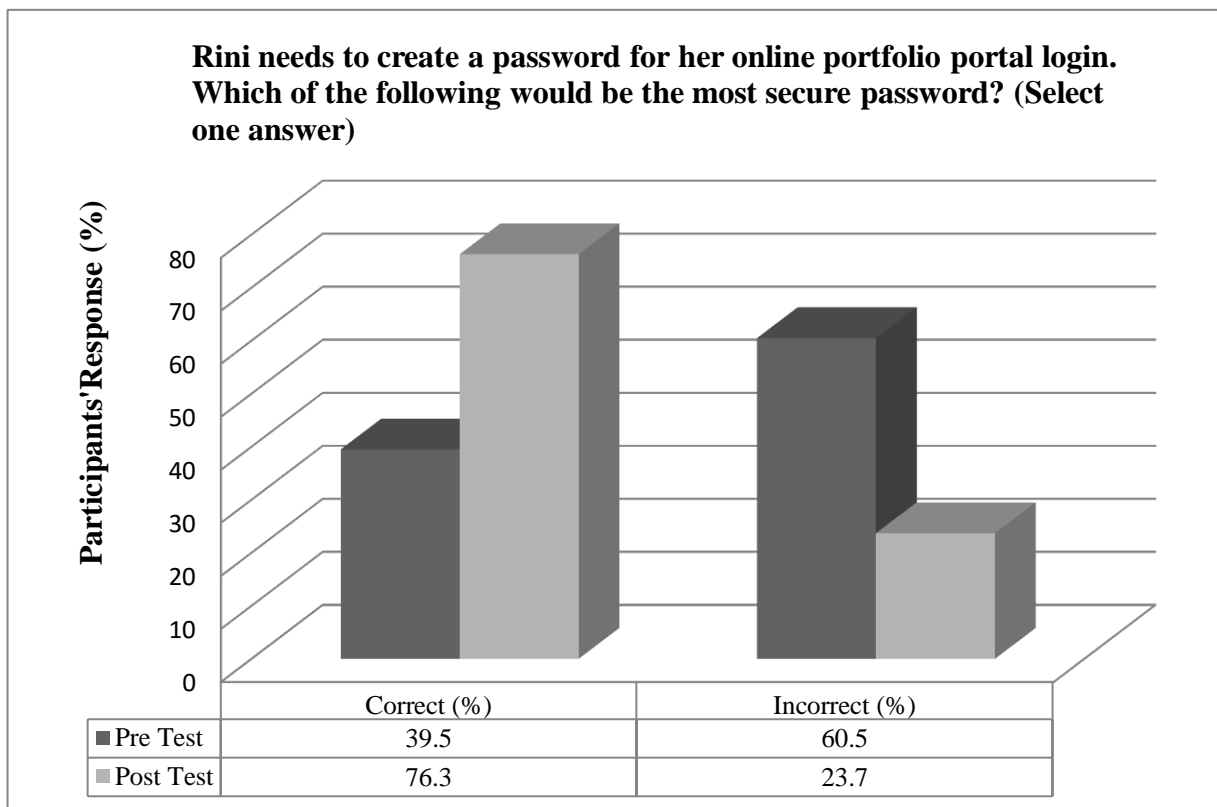
Figure 4.55 Pre and Post Intervention participants' knowledge about creating strong password

3. <u>Blog Privacy</u>: Post intervention, participants' attitudes towards keeping their blogs private changed significantly. Nearly all (92.1%) of the participants felt their blogs should be private and secured online by the end of the intervention (see Figure 4.56). The positive changed in participants' attitudes post intervention was significant[95]. The effect size of $r = 0.25$ suggested low practical significance.

Do you think that students' blogs should have private security settings, allowing only specified readers to read and comment?

	Yes (%)	No (%)
Pre Test	81.6	18.4
Post Test	92.1	7.9
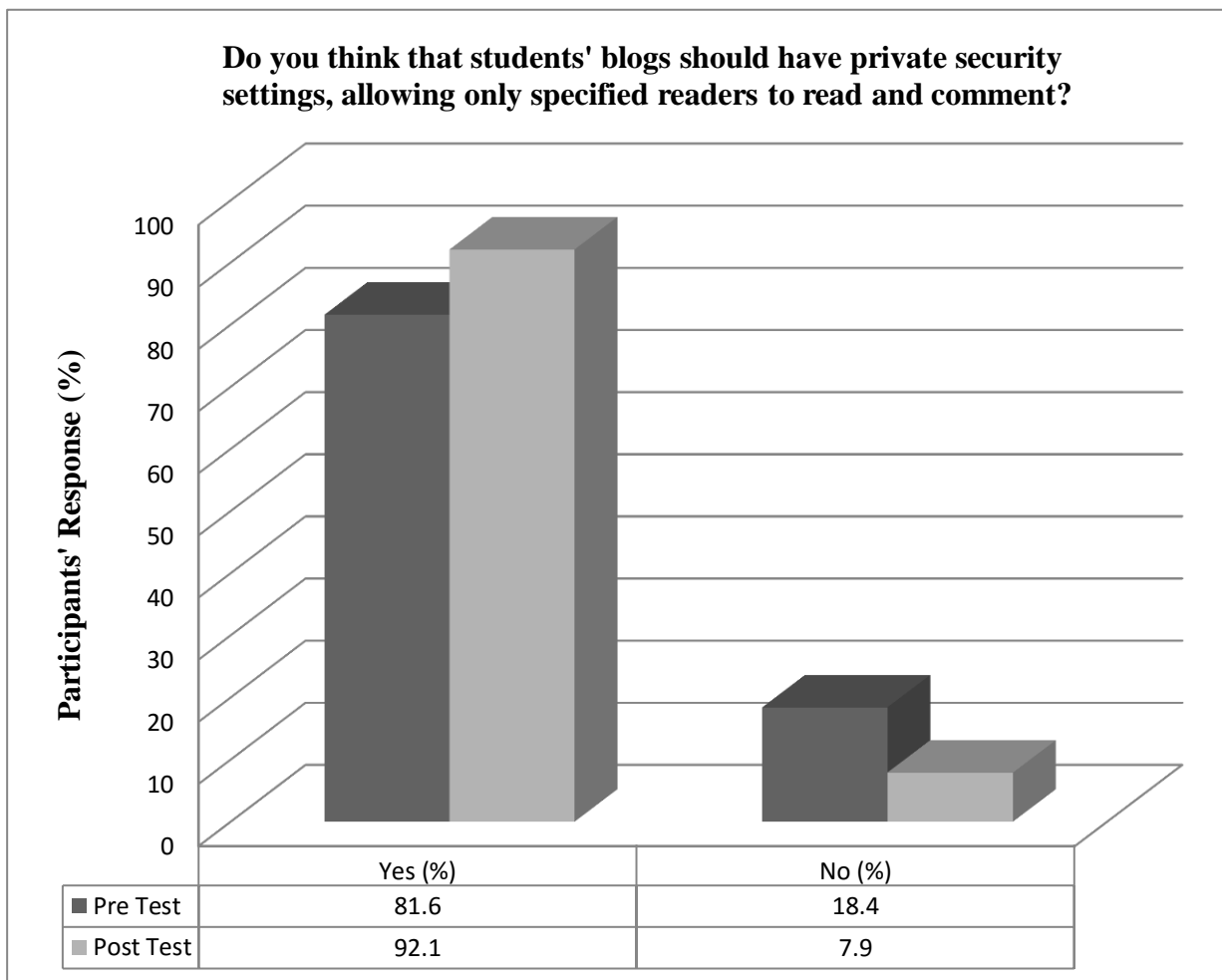
Figure 4.56 Pre and Post intervention participants' attitude about the privacy of student's blog

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[95] (Wilcoxon signed rank test $Z = -1.41$, $p = .157$)

4. Checking school network security settings: Post-intervention participants'

perspective changed significantly in response to the scenario "Michelle wants to check the IT

Lab drive for the security setting. How appropriate are the different actions she takes 1. She

tries to check the security setting by accessing other peoples' folders 2. She decides to copy

all the data on her thumb drive 3. She asks the teacher or tech expert about the security

setting and how they work and 4. She deletes an old document that belongs to a friend who

does not need it anymore".   Prior to intervention, participants felt that checking security

settings for the school network drive by copying the data and deleting the old document was

acceptable. However, post intervention participants responded that asking a teacher or

technician would be the most appropriate way to learn about network security settings (see

Figure 4.57).

Some significant changes were found for the following

- Copying data on thumb drive – Post intervention 63.2% of participant's indicated

  that copying the data to the thumb drive was a highly inappropriate action[96]. The

  effect size of $r = 0.49$ suggested moderate practical significance.

- Delete the old document – Post intervention 42.1% of participant's indicated that

  deleting an old document was a highly inappropriate action[97]. The effect size of $r =$

  0.33 suggested moderate practical significance.

No significant changes were found for the following

- Checking security setting for other people's folders – Both pre and post

  intervention half of the participants' indicated that checking the security setting for

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[96] (pre-test $M = 2.94$, $SD = 1.91$ and post -test $M = 1.72$, SD = 1.06; $t(35) = 3.33$, $p =.002$)
[97] (pre-test $M = 3.26$, $SD = 1.67$ and post -test $M = 2.46$, $SD = 1.56$; $t(34) = 2.05$, $p < .048$)

other people's folder was highly inappropriate [98]. The effect size of $r = 0.00$ suggested negligible practical significance.

- Ask a teacher or technician – The participants' attitude towards asking a teacher or the technician were almost the same for pre test (31.6%) and post test (36.8%) intervention[99]. The effect size of $r = 0.05$ suggested trivial practical significance.

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[98] (pre-test $M = 1.91$, $SD = 1.39$ and post -test $M = 1.91$, $SD = 1.26$; $t(34) = 0.000$, $p = 1.000$)
[99] (pre-test $M = 5.31$, $SD = 1.46$ and post -test $M = 5.43$, $SD = 1.79$; $t(34) = -0.32$, $p = .754$)

Michelle wants to check the IT Lab drive for the security setting. How appropriate are the different actions she takes
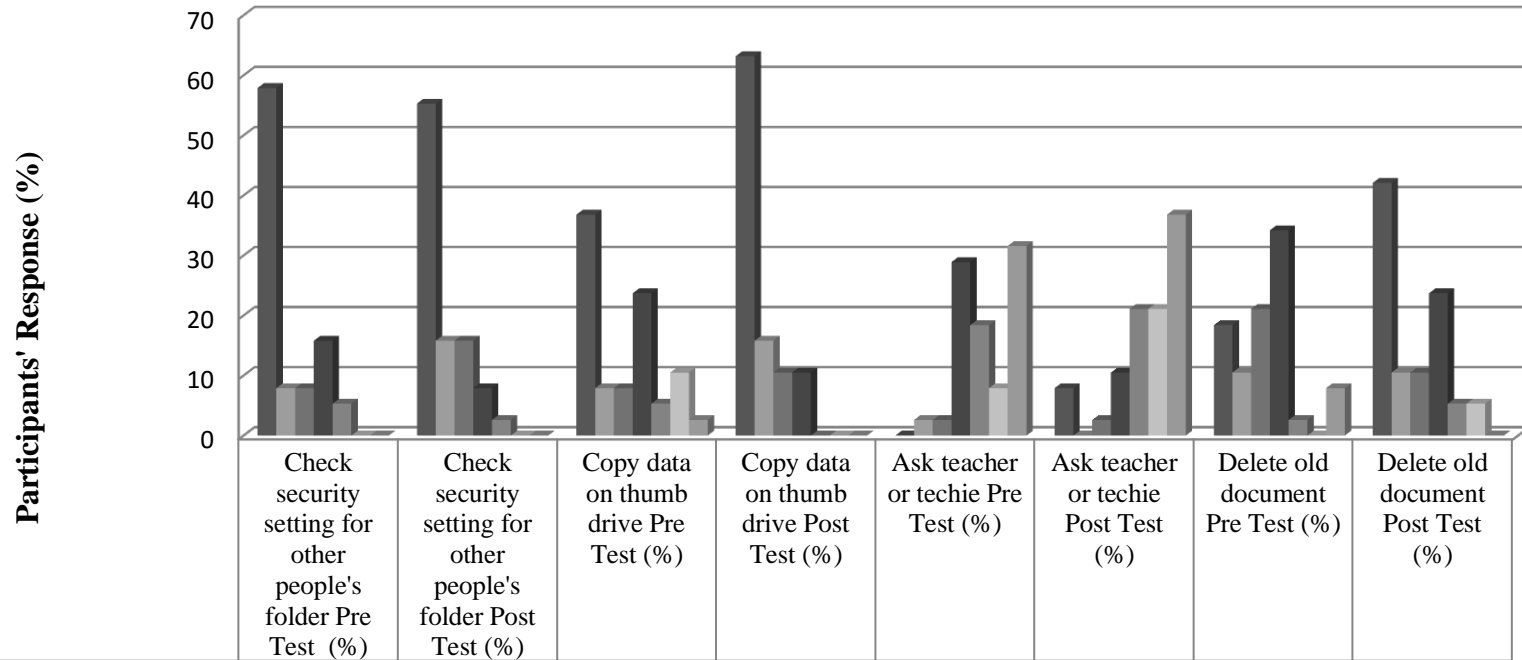
	Check security setting for other people's folder Pre Test (%)	Check security setting for other people's folder Post Test (%)	Copy data on thumb drive Pre Test (%)	Copy data on thumb drive Post Test (%)	Ask teacher or techie Pre Test (%)	Ask teacher or techie Post Test (%)	Delete old document Pre Test (%)	Delete old document Post Test (%)
■ Absolutely inappropriate	57.9	55.3	36.8	63.2	0	7.9	18.4	42.1
■ Slightly inappropriate	7.9	15.8	7.9	15.8	2.6	0	10.5	10.5
■ Inappropriate	7.9	15.8	7.9	10.5	2.6	2.6	21.1	10.5
■ Neutral	15.8	7.9	23.7	10.5	28.9	10.5	34.2	23.7
■ Appropriate	5.3	2.6	5.3	0	18.4	21.1	2.6	5.3
■ Slightly appropriate	0	0	10.5	0	7.9	21.1	0	5.3
■ Absolutely appropriate	0	0	2.6	0	31.6	36.8	7.9	0

Figure 4.57 Pre and Post intervention participants' attitude about the checking school network security settings

5. Dealing with unwanted popups: In response to the question regarding the appropriate reaction towards unwanted pop-ups on mobile devices, there was a significant change post-intervention, as 86.8% of participants responded that their action would be to close the pop-up and report it to an adult (see Figure 4.58). There was a noticeable 26.3% increase in participants responding that they would behave responsibly post- intervention indicated by the results [100] and the effect size of $\varphi = 0.32$ indicated a moderate, practical significant as $p < 0.05$ and $\varphi \geq 0.5$.

While working on the internet, a pop up window appears with the message "you have won an IPAD", so you would

	Correct (%)	Incorrect (%)
Pre Test	60.5	39.5
Post Test	86.8	13.2
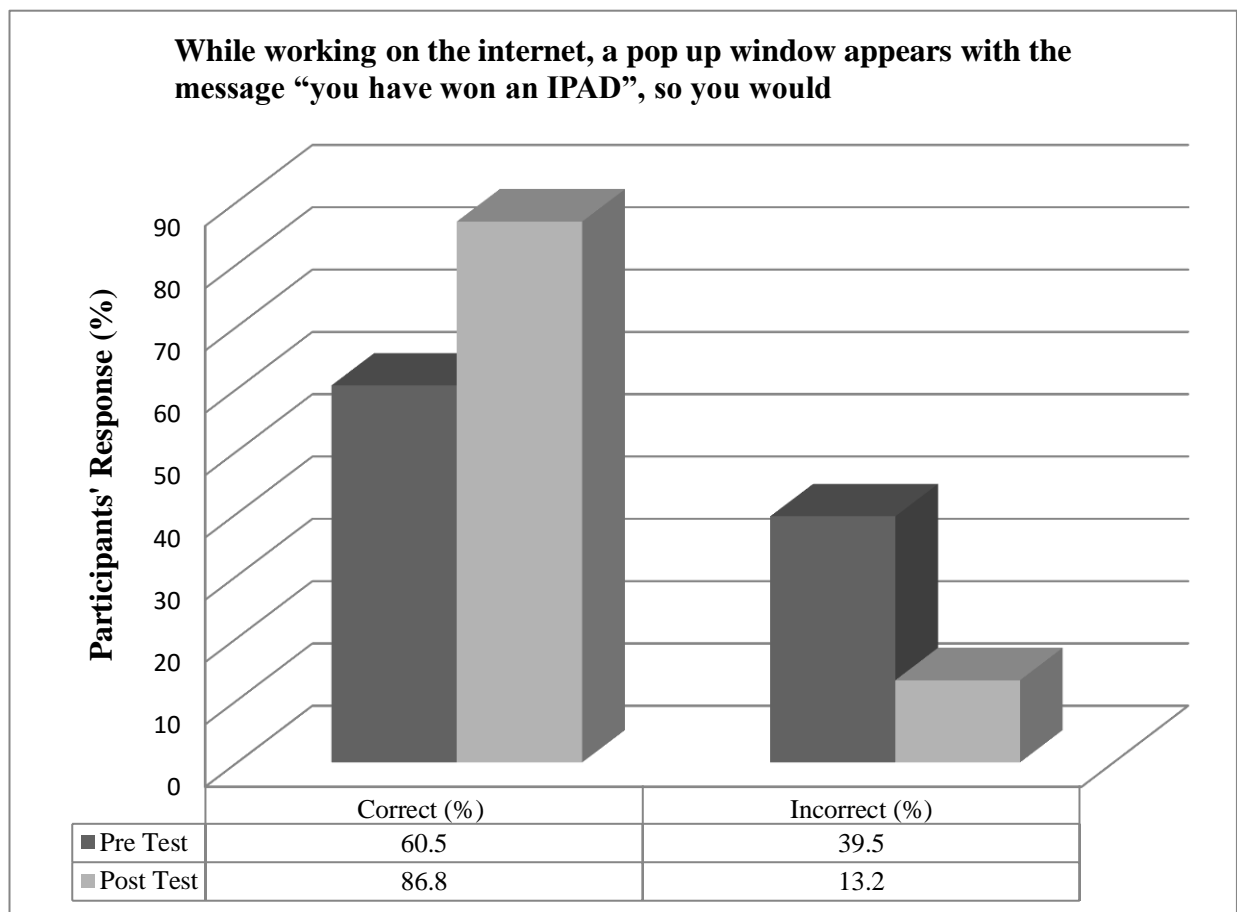
Figure 4.58 Pre and Post intervention participants' attitude about dealing with unwanted pop-ups

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[100] (Chi-square test $\chi^2 (1) = 3.96$, p = .047)

Chapter 5 Results

6. <u>Communicating with an unknown person</u>: Post intervention there was a positive change in participants' responses to the scenario "If someone you don't know approaches you on the internet and says he is a student from another international school and asks if you would like to have a play date, what would you do? 1. Chat with him to check whether he is really who he says he is, 2.Check his internet profile by Googling his name, 3.Call him over to your home, 4.Ignore him and 5.Talk to your parents about it". Post-intervention almost all (94.7%) of participants reported that they would not be allured by anyone online. There was a positive change in participants' understanding that online strangers are dangerous[101]. The effect size of $r = 0.38$ suggested moderate, practical significance (see Figure 4.59).

If someone you don't know approaches you on the internet and says he is a student from another international school and asks if you would like to have a play date, what would you do?

	Correct (%)	Incorrect (%)
■ Pre Test	78.9	21.1
■ Post Test	94.7	5.3
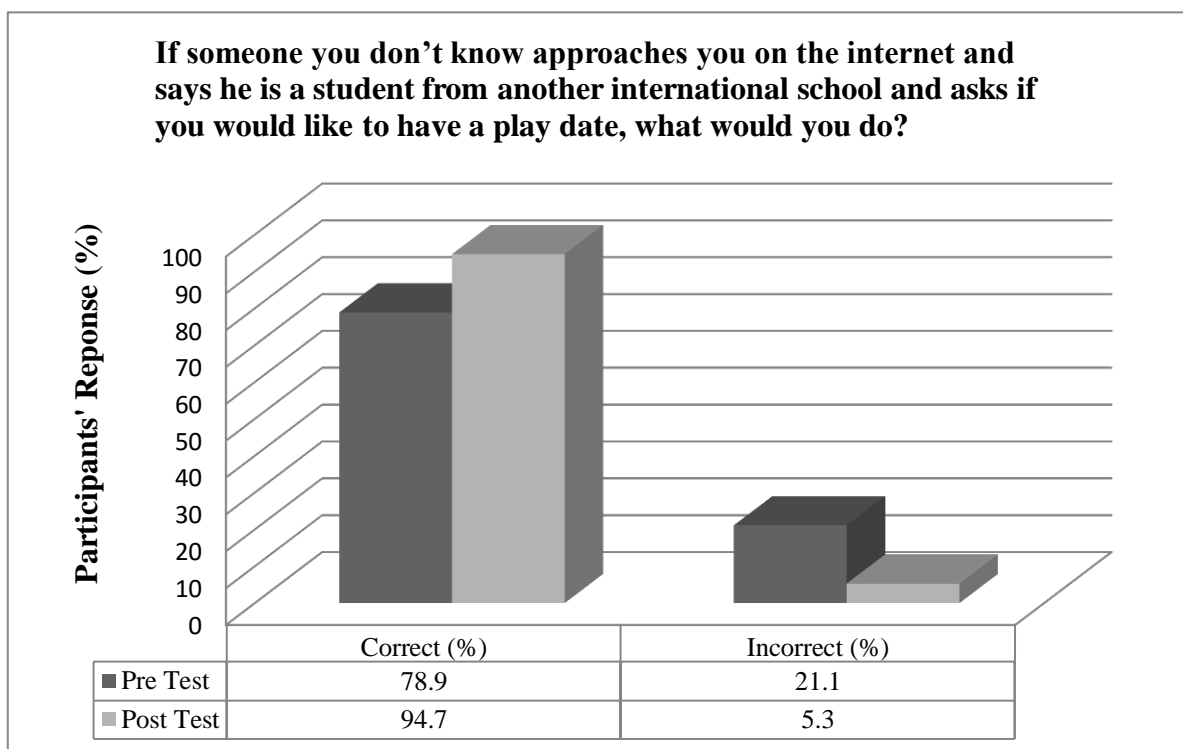
Figure 4.59 Pre and Post intervention participants' attitude about communicating with unknown person

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[101] (Wilcoxon signed $Z = -2.12$, $p = .034$)

4.2.10 Additional questions included in Post DCQ

Participants answered ten additional questions in the Post DCQ to confirm their understanding of the concept of Digital Citizenship.

1. Post-intervention, all the participants in response to the task "Complete the sentence- What you do online", indicated that online and offline lives were connected and were affected by how a person reacts online (see Figure 4.60). The results confirmed the findings in the Digital Etiquette section that any digital device connecting to the internet will require one to exhibit Digital / net etiquette, Digital etiquette skills are highly important for them as well as any member of the society and permission is required to pick up the phone or use digital devices for learning during lessons.

	is not important (%)	affects your life offline (%)	make you look cool (%)
■ Student response	0	100	0
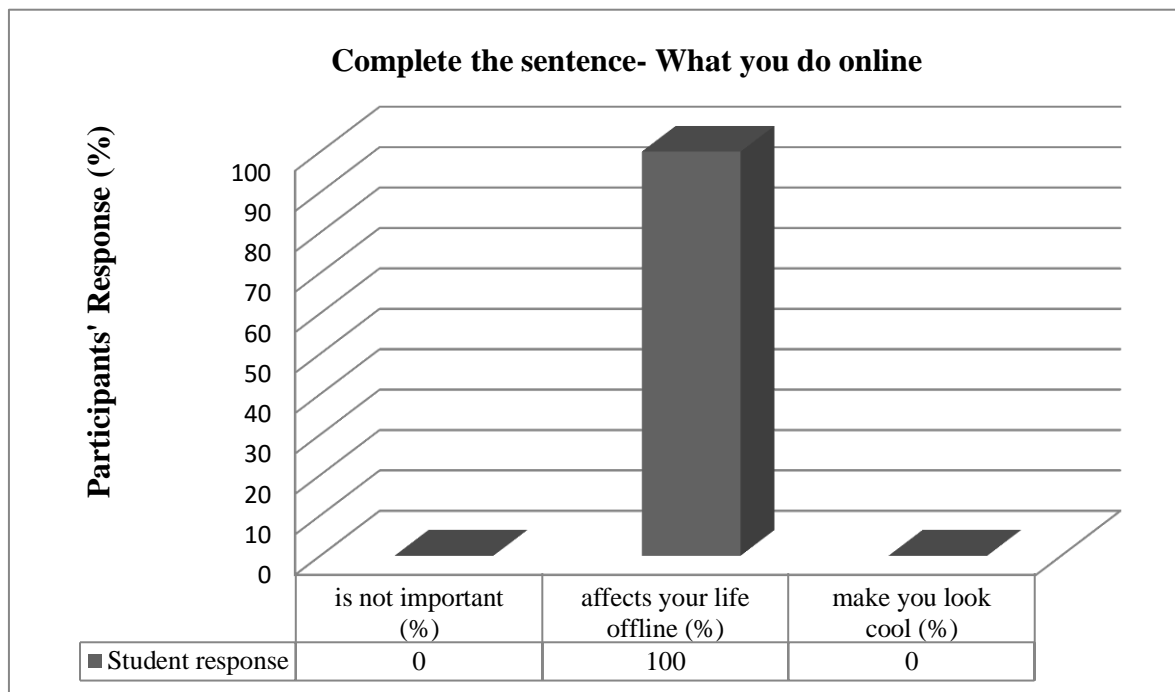
Figure 4.60 Post intervention participants' attitude about the online and offline profiles

2. Similarly, Post intervention participants were able to define Detechnologizing correctly as staying away from all forms of technology for a period of time. Nearly all (97.4%) of the participants understood what technology detox meant (see Figure 4.61). These results are in alignment with findings of Digital Health and Wellness section whereby students have indicated that frequent breaks, listening to music at an appropriate volume, maintaining the temperature of digital devices and proper posture and lighting are good habits that would be beneficial to their health and wellness while working on digital devices.

Detechnologizing means

	Detective using technology (%)	Stay away from all forms of technology (%)	Use only cell phones (%)	Use any and all digital devices (%)
■ Students' Response	0	97.4	0	2.6
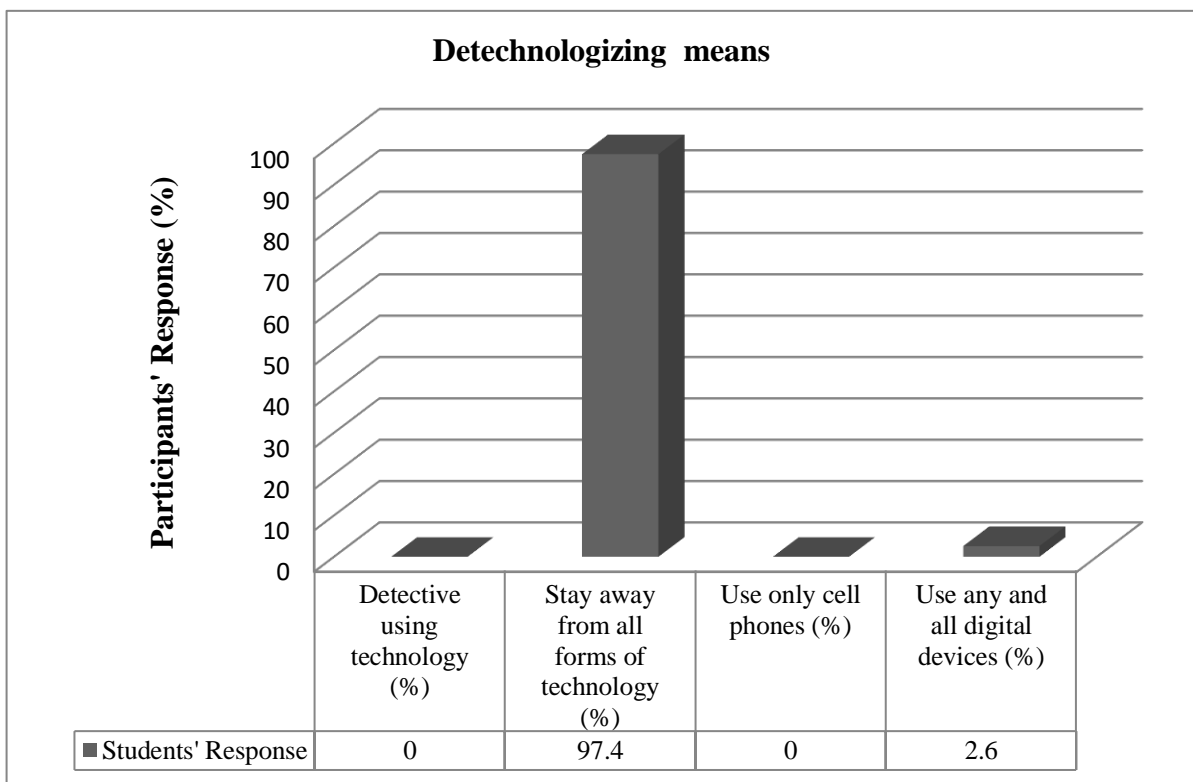
Figure 4.61 Post intervention participants' knowledge about Dectechnolizing

3. In response to the question "Using somebody else's login or identity to send inappropriate messages to their contact is an example of bad netiquette" participants indicated that this was an example of bad net etiquette. Post-intervention, 97.4% of participants, agreed that using someone else's identity and password were not good examples of net/digital etiquette (see Figure 4.62). The findings confirmed the change in participants understanding and perspective of the importance of Digital Etiquette in classroom situations.

Using somebody else's login or identity to send inappropriate messages to their contact is an example of bad netiquette

	Statement is true (%)	Statement is false (%)
■ Students' Resposne	97.4	2.6
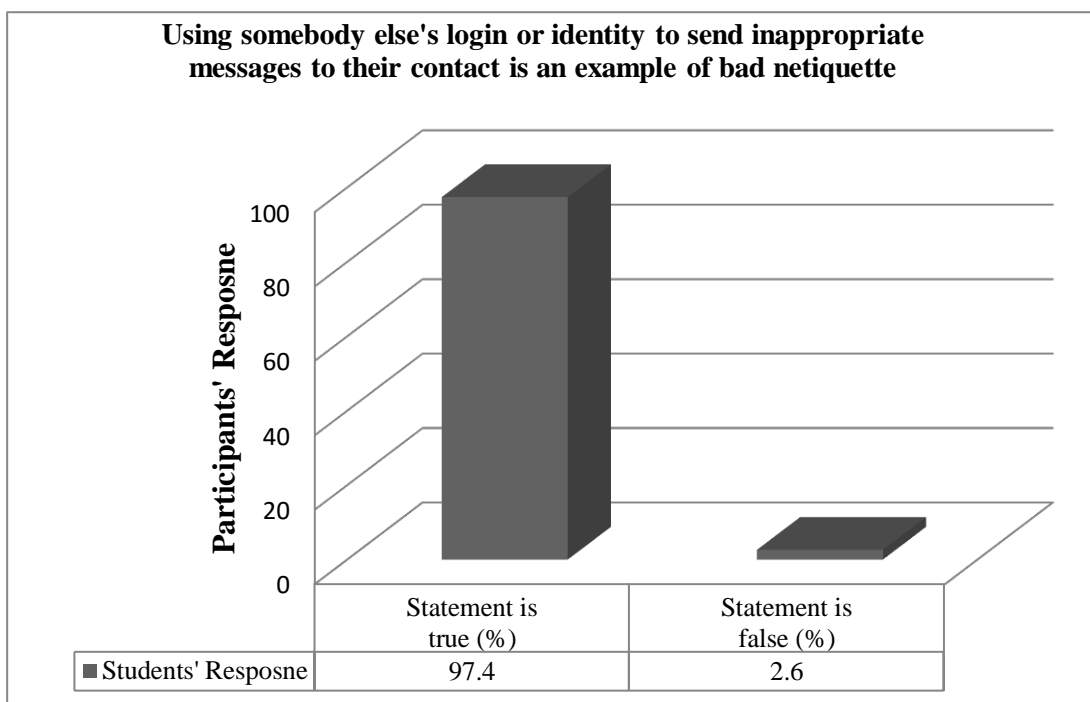
Figure 4.62 Post intervention participants' attitude about using someone's login or identity

4. Participants' responses confirmed the findings in Digital literacy by answering correctly to a question describing Digital literacy. The results in the Digital literacy sections found an increased understanding and knowledge in terms of the usefulness of search engines, applications, and software for presentations and note-taking, the use and exploration of digital tools and other elements of digital literacy. Post-intervention, 92.1% participants, had an overall understanding of Digital literacy and its components (see Figure 4.63).

Digital Literacy includes

	Searching for information and analysing it (%)	Creating and publishing online or offline (%)	Using devices to type your assignment (%)	All of the above (%)
Students' Response	7.9	13.2	5.3	92.1
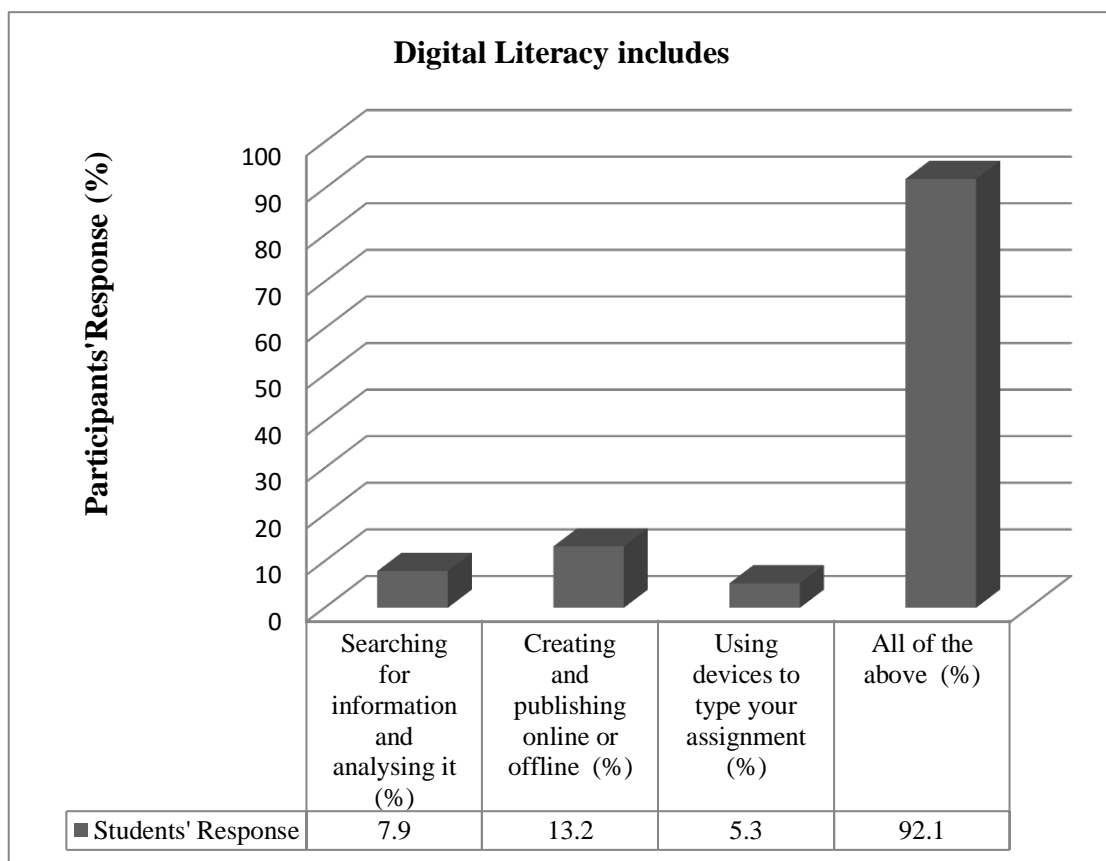
Figure 4.63 Post intervention participants' knowledge about Digital literacy

5. Post-intervention participants responded to the hypothetical scenario "What would you do if you are exercising while listening to music on the IPOD and somebody approaches you?" Nearly all (92.1%) of the participants indicated that they would follow appropriate digital etiquette and remove the earbuds to talk to the person who approached them (see Figure 4.64).

What would you do if you are exercising while listening to music on IPOD and somebody approaches you

	Keep the music on while talking to the person (%)	Ignore and behave as if you have not noticed the person (%)	Remove the earbuds and talk to the person (%)
■ Student Response	2.6	5.3	92.1
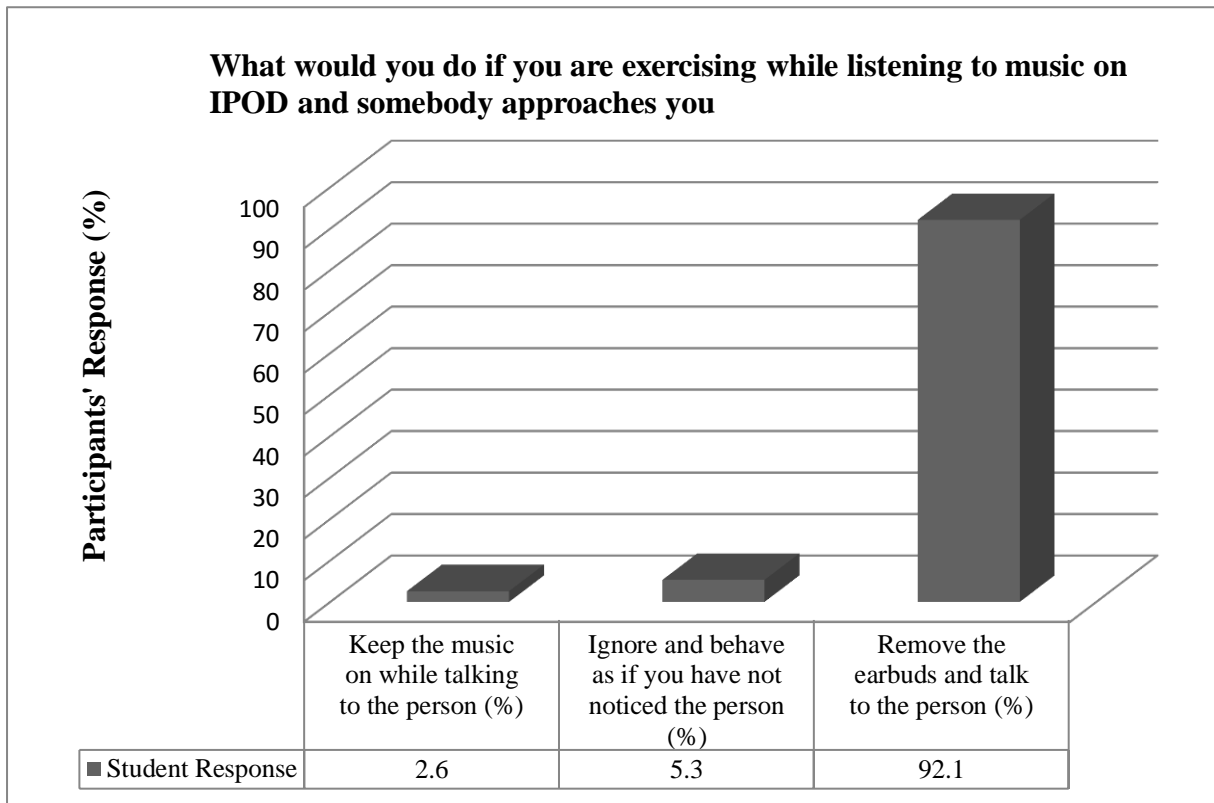
Figure 4.64 Post intervention participants' attitude about Digital Etiquette

6. Post-intervention the majority (65.8%) of the participants agreed to use the digital equipment appropriately. Similarly, 57.9% of the participants agreed to use virus protection; 52.6% of the participants agreed to use phishing and spyware filters, 52.6% of the participants agreed to back up the data regularly, and 73.7% of the participants agreed to password protect documents and their computers (see Figure 4.65).

How strongly do you agree or disagree with following steps to secure your data

	Using equipment properly (%)	Using Virus Protection (%)	Strong phishing and spyware filters (%)	Backing up regularly (%)	Password protection for computers and documents (%)
■ Strongly disagree	0	0	0	0	2.6
■ Moderatly disagree	0	2.6	2.6	2.6	0
■ Slightly disagree	0	0	7.9	0	0
■ Neutral	7.9	15.8	18.4	23.7	5.3
■ Slightly agree	0	13.2	5.3	10.5	10.5
■ Moderately agree	10.5	10.5	13.2	10.5	7.9
■ Strongly agree	65.8	57.9	52.6	52.6	73.7

Figure 4.65 Post intervention participants' knowledge about the digital security

7. Participants were asked to "complete the sentence- Using online resources in an ethical manner is (select one answer) 1. Is digital responsibility, 2. Is important, but not necessary and 3. Is important to avoid fights". This sought to check how participants would use online resources in an ethical manner and to check their understanding of academic honesty. Post- intervention all most all of the participants (94.7%) indicated that using online resources ethically is their responsibility (see Figure 4.66).

Complete the sentence - Using online resources in an ethical manner

	is digital responsibility (%)	is important but not necessary (%)	is important to avoid fights (%)
■ Students' Response	94.7	5.3	5.3
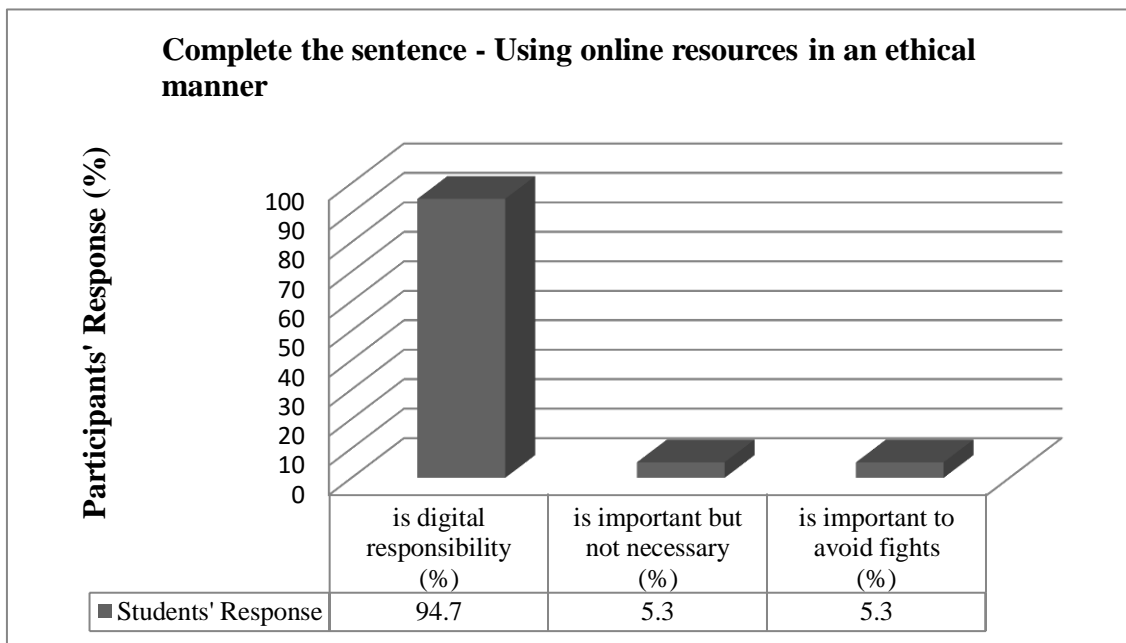
Figure 4.66 Post intervention participants' knowledge about the ethical uses of resources

8. Participants were asked to define "Digital Access" as an additional question. Post-intervention almost all participants were able to define digital access as "everyone has the right to use technology irrespective of his or her age and ability".

As defined by participants

Male Participant 1: "The opportunity to have access to technology for all in the community/country and world".

Male Participant 14: "Every person has right to use computer".

Male Participant 16: "Access to technology for everyone in the whole world".

Female participant: "Digital access means that all people have the right to have access to digital technology and tools".

Male Participant 29: "Digital Access is right for every single person in the world to have equal access to digital devices and technology".

Male Participant 8: "Every child in the world has a computer".

9.   Participants were asked an additional question of "How important are the following aspects of digital communication for you" by rating the level of importance of different aspects of digital communication for them (see Figure 4.67). Post-intervention, 89.5% of the participants, agreed that they will think, pause and click, 83.8% of the participants indicated that they would use appropriate language, 57.9 % of the participants agreed on the type, size and colour of the content and 68.4% participants indicated that they would keep the audience in mind before communicating.

How important are the following aspects of digital communication for you

	Think and Pause before you click (%)	Use Appropriate language (%)	Type with readable font type, size and colour (%)	Keep your audience in mind before posting on blogs or websites (%)
■ Not at all important	0	0	0	2.6
■ Somewhat important	0	0	0	0
■ Slightly important	0	0	5.3	2.6
■ Neutral	7.9	8.1	13.2	7.9
■ Moderately important	2.6	2.6	15.8	10.5
■ Very important	0	5.4	7.9	7.9
■ Extremely important	89.5	83.8	57.9	68.4

Figure 4.67 Post intervention participants' knowledge about the digital communication

10. Participants were asked to describe what were three steps that they would take to counter cyber bullies. Post-intervention participants were able to identify three steps to stop cyber bully 1) ignore, 2)save the conversation and 3) report to adults in case of bullying.

As stated by participants.

Female Participant 11: "1.Do not respond, 2. copy and paste the post or chat conversation for records, 3.Talk to an adult."

Female Participant 15: "1 Stop ignore,   do not respond, 3 talk to an adult."

Male Participant 2: "stop chatting, ignore, talk to mum and dad."

Male Participant 23: "1. Do not respond, 2. Copy and paste the post or chat conversation for records, 3. Talk to an adult."

Male Participant 9: "ignore it, save message; tell the teacher or your parents."

Female Participant 5: "1. Do not respond. 2. Copy and paste the post or chat conversation for records. 3. Talk to an adult."

4.3 SUMMARY OF FINDINGS

The summary of the main findings in each section is as listed below

4.3.1   Knowledge and Technology use

- There was a positive change and an increase in the participants' understanding of the elements of Digital Citizenship and the meaning of Digital devices.

- Participants' responses and positive change in the results indicated that participants' were conscientious about the amount of time spent on digital devices for education and study related activities.

- There was no change in participants' usage of social media, and the popularity of the social media did not increase or decrease during the intervention.

- A positive change in participants' knowledge about technology and how it works was recorded in the results.

- There was a positive change indicated by an increased understanding of the purpose of URL and Search bar recorded post intervention.

- There was a positive change in the participants' understanding of E- commerce websites and the purpose of the website.

4.3.2   Digital Citizenship

- Participants' attitudes about the access and right to use digital devices and WIFI network for all members of the school community and family changed positively.

- Post intervention, positive changes in participants' knowledge and attitude about the E- commerce transaction and purchases was found.

- Participants indicated that they would use appropriate digital communication strategies and language while communicating using online applications. This positive change in attitude indicates that intervention facilitated necessary digital communication skills.

- There was a positive change in participants' attitude about responding and connecting with strangers online. Participants had indicated through their responses that they would take necessary precautions while working online.

- A positive change was also indicated by the participants' response in Digital literacy section, signifying increased understanding of elements of digital literacy as well as the requirements of an appropriate tool for presenting their perspective on topics.

- There were noticeable differences leading to positive change in the participants' understanding of copyright and academic honesty post intervention.

- There was a positive change in participants' understanding and attitude towards digital etiquette requirement post intervention. Participants through their responses to questions indicated that it was absolutely necessary for everyone using digital devices and internet to maintain digital etiquette.

- Participants' attitude towards the rights and responsibilities related to the use of digital technology changed positively post intervention.

- There were positive changes in participants' attitude about personal health and well-being while using digital devices.

- The positive changes in participants' attitude towards personal data security, and checking network security settings were recorded.

The intervention in the form the Digital Citizenship Unit of Inquiry was well received by the students as indicated by the findings in this chapter.

Chapter 5: **Discussion**

A discussion section describes and connects the findings of this research literature review. This section follows the theme of the research paper and is further divided to subsection to highlight major findings of the research and interpret them to provide further curriculum integration in the IB PYP school. This section also specifies the limitations of the research undertaken and recommendation for future researches.

The data gathered thorough this research project has laid the foundation for future curriculum integration, and it supports educators wishing to address the elements of Digital Citizenship within the school context. The findings suggest that through the Digital Citizenship Unit of Inquiry, participants have benefitted and become empowered with the digital competency skills necessary for becoming responsible and good digital citizens.

This research sought to determine whether a Digital Citizenship Unit of Inquiry, which raised awareness and knowledge of digital rights and responsibilities, was effective for year 5 participants in an IB PYP school. The findings suggest that integrating Digital Citizenship within the IB PYP curriculum has a positive impact on participants, and this was demonstrated by participants' principled, reflective and responsible behaviour during and after the intervention.

This quasi-experimental research project integrating Digital Citizenship curriculum in an IB PYP School has added to sparse research involving interventions to promote Digital Citizenship in a primary school.

Furthermore, findings showed that substantial gains were made in participants' knowledge, understanding and digital competency skills for each of the nine elements incorporated into the Digital Citizenship Unit of Inquiry.

5.1   Knowledge and Technology use

The findings of this research suggest that there was a change in knowledge and attitude of participants using digital devices at school as well as at home. These findings show that through the lessons in a Digital Citizenship Unit of Inquiry including self-reflections, can increase participants' knowledge base on technology and its ethical use for learning can be enhanced.

The participants have now become conscientious about time spent on the digital devices. As indicated in the research results, the participants are now spending the majority of their time on research and studies. This suggests that participants are conscious about the development of digital competency and self-efficacy skills to use digital devices effectively. Participants made a conscientious effort to monitor their activities on digital devices to use the technology appropriately. The majority of participants during the research period were not using social networking services. However, there were a significant number of participants using *Google+* and blogs to connect and communicate with others online. The results also indicated that about one in ten participants were actively using *Facebook* for social networking with family and friends. This finding is similar to reports by the *BBC*, *Huffington post* and *The Guardian* (see section 1.2.2 "Digital Footprints" in Introduction chapter 1) on a large number of underage users on social networking sites. The Digital Citizenship Unit of Inquiry will facilitate students to engage in appropriate communication and etiquette while they are communicating with any social media applications.

The findings clearly indicated that participants regard technology as an important aspect of their learning in school. However, through the Digital Citizenship Unit of Inquiry, participants have gained an understanding that it is important to know 1] how the technology works, 2] the rules for appropriate use of digital devices and 3] how to work in collaboration with others. The lessons designed to teach the appropriate use of technology have facilitated the change in attitude, knowledge and understanding for the use of digital devices for learning.

Participants of the digital generation in primary school have little by way of life experiences of life. However, they relate to information gathering, knowledge creation and communicating their views through a common culture of digital technology (Palfrey & Gasser, 2013). Participants in this study had responded that their online and offline activities were connected, and, therefore, they needed to be mindful of their activities while working with digital technology. The Digital Citizenship Unit of Inquiry has enabled participants to make connections with important life situations e.g. participants realised that an online comment or friendly joke can provoke confronting situations offline among friends. The integration of Digital Citizenship across the year levels in a primary school would facilitate students acquisition of appropriate online behaviour and might reduce the cyberbullying incidences in schools. This curriculum integration has also facilitated a gain in understanding that the responsible use of digital devices and technology is necessary to learn in a safe and secure environment.

5.2   Digital Citizenship

The Digital Citizenship curriculum is rapidly gaining recognition among educators and school administrators. However, it has not been implemented widely, and the educational

system must be prepared to deal with increasing demands for appropriate and effective use of technology. *Common Sense Media*, *Net Smart*, *Google*, *Microsoft* and the *International Society for Technology Education* (ISTE) have a curriculum framework for Digital Citizenship that supports the training of educators, and the implementation of curriculum and student resources for any school as part of open educational resources. Schools and educational leaders must take initiatives to integrate these with their school curriculum. The teaching and learning resources available from *Common Sense Media*, *Net Smart*, *Google*, *Microsoft* and the *International Society for Technology Education* (ISTE) can be used to plan future units of inquiry on the Digital Citizenship as well as design and review the ICT scope and sequence document of the school.

5.2.1 Digital Access

The results have provided insights on elements of the Digital Citizenship Unit of Inquiry that need a more focused approach, especially Digital access. As found, approximately one third of participants spent two to more than two hours on digital devices for various learning and leisure activities in a day. These findings accord with the findings reported in IDA report that stated that 39% 7-14-year-old**s** are using online networks (IDA, 2015a). The infrastructure of IT and WIFI in Singapore is extensive providing 24/7 access to the internet and other digital tools. The report from Infocomm Development Authority of Singapore (IDA, 2015a) shows that 65% of households have more than two computers at home, and over 75% individuals have access to the internet as well as computers. Moreover, access to broadband through mobile devices in Singapore is much higher than the global average of 38%. With such Digital access it becomes difficult for students in Singapore to understand how one cannot have access to the Internet or digital devices. Children who are born after 2004 i.e. after the birth of the Web 2.0 generation, have no idea about the world without the internet. The

Okinawa Charter on Global Information Society has developed a task force to bridge this digital gap and provide global citizens learning opportunities with digital technology and to facilitate lifelong learning skills (Force, 2001). It is important to parents at a school to understand the digital gap so that they can support schools'efforts to facilitate the effective and appropriate use of digital devices as well as appreciate the available technology for learning.

The results of this research indicated that student unanimously agreed that everyone in the school should have access to computers in common areas, and the internet through a WIFI network. Moreover, the participants also believed that everyone had a right to use technology at school but were unsure if the same philosophy was applicable at home too. However, participants' perspectives changed following the Digital Citizenship Unit of Inquiry, and they now support the notion that every member of the family has a right to use computers and have a WIFI network at home too. The findings indicated that participants in developed countries like Singapore have a false understanding that technology is always available to everyone in the world. This information leads us to the question: is this the reason for those participants who do not agree with the right of children around the world to have access to technology? Further testing and research are required to understand students' beliefs about technology for children around the world.

5.2.2 Digital Commerce

Digital devices and their connections to App stores or play stores require the users to set up payment details using credit cards. The App stores are designed in such a way that the user would not realise the implications of having credit card details readily available. It does give one ease of use in the sense that details are not required to be keyed in for every transaction. Therefore, digital commerce was an important element for students to understand in order to

comprehend how online transactions work. The results indicated that the participants gained

an understanding of e- Commerce and tools that enable online financial transactions.

Participants identified *E-bay* as an online store which is used to buy and sell products online

and acknowledged that one requires a credit card for any financial transactions. The

participants were able to articulate that though the online financial transaction does not mean

the physical transfer of money, money in a bank account is required to pay the credit card

bills. This knowledge and understanding were significant as post-intervention the majority of

the participants' responses indicated that they would ask for parents' permission before

purchasing any gaming module. It is an important etiquette that participants need to adhere

to, to ensure appropriate use of online purchasing facilities.

The Digital Citizenship Unit has facilitated the understanding of E- commerce among

the primary school students and therefore, students will think and ask parents if in doubt

before conducting any online transaction that may or may not involve the payment details.

This practice will be beneficial to students as, and when they are the owners of first the

subsidiary credit card or, later on, personal credit line, the students will know all the steps to

protect personal data and identity before carrying on the transaction.

5.2.3 Digital Communication

Digital communication is very much a part of our lives. Today, one does not realise how

much we depend on the digital mode for communicating with each other for professional as

well as personal purposes. Besides emails, *Blogs*, *Skype*, *Whatsapp*, *Wechat, Facetime* and

many more applications are being used for communication. The language used for different

types of communication is critical. Due to the lack of face-to-face communication, it

becomes difficult to analyse the salient features and reading of the behavioural language.

Humour sometimes is easily misinterpreted as a derogatory comment when using digital devices for communication. Therefore, participants must be competent enough to use these digital communication skills appropriately. After the intervention, the participants developed an understanding that a conscious effort must be made in all digital communication so as not to hurt anyone's feelings.

The research findings have provided direction for further implementation of digital communication tools within the classroom. Participants were aware of different devices and their functions for communication purposes. The frequency of usage of digital devices for communication by participants was quite high even before the intervention. The research also provided the insight that most participants were aware that email communication requires them to think and reflect before sending. However, there were a small number of participants with no knowledge about the impact of prompt communication before the intervention that gained a greater understanding post-intervention and would hence act appropriately before sending the emails out.

The major change in participants' perspectives was that post intervention; they indicated that they would not email or mass emails in frustration. This result was recorded in response to the scenario "*Scolly had a fight with a friend. Scolly writes an email to tell the friend how upset he was, and he copies (cc) it to everyone in the class*." Whereby nearly all participants responded that Scolly's behaviour online was inappropriate. The results indicate that the Digital Citizenship Unit of Inquiry facilitated the acquisition of digital etiquette among students and therefore integrating this Unit on Digital Citizenship would help to curb cyberbullying at school.

The language used in emails for different types of communications differs depending on the person and requirement of the communication. Before the intervention, participants were oblivious to the "SMS lingo" used by them for communication with teachers via email. Participants were engaged in a heated discussion on this topic, as some believed that if someone was comfortable with the teacher and if the teacher had no objections, using SMS language would be acceptable. Others, on the other hand, defended their argument stating that while teachers may not have any objections, it does have an impact on their ability to use proper language. The use of proper language for emails related to all school-based communication ensures that respectful and clear messages are conveyed through emails. Moreover, to maintain Digital Etiquette and the appropriate use of digital devices, it is foremost necessary to use proper English for any formal communication between participants and teachers. The results of these discussions and research by participants on the types of digital footprints left online led them to come up with an agreement that formal communication requires the use of appropriate language as chats, emails, and comments are all forms of digital communication that leave an imprint in the digital world.

Discussions of one's digital footprint had participants buzzing with queries and what could be done to create positive digital footprints so that their image is maintained online. Participants were intrigued by the search engines and what could be displayed about them, as well as their family members, online. One of the participants was quite disturbed by the fact that his granddad had posted pictures of his family with the family home in the background which he was able to download. It is a breach of the personal security of the student, as a person with criminal intentions could download, modify and, or use the photograph, or based on details available on the photo, locate the family home to conduct an unlawful activity such as theft or kidnapping. The discussion among the participants regarding the breach of

personal security was the driving force for the upset student to go home and have a chat with family about digital footprints. Participants also decided to take action to create awareness among the school community by creating posters of digital footprints and its impact on one's life.

Similarly, students came to the understanding that all and any communication using digital devices requires them to be cautious regarding their language use and written message. The intervention facilitated students' understanding of a Digital footprint and its impact on their lives. Students are now making a conscious effort to lay a positive and constructive footprint in order to create and project a good digital image. Students now and in future will use appropriate language and etiquette during any and all online communication, thereby reducing the chances of being a cyberbully and creating a negative online image.

The findings of the study suggest that students have gained an understanding of the concept of Digital Citizenship and how the digital footprint affects their lives, and so they would work towards creating a constructive, positive image online. Therefore, it is important students across the school are able to gain this understanding through the integration of the Digital Citizenship unit at different year levels.

5.2.4 Digital Literacy

Participants as part of this project embarked on a journey of research and inquiry. The research on Unit of Inquiry topics, as well as the inquiry process, are integral components of the IB PYP curriculum, and participants need to have guided learning experiences to work on both. Digital literacy competence becomes necessary for participants to scan through the digital readings and information available in a variety of digital formats. Throughout the study participants were more inclined to search online for sources of information rather than

from books and magazines. The ease of shifting through diverse and an enormous amount of information available online was no match for sitting physically, reading books or journals and taking notes. Therefore, participants preferred to conduct their research using online database and sources.

Participants used *Google* as their default search engine rather than the child-friendly *Google kids* and *Kidsclick*. Child-friendly search engines were not preferred by the participants because the information on the topics of research for their Digital Citizenship unit as well as other units in their homeroom was limited. The question that now arises is; "Are child-friendly online tools designed to support learning and digital experiences or do they just stop participants from going to inappropriate websites?"   Research on child-friendly digital tools and how they support or hamper learning in the primary years is required to understand why tools designed for children are not popular among young students.

The ability of participants to create their content for online publishing is supported by the availability of advanced digital tools as mentioned earlier in the literature review (see Rogers & Price 2009). Pre-intervention participants were totally unaware of how the copyright law works and what is required for a participant's work to be certified by copyright agencies. Through the Digital Citizenship Unit of Inquiry, participants came to the understanding that the fundamental requirement for any work to be copyrighted is the originality of the work. The participants' responses to post-intervention questions indicated that they now understand the requirement to abide by copyrights and would either purchase books and DVDs or borrow them from the library. Through the Digital Citizenship Unit of Inquiry students have gained the understanding of the original work, citing sources and creators' rights. The changed perspective and understanding of students might help to reduce

the piracy and illegal download of media as students will make a conscious effort to create a positive digital footprint.

The boundaries defining plagiarism and intellectual property rights have been thinning and with easy access to a digital library of multimedia, it is difficult for participants to distinguish between the appropriate and inappropriate use of others' work. The Digital Citizenship Unit of Inquiry had led participants to understand that originality of work is appreciated, and any use of digital media without the owner's permission is not respecting the rights of the owner. The understanding of copyright and respect for the original work was evident from the participants' response to the classroom scenario. The classroom scenario question- "*Rini has found a cool music album, and she wants to extract the background music using music editing software for her school project*". The participants were in total agreement that Rini should obtain permission before using any music for her school project. Participants' understanding was facilitated by the task of creating original lyrics for the cyber bullying song in music lessons. Blending the traditional literacy requirements with new digital literacy capabilities provided participants with a range of experiences to explore the tools of self-expression. Intervention in the form of the Digital Citizenship Unit of Inquiry had facilitated participants to make an informed decision to use online resources ethically and appropriately.

The digitally literate educator would embed technology in the classroom based on the understanding of participants' developmental and curriculum needs. Most participants were in agreement that exploration of available digital tools on their own was a definite "no-no". The consensus among the participants was that they needed to discuss the requirements of the assignment and express a readiness to experiment with different digital applications for publication with the teacher before proceeding.

Interactive digital tools to present participants' understanding of the topic are the requirements of a digital culture. The Unit of Inquiry tasks were designed to introduce a variety of applications to give participants a choice to create digitally and present to an audience. Participants who were not familiar with tools like *Prezi*, *Cartoon strips* and Animation pre-intervention expressed that they preferred the interactive nature of *Prezi* and *Toondoo*, and used this digital tool for their presentation post-intervention. The introduction of interactive digital tools within the curriculum supports students' urge to find new ways of self-expression, gives them a safe environment to try these tools and provides opportunities to learn from experiences of self and others.

Note taking and documentation are part of participants' digital literacy skills and so the digital tools, and their effectiveness are vital for participants. While *Prezi* was preferred as the mode of presentation and collaboration; *Microsoft Word* and *Wiki* were most popular applications used by participants for this purpose. It was also noticed that *Pages* and *Notes* were also favoured by a small number of participants. Post-intervention participants realised that the content was vital for any presentation or documentation. The expression of views and thoughts on any particular topic would only be effective if the content was good enough. Similarly, the alignment and visibility of content regarding font colour and size must be appropriate for the presentation and type of audience. Participants had a higher affinity for audio and video than anything else, but post intervention participants demonstrated their understanding that a balance of elements was required for any literary creation.

The intervention had a significant impact on the research and citation activities of students. Students displayed their knowledge and understanding which was reflected in the work submitted with a proper bibliography, and citation of the original source. Students' actions indicated that they respected original creators, academic honesty was important to

them and at the same time, students were aware of their own rights as authors. The digital literacy skills acquired by students during the intervention will go a long way as students will be producing and publishing their work in middle and high school years. The workload and other academic pressure of middle and high school students will be at an advantage and will always use information appropriately thereby avoiding the plagiarism and academic dishonesty.

Students have indicated that they would not be involved in any illegal download of music and movies through a Torrent website. This is a major finding of the intervention as students gained digital competency skills to differentiate as well as analyse appropriate and inappropriate websites, keeping their digital devices safe from infringements of copyright laws. Temptations to download music, movie and software from torrent or pirate bay are very high. However, the intervention has equipped students with necessary skills to resist these temptations and acquire the media through proper channels.

5.2.5 Digital Etiquette

The finest digital etiquette skills can be nurtured through curriculum integration of a Digital Citizenship Unit of Inquiry. Study findings have shown that Digital technology, when used effectively to support the curriculum requirements, can enhance participants' learning beyond classroom walls and this align with Cennamo, Ross, and Ertmer (2013) findings. The results of this study confirms that Digital Etiquette skills are nurtured among the students through thoughtful curriculum integration of Digital Citizenship framework.

Digital devices with an ability to connect to the internet require users to exhibit the proper etiquette for everyone to have good digital experiences. The permission for the use of students'photos and videos online were presumed to have been provided by the teacher

before the Unit of Inquiry intervention. This was because the school did not have a set policy and teachers were unaware of the digital etiquette requirements and so actually allowed photos and videos to be published online. Moreover, once the parents have signed the form during admission which has a section concerning the use of their child's photo and videos for school publications; educators overlook the fact that the student still has the right to say no for a photograph of them being taken and used by the school. ISTE standards for teachers advocates that teachers should model ethical and appropriate behaviour while working with technology (Crompton, 2014). The modelling of appropriate etiquette by teachers is important for participants as the behaviour of adults speaks louder than what is being taught in digital etiquette lessons. Therefore, teachers and other adults around children should not only be mindful of their digital behaviours but also model appropriate etiquette in regards to digital technology.

Post-intervention most participants agreed that they would consider Digital Etiquette as being imperative for them as they would like to have a positive image as users of technology. Post-intervention participants also acknowledged that a cyberbully should not be entertained and must be reported by saving the message and post sent by the cyber bully. Participants' responses indicated that competent digital learners will follow digital or net etiquette rules at all times while using technology for work and play.

Cyberbullying is a covert type of bullying and is not normally visible, and so adults should be vigilant about any behaviour changes among children (Bauman, 2014). The ability of primary school educators to tackle cyberbullying was not part of this research, but primary schools must have professional development and policies in place to counter any incidences of cyber bullying. The Digital Citizenship Unit of Inquiry led participants to come to the conclusion that irrespective of the device used, age, technology skills or social status,

everyone must exhibit appropriate Digital Citizenship skills for a positive, holistic experience in the digital world. The findings of this study suggest that facilitating digital etiquette skills through a Digital Citizenship Unit of Inquiry supports the participants to be safe online. These results accord with research by Livingstone, Haddon, Gorzig and Olafsson (2010) on European Union children that participants must be explicitly taught Digital Citizenship skills to empower, build confidence and resilience towards their online safety.

Similarly, students now recognise that their online and offline lives are connected, and so they need to maintain Digital Etiquette at all times while working with technology, including appropriate email etiquette. Students are now aware that cyberbullying damages the life of the person who is being bullied, and also the person who is bullying others. Like online activities any act of cyberbullying will also create a permanent record in the form of digital footprint and also impact their academic achievements in the school. The intervention lessons during this study have provided students with the understanding and skills to use their digital etiquette while online, behave appropriately and report if they witness a cyberbullying incident. Students now know that passive participation in a cyberbullying act is also a kind of bullying and they must stand up for vulnerable students and protect them by reporting it to appropriate authorities. The Digital Citizenship unit has prepared students to become responsible with their online endeavour by refraining from any unkind and inappropriate activities that might cause harm to others.

5.2.6 Digital Law

The curriculum integration facilitated participants to reflect upon their actions in relation to digital laws and how they impact their online image. Through the Unit of Inquiry checking someone's email account without their knowledge was understood to also be an invasion of privacy. The Digital Citizenship Unit of Inquiry facilitated the acquisition of skills among

participants and post intervention participants indicated that they would log out the user as part of digital etiquette norms. Post-intervention participants acknowledged that data security starts with self-contained measures like using equipment properly, enabling antivirus protection, enabling phishing and spyware filters, backing up regularly and foremost of all using passwords to protect their computers and documents.

5.2.7 Digital Rights and Responsibility

There was no significant change in participants' knowledge of the public domain and also about the copyright laws for using work available on the public domain. However, participants were very clear about the copyright laws indicating they would not photocopy copyrighted material or make money out of it, and they would buy a DVD instead of downloading or copying it. There was a substantial change in participants' knowledge after intervention about rights to the publishing of a book written by a child. An independent inquiry by a student intrigued by copyright laws led her to examine the patent war between two technological giants *Apple* and *Samsung* closely. The student researched the origin of the dispute and the continued intellectually property rights accusation between the two. Her presentation for summative assessment for the unit was based on the research of copyright laws, and her findings reflected the complexity of the issue between the technological corporations (see Appendix H).

Participants' recognised that the opportunity to use digital technology for learning was a privilege and that they needed to exercise responsible behaviour while using digital tools. The findings of the research indicated that participants would not act irresponsibly out of frustration and would ask for help when required. The findings also suggested that

participants would discriminate between the age appropriateness of websites during research and notify the teacher of any breach in security of the firewall or antivirus software installed.

Students are now aware it is not only their right to use digital devices and technology for work and play but also, they have a responsibility to use both appropriately and effectively. Post-intervention students have indicated that their online security is manageable by caution and security checks through internet security software. Students are now aware that using someone's email ID, or data without their permission is a punishable crime, and any breach must be reported to teacher or respective authorities.

5.2.8   Digital Health and Wellness

Participants had ignored digital health and wellness associated with the use of digital devices before the intervention. Participants were totally unaware of health problems that might be caused by the extensive and prolonged use of digital devices. Therefore, they were not able to conceptualise the steps necessary for their physical and mental well-being. The Digital Citizenship Unit of Inquiry has filled the deficit in participants' understanding about healthy habits while working on digital devices. During classroom discussions, a student had mentioned that he had a habit of playing games in the middle of the night as he is not allowed to play during weekdays. He also mentioned that he is sometimes sleepy during the day and is unable to focus in class. The researcher faced a dilemma whether to notify the parents or keep the confidentiality of the discussion within the classroom environment. The researcher organised a three-way conference with the participant and his parents to support the participant in forming a healthier habit while using digital devices. After the three-way conference, the participant and parents formed an essential agreement to monitor the participant's activities on digital devices. The results of the research signify that participants

gained a substantial understanding of the implication of the prolonged use of digital devices and the steps to be taken to sustain healthy work habits while working with digital devices.

The participants reported that proper posture and lighting are very important while working on the computer. Significant changes were noted in forming healthy habits like taking breaks when working on digital devices, ensuring the volume of music would not damage hearing abilities and monitoring the temperature of digital devices. The fundamental understanding among participants due to the Unit of Inquiry was that they need to carry out "technology detox" periodically and connect with people through interpersonal interactions. For example, participants have come up with an agreement with their family members that digital devices will not be used during family mealtimes.

The Digital Citizenship intervention and lessons on health and wellness about the use of digital devices has supported students to acquire an understanding of health related issues while working on digital devices. Students now consciously monitor their activity and believe that taking frequent breaks is good to maintain healthy habits while working on digital devices. The students now are aware of the requirement for proper lighting, as well as possible strains and pains that may cause physical comfort. Healthy routines developed during intervention will support students to look after their physical and psychological well-being in the busyness of teen and adulthoods by taking a rest and managing their digital lives well.

5.2.9 Digital Security

Digital security is related to both online security as well as network security. Participants were knowledgeable about the difference between the two. However, they were a little unsure about network security, implying that they needed more experience and information

about how network security worked. The personal project on online security by the student who wanted to know what steps are taken by adults inspired him to video-interview family and friends on this topic. His findings were that some adults were less concerned and ignored the basic requirements of digital security, whereas some were paranoid about it. Two conflicting views presented to participants in their home environment can be confusing for children. The counter measures are to run workshops with parents on Digital Citizenship.

The findings indicated that participants acknowledged that private information related to their whereabouts, family members, passport details and other personal details should not be revealed online. They also affirmed that they would not entertain unknown persons online to keep themselves safe. The participants agreed the best way to keep unwanted people out of their online world was having a secure password and keeping their profile on blogs and other social networking websites private. Participants developed the strategies to add the author and friends to their private blogs and profiles for safe online interactions.

The results are encouraging, but the researcher's concerns are "Does this tally with the practical application by participants?" The reason for the doubt is that a student involved in the research project had a public *Youtube* channel that due to learning about a Digital Citizenship, he turned to a private channel. This resulted in no interaction or feedback about his published work. The student was emotionally upset as being an only child of a single working mother; he had limited social interactions. He changed the settings back to the public setting because the *Youtube* channel was and still is, the only outlet (according to the student) of reaching out to the world. This is a one-off incident and should not be generalised, but it does raise concerns about participants' exposure to an unknown world on the internet.

The intervention has provided students with the tools to recognise the difference between personal and public information. Students now understand that they need to be protected online, and all their personal information including photographs should not be uploaded to social networking and public websites. Students actions after the intervention were to keep their blogs and online profiles private. Furthermore, students were sure to log out of every session of online activity on any digital device that they were using during the lessons. The digital habits thus formed in their primary school years will keep students safe in future to make well-informed decisions for their online activities when they are out of their protective environment of the primary years.

5.3 Summary

The Digital Citizenship Unit of Inquiry with year five students in an IB PYP school has facilitated digital competency skills among the students to be lifelong learners and responsible digital citizens. Students will use and sharpen their digital skills of paraphrasing, citing sources, creating pieces of work with a combination of multimedia applications and sharing it with other others. Students will demonstrate the excellence in the use of digital tools for their literary productions and engage in meaningful dialogues in online sessions. Digital Etiquette and Communication will be a priority for these students as they have displayed that creating and managing positive digital footprints is of utmost importance for them, and so they will ensure that their participation in the digital world is constructive and appropriate. Students will continue monitoring their digital lives, both for the health and wellness as well as security and take appropriate steps to ensure healthy and secured digitventures. The Digital Citizenship Unit has provided some useful data that would help educators to provide necessary curriculum integration for the acquisition of digital competencies among the students. Students have acquired digital skills for appropriate and

effective use of technology through the intervention which will support their lifelong learning requirements to become a responsible digital citizen of the 21st century.

5.4 Limitations

The reliability and credibility of the results obtained through the research are critical as the results will set further directions of an integration of Digital Citizenship curriculum into the IB PYP curriculum framework. The threats to internal validity may be due to pre-test and instrumentation (Kirk, 1982). As the topic of the research, Digital Citizenship was new for the students so the pre-test drove the interest for the inquiry and students' questions during the lesson. The instrument, in this case, was a questionnaire which was designed specifically for the research and has not been tested before.

Generalisation of the result is another limiting factor in the results of the study to be transferred to other educational settings. The study used convenience sampling so the same intervention may not be effective across the student population in other international schools around the world. The limitation of generalisation can be nullified by replication of the treatment to confirm the effectiveness of the Digital Citizenship Unit of Inquiry in an IB PYP school. The replication of intervention will confirm the findings of this research study and will allow the results to be applied to broader educational practices (Yin, 2009). Replicating the research study will reduce the chance effect of the intervention and increase the probability of a "functional relationship" (Riley-Tillman & Burns, 2011, p. 26) between the intervention and acquisition of digital competency skills. The skills and understanding acquired through intervention need to be retained and tested at a regular intervals, and therefore, it is important that the ICT Scope and Sequence integrating the Digital Citizenship framework across the year levels be implemented throughout the school. Considering these

limitations the researcher has some recommendations for future research on Digital Citizenship integration in IB PYP schools.

5.4 Recommendation for future research

The role of digital devices and technology in education is dynamic and is ever increasing with advanced technology being easy and affordable for everyone. As mentioned in the introduction and literature review, educators facilitating learning with technology requires proper professional development to be digitally competent educators. Digital Citizenship concepts provide the foundation for educators to understand and support the learning needs of the digital generation and prepare them to be responsible technology users (Ribble, 2011).

This study investigated the effectiveness of the Digital Citizenship Unit of Inquiry in an IB PYP school. Due to the pervasive nature of technology and the school moving towards BYOD or BYOT, the job of a teacher integrating the Digital Citizenship curriculum becomes vital. The findings of this research provide specific directions for designing an ICT Scope and Sequence and recommendations for future research to strengthen the acquisition of the Digital Citizenship skills in primary school children. Recommendations for further research include:

• To carry out a qualitative analysis of students going through the curriculum integration and implications for Digital Citizenship curriculum for primary school students. This would focus on students' application, emotional journeys and thought processes of being responsible digital citizens.

• To plan and deliver professional development workshops to all teachers and parents.

• To evaluate teachers' digital competency skills and provide feedback for an update if required.

- To conduct horizontal and vertical studies of Digital Citizenship skills across the year levels and review the curriculum accordingly.

Chapter 6: **Conclusions**

The conclusions section of this research paper highlights the key findings by connecting them to the purpose of the research and the importance of integrating Digital Citizenship framework with IB PYP curriculum.

This research study investigated the concept of Digital Citizenship integrated with the IB PYP curriculum and tested the effectiveness of the Digital Citizenship Unit of Inquiry in developing appropriate and effective digital competency skills among primary school students in Singapore. The Digital Citizenship Unit of Inquiry developed for this study was based on Ribble's (2011) nine elements of Digital Citizenship. The study sought to develop an understanding among IB PYP students of the appropriate and effective use of digital devices in an ethical and responsible manner for the benefit of all. The study sought answers to two important questions related to digital technology integration in education

1] How effective is the Digital Citizenship Unit of Inquiry in a year 5 IB PYP classroom?

2] Does Digital Citizenship curriculum integration, facilitate the appropriate and effective use of technology?

The study findings show that students can develop a sound understanding of the concept of Digital Citizenship and of being responsible users of digital technology.

In summary, the effect of the Digital Citizenship unit of inquiry was an increased understanding and knowledge among students about the use of technology and digital devices. Students demonstrated that knowledge of how a particular device or application works is important as well as how effectively, they would use it for the presentation of their ideas. Positive changes were found in students' attitudes towards digital communication,

digital literacy, digital etiquette, copyright law and rights and responsibilities as a user of digital technology

The impact of digital literacy was powerful as students ensured that they had cited a source for interviews, websites, books and conversation for their summative assessment ask for the unit. The digital literacy skills acquired during the intervention supported students' learning by authoring an original piece of work, understanding and respecting diverse perspectives or viewpoints, analysing and evaluating the credibility of information and conducting research by accessing varied sources of information in the digital world.

Students' attitudes towards the right to access technology changed positively and they not only used the ICT lab equipment properly, but also their own devices were used appropriately and taken proper care off during movement across the school. The Digital Citizenship lessons enhanced students' understanding that the responsible use of technology is not only limited to, school devices, but also extended to all the devices and environments where they are actively participating in the online world. Taking photos or videos of self and others and posting them online is a common phenomenon for the digital generation and knowledge that respecting the privacy of other members of the community is essential. This notion is an important trait that students have developed through this study which should be supported by a policy designed by the school administration.

Post-intervention students' actions for the appropriate and effective use of digital devices and technology were positive and well received by parents. Students turned the setting for their blogs and other online profiles to private. Students were conscientious about their digital footprints, and so they monitored their online activities, logged out of the online application after each session and used appropriate language for online chats, emails and comments. Students reported if they had encountered any inappropriate websites or pop-ups

during the lessons or even on their personal devices so that further action could be taken for their safety. Students acquired skills to identify unwanted pop-ups or inappropriate websites as well as ignore and report strangers trying to communicate with them during a chat session. These skills will keep students safe from being victims of stolen data or identity and also from perpetrators lurking on the online world searching for easy targets.

Digital technology is evolving and changing constantly. Students are immersed in the digital world through connected networks and constantly interacting with each other as well as others on the digital platform. Therefore, it is important that the education system makes provision for the acquisition of digital competency skills to enable students to be responsible Digital Citizens and become ethical contributors to the digital world. The findings of this study show that students who participated in the intervention understood the concept of Digital Citizenship and its elements.

The Digital Citizenship intervention has led students to focus on different elements of Digital Literacy not only multimedia. Students are now aware and conscious that any presentation, documentation and published work requires a] appropriate and adequate content, b] readable font size and colour c] alignment of content d] balance of media and written work.

The Digital Citizenship framework integration with the IB PYP curriculum has facilitated students' acquisition of digital competency skills among year five students in primary school. The results found a positive impact of the intervention which enabled the year five students to make a conscious effort to use digital devices effectively and appropriately. It is important to note that this study shows that through education and curriculum integration students can acquire digital competency skills required for 21st-century learning and to become responsible Digital Citizens. This is consistent with Ribble's

(2015) notion that only through Digital Citizenship education and curriculum integration "an individual can become a productive and responsible digital citizen" (p. 17). The combination of collaborative and independent tasks as well as time allocated for group discussions during the intervention lessons enabled students to work cooperatively with each other and they also supported others in their group to become good digital citizens.

This study provides guidelines for teachers and curriculum coordinators to integrate Digital Citizenship with the curriculum; design and develop units that would support the acquisition of digital competency skills for students of primary years in the schools. Moreover, the study has given us an insight into students' perspectives on different aspects of their digital world. The Digital Citizenship Unit of Inquiry has facilitated digital competency skills and empowered year five students in an IB PYP school to become effective and appropriate users of digital technology and responsible Digital Citizens.

The Digital Citizenship intervention with the IB PYP curriculum was successful in supporting and developing students digital competencies for all the nine elements of Digital Citizenship as described by Ribble (2011).

The lessons for this unit were designed to develop digital competency skills that can be a self-regulated and guiding force for students to manage their digiventures. Students had an opportunity to explore the digital tools, communicate with each other, study real-life cases of cyberbullying and draw their conclusions for the appropriate and effective use of digital technology for learning. Results show that young students can and are able to gain necessary digital skills to be responsible Digital Citizens by self-regulating their online activities and behaviour.

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Appendices

Appendix A- Letter requesting research approval from the principal of the school

School of Education

Faculty of Education, Humanities, Law and Theology

GPO Box 2100
Adelaide SA 5001

Tel: +61 08 8201 5878
Fax: +61 08 8201 3184
http://ehlt.flinders.edu.au/education/

CRICOS Provider No. 00114A

Dr Grace Skrzypiec
grace.skrzypiec@flinders.edu.au

30 April 2013

Dear Ms Cheryl Kelly

Re: Investigating Digital Citizenship in an International Baccalaureate (IB) Primary Years Program (PYP) school in Singapore

Ms Vibha is undertaking a study to understand the implication of Digital citizenship on learning in a PYP classroom. How skills required for being a good digital citizen can integrate into a PYP curriculum and the effectiveness of a new ICT digital citizenship unit of inquiry, form the main purpose of her study. The data collected through this research will help develop an ICT scope and sequence as well as a set of digital citizenship lessons. Ms Vibha would like all students to understand their rights as digital citizens and also accept the responsibility that comes with it.

She is undertaking this research to determine how students can be empowered with essential digital learning skills in order to become good digital citizens. It is the focus of her MEd studies. It is hoped that this understanding will inform the development of future ICT digital citizenship topics.

Ms Vibha is seeking your permission to approach year 5 students at your school to participate in a trial of a series of digital citizenship lessons. Students will also be asked to complete a pre- post and follow-up questionnaire about digital citizenship. The information gathered from the questionnaires will provide an indication of the effectiveness of the lessons.

The digital citizenship unit of inquiry would take place, preferably during the first **term, of the new academic year, 2013.**

What does the study involve?

- **Minimal involvement by other school staff.** With your approval, Ms Vibha will
    - o Provide information for parents and students about the research
    - o Seek voluntary participation from potential participants
    - o Seek informed consent from those who wish to participate
- Ms Vibha would be happy to speak to you further about the research if that is desirable.
- Ms Vibha would be happy to present findings to you and other staff members at the end of the project

This study has the approval of the Flinders University Ethics Committee (see contact details below) Staff and **schools will not be identified in the research**, and collected data will be de-identified.

All participants will be given feedback of the findings on completion of the study.

Any enquiries you may have concerning this research should be directed to me at the address given above or by telephone on 8201 5878 or e-mail grace.skrzypiec@flinders.edu.au.

Do you approve the participation of students at your school?

If so, you will need to sign the attached approval letter and return it to Ms Vibha who will pass it onto SBREC Ethics committee.

I hope that you will give this request due consideration and I assure you that Ms Vibha will be willing to work with you in a manner which suits the school and which will cause minimal disruption to the school day.

Yours sincerely

Dr Grace Skrzypiec

Research Associate, School of Education

Faculty of Education, Humanities, and Law

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee. For more information regarding ethical approval of the project the Secretary of the Committee can be contacted by telephone on 8201 3116, by fax on 8201 2035 or by email human.researchethics@flinders.edu.au.

Appendix B -Approval from Principal of the school

E t o n H o u s e ®
International School
IB World School

Friday, 3 May 2013

<u>Consent from Ms. Cheryl Kelly (Principal EtonHouse International School Singapore)</u>

Investigating "Digital Citizenship In an International Baccalaureate- Primary Year Program

CONSENT FOR Research to be conducted by Ms Vibha Sheth at EtonHouse International School at Broadrick Road Singapore.

I **Cheryl Kelly** hereby give my consent to Ms Vibha Sheth to carry out the research on the *Digital Citizenship in an International Baccalaureate (IB) Primary years Program (PYP) school.*

I have read the information provided.

1. Details of procedures and any risks have been explained to my satisfaction.

2. I am aware that I should retain a copy of the Information Statement and Consent Form for future reference.

3. I understand that:
   - While the information gained in this study will be published as explained, and students will not be identified, and individual student information will be kept anonymous.
   - Whether any student participates or not, or withdraws after participating, will have no effect on any treatment or service that is being provided to him/her.
   - Whether any students who participates or not, or withdraws after participating, will have no effect his/her progress in his/her course of study, or results gained.

Cheryl Kelly
Principal

Appendix C Participant information & consent form

PARTICIPANT INFORMATION STATEMENT AND CONSENT FORM

Digital Citizenship: An investigation of learning in an IB (International Baccalaureate) PYP (Primary Years Programme) school.

What is the study about?

This is a Masters Research study being undertaken by me (Ms. Vibha) to understand the implications of Digital Citizenship on learning in a PYP classroom. How can we integrate the skills required for being good digital citizens into our PYP curriculum and what benefits would our students have by acquiring these skills form the main questions of this study. The data collected through this research will help us improvise our ICT scope and sequence as well as allow us to incorporate the lessons based on digital citizenship at various year levels in our school. We would like all our students to understand their rights as digital citizens and also the responsibility that comes with it. The students will gain the understanding of the nine elements of digital citizenship as described by Mike Ribble, which includes intellectual property, academic honesty, and cyber bullying. Through the Unit of inquiry on digital citizenship we seek to facilitate students in becoming confident users of digital media/ devices and able to make informed choices when faced with challenges online or offline involving net etiquette.

If you wish to participate, what do you have to do?

Please sign the consent form and return it to me at the school. Also, please ask questions if you have any. Students who wish to be part of this study will participate in digital citizenship lessons during the school terms. They will also complete 30-40 minute pre and post questionnaires containing questions about digital citizenship. These will provide a measure of the effectiveness of the digital citizenship lessons.

What are the benefits of participating in this study?

This unit of inquiry seeks to facilitate students' understanding of the nine elements of digital citizenship, including the concept of Intellectual property, digital literacy and assist them to become informed and responsible digital citizens.

What if I don't want to participate or what if I change my mind later and want to withdraw from the study?

Participation is _voluntary_ and you can choose _not_ to participate. If you do participate you can withdraw from the study at any time. Your decision whether or not to participate will have no impact on your child's grades or involvement with the school.

What are the risks of participating?

There is minimal risk involved in this research as it is classroom based and in the natural daily environment of the students. However students might experience mild anxiety or stress related to the uncertainty of actions required to be taken during the lessons as responsible

learners. If you notice any symptoms please notify the school personnel listed below so the necessary counselling support can be provided for your child. The Learning support teacher and welfare coordinator Ms. Joanna Montinola can be contacted if there are any signs or symptoms of distress. Her email ID is Joanna.Montinola@etonhouse.edu.sg.

What about confidentiality?

All information collected for the study and that can be identified will remain confidential and will not be disclosed, except as required by law (illegal activities must be reported to the appropriate authorities). If you provide consent the interview will be tape recorded. We plan to publish the results of the study in a report and in academic journals. In any publication, information will be provided in such a way that you cannot be identified.

What if I have complaints about the study?

This study has been reviewed and approved by Flinders University Social and Behavioural Research Ethics Committee. If you have any concerns or complaints about the study you can contact the Secretary of the Committee in SA on 8201 3116, or by fax on 8201 2035 or by email human.researchethics@flinders.edu.au. Any complaint you make will be investigated promptly and you will be told of the outcome. You will be given a copy of this form to keep.

What do I do now?

If you agree to take part in the study, please sign the 'Participant Information Statement and Consent Form' on the next page and return the form to me (Ms Vibha).

If you have any questions or would like **further information** about this study or have any comments at any time during the project, please feel free to contact me by e-mail: rajvibs76@gmail.com or phone: 98273976, or my supervisor Dr Grace Skrzypiec by e-mail: grace.skrzypiec@flinders.edu.au or phone: +618 8201 5878.

Thank you very much for taking the time to read this and considering whether you will participate.

FOR STUDENT COUNSELLING SUPPORT

The Learning support teacher and welfare coordinator

Ms. Joanna Montinola

Email: Joanna.Montinola@etonhouse.edu.sg

Phone number: 6346 6922

FLINDERS UNIVERSITY

PARTICIPANT INFORMATION CONSENT FORM

Digital Citizenship: an important aspect of learning in an IB (international Baccalaureate) PYP (Primary years Program) school.
CONSENT FOR PARTICIPATION IN RESEARCH
(by Questionnaire)

I …..…

being over the age of 18 years consent/do not consent (delete as required) to my child .... participating, as requested, in the *Title of Project* study.

I have read the information provided.

1. Details of procedures and any risks have been explained to my satisfaction.

2. I am aware that I should retain a copy of the Information Statement and Consent Form for future reference.

3. I understand that:

    • My child may not directly benefit from taking part in this research.

    • My child is free to withdraw from the project at any time and is free to decline to answer particular questions.

    • While the information gained in this study will be published as explained, my child will not be identified, and individual information will be anonymous.

    • Whether my child participates or not, or withdraws after participating, will have no effect on any treatment or service that is being provided to him/her.

    • Whether my child participates or not, or withdraws after participating, will have no effect his/her progress in his/her course of study, or results gained.

Parent/Guardian's signature……………………………………………Date……………

Child's signature …………………………………………………

Appendix D: Participant information and Consent in Japanese

[参加者の情報の取扱方針および同意書]

デジタルシチズンシップDigital Citizenship ：
IB(International Baccalaureate) PYP(Primary years Program)School における学習の重要な要素となります。

この調査とは？
この修士研究は、PYP の教室において、デジタルシチズンシップがどのような意味合いを持つのかを理解するために、私（Ms. Vibha)が行います。主な目的は、望ましいデジタルシチズンとしての技能をいかにPYPのカリキュラムに取り入れることができるか、そして、その技能の習得がいかに生徒に役立つかと見極めることです。この調査データは、学校の様々な年次におけるデジタルシチズンシップに基づいた授業の導入のみならず、ICT（情報通信技術）の学習内容と順序の考案にも役立ちます。

参加ご希望の場合は？
同意書にご署名の上、ご提出ください。何かご質問があれば、ご遠慮なく問い合わせてください。

参加のメリットは？
生徒はデジタルシチズンシップの９つの要素、知的財産およびデジタル技能の概念を理解し、情報に精通した、信頼されるデジタルシチズンシップとなります。

不参加あるいは考えが変わり途中辞退の場合は？
任意参加です。参加の場合でも、いつでも途中で辞退できます。参加の有無が、将来的にお子様とFlinders University および EtonHouse International Schoolとの関係に偏見を及ぼすようなことはありません。

参加にかかるリスクは？
教室および生徒の自然な状況で行われるため、ごく僅かなリスクが伴うことがあるかもしれません。実施内容に不安を覚えたり、緊張したりすることがあるかもしれませんが、なにか兆候に気づかれましたら、Ms. Vibhaまでお知らせ願います。お子様にとって必要なカウンセリングを行い、サポートいたします。

守秘義務は？
この研究において収集された身元が特定可能な情報はすべて、法律での要請がない限り、開示されることはありません。（非合法活動は当局への報告が必要です。）

この研究結果は報告書および学術誌に発表予定です。いかなる発表においても、情報はお子様の身元が特定できないように提供されます。

この研究について何か苦情がある場合は？

この研究は Flinders University Social and Behavioural Research Ethics Committee によって、見直され、承認されております。もしこの研究に関して、懸念事項やご不満がある場合は、Secretary of the Committee in SA に連絡してください。
連絡先は、電話　8201 3116,　　ファックス　8201 2035,
Eメール　　human.researchethics@flinders.edu.au
受領した申し立ては、迅速に調査し、その結果をお知らせいたします。
この同意書の写しは、貴方の控えとしてお渡しいたします。

ご参加していただける場合、この**[参加者の情報の取扱方針および同意書]**にご署名の上、Ms. Vibhaまで提出をお願いいたします。

何かさらなるご質問、あるいはこの研究の最中に何かご意見等がおありになる場合、以下にいつでもご遠慮なくご連絡ください。

Ms.Vibha
Vibha.sheth@etonhouse.edu.sg
9827 3976

Dr. Grace Skrzypiec
Grace.skrzypiec@flinders.com.au
+618 8201 5878

本件についてご一読していただき、大変有難うございました。

本プロジェクトへご参加してくださることを楽しみにしております。

Japanese Translation of the Consent Form

IB Digital Citizenshipリサーチ参加同意書

私こと_____はIB　Digital　Citizenshipリサーチ参加にあたり、下記の内容について同意します。
記

1. リサーチの流れやリスクについて十分に確認しました。
2. IB Digital Citizenshipリサーチに関する書類（複写）と同意書を所持します。
3. 以下の項目について理解しています。
　　・このリサーチに参加することにより、直接的にお子様の利益となることはありません。
　　・　　お子様はいつでもリサーチの途中で辞退することができます。また、リサーチを進めるにあたり、学生が全ての質問に答える必要はありません。
　　・　　この研究の成果は後に出版予定ですが、お子様のお名前が特定されることはありません。個人情報は必要とされる作業の範囲以外の目的では使用されず、第三者へ提供されることもありません。
　　・　　プログラムへの参加の有無・途中辞退に関わらず、今後も引き続き従来と変わらぬ指導をご提供させて頂きます。また、学業の評価に影響を及ぼすことはありません。

保護者署名_____　　　２０１３年____月____日
学生署名_____　　　２０１３年____月____日

以上

Digital Citizenship In IB PYP School In Singapore

**Digital Citizenship Questionnaire
For PYP Students**
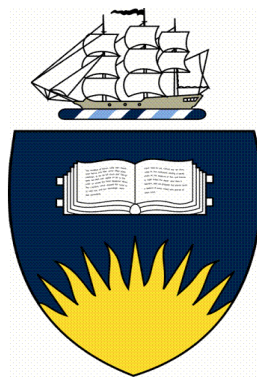
Flinders University IB Research Project

Please read instructions carefully
1. Complete each section independently
2. Please read and think before you answer
3. Click on the option that you think is correct.

1

Section   1   (Knowledge)

In this part we would like you to tell us what you know about digital citizenship. Please answer each question by selecting the answer you think is correct.

What do you think?
1) Does any device connecting to online services require users to display net etiquette skills?

○ Yes

○ No

2) How important are net etiquette skills for you?

○ Not at all important

○ Somewhat important

○ Slightly important

○ Neutral

○ Moderately important

○ Very important

○ Extremely important

3) How many elements of Digital citizenship are there?

○ 11　○ 1　○ 15　○ 9　○ 7

4) In terms of technology – "Digital Device" means any electronic device that enables people to access information in various forms, connects to others and allows communication with others through a set of signals sent in the form of numbers.

○ Yes

○ No

5) How would you rate the usefulness of the following search engines for your research?

	Excellent	Very good	Good	Okay	Not very good	Bad	Really bad
Google	○	○	○	○	○	○	○
Yahoo	○	○	○	○	○	○	○
Google Kids	○	○	○	○	○	○	○
Kids Click	○	○	○	○	○	○	○
Bing	○	○	○	○	○	○	○

Ask	○	○	○	○	○	○	○

6) List the types of private information that should not be posted on internet sites?

1: [   ]

2: [   ]

3: [   ]

4: [   ]

5: [   ]

6: [   ]

7: [   ]

7) Rini needs to create a password for her online portfolio portal login. Which of the following would be the most secure password? (Select one answer)

○ Her Birthdate

○ Her pet's name

○ 1234567890

○ 0987654321

○ A combination of capital and small letters and a number

○ A phrase like "I am the smartest"

○ A Condo name

8) If a work is in the public domain what does it mean? (Select one answer)

○ You can find it in the public library

○ You can get it for free online

○ You can copy without permission

○ May be its not an authentic piece of work

○ The term of copyright in a work has run out and its free to use now

9) You just bought the latest Harry Potter or Diary of Wimpy Kid book and your friends would like to have copies of it. How likely are you to:

	Very likely	Somewhat likely	Likely	Not likely	Not all likely

Photocopy the book and give it to them for free	○	○	○	○	○
Photocopy the book and sell it at a price	○	○	○	○	○
Let your friends borrow it for $2 per day	○	○	○	○	○

10) For a work to be protected under copyright it must (Select only one answer)

○ Be original

○ Be in tangible form of expression

○ Be of professional quality

○ Be liked by the copyright officer

○ Be considered good stuff with lots of pictures and video

11) Do you think everyone in school should have the right to access internet through secured WIFI available in school?

○ Yes

○ No

12) The computer in the library and common areas of the school should be accessible to any member of the school community including support staff. What do you think?

○ Yes

○ No

13) Old unwanted digital devices can be sold using which of the following E Commerce services? (Select one answer)

○ E-Bay

○ Amazon

○ Pay pal

○ Visa

14) To purchase anything on the internet one needs

○ Money

○ Credit card

○ Ez link Card

○ ATM Card

15) Which of the following devices will facilitate digital communication?

○ Camera

○ Laptop

○ Digital pen

○ T.V.

16) While sending or answering an email you must (select one answer)

○ Write the response and read before you click send

○ Once written just click and send

○ Think, write, read and send

17) How important is to maintain proper posture while working on the computer?

○ Not at all important

○ Somewhat important

○ Slightly important

○ Neutral

○ Moderately important

○ Very important

○ Extremely important

18) Do you think that students' blogs should have private security settings, allowing only specified readers to read and comment?

○ Yes

○ No

19) If as a student is experiencing discomfort while working on the computer the student should

○ Continue working

○ Report to teacher or an adult who is around

○ Just rest for a while and then continue working

○ Look on the internet for a solution

20) How important is it for the following people to display good digital citizenship?

	Not at all important	Somewhat important	Slightly important	Neutral	Moderately important	Very important	Extremely important
Anyone using digital devices in any form	○	○	○	○	○	○	○
A person who uses the internet frequently	○	○	○	○	○	○	○
A person with good tech knowledge	○	○	○	○	○	○	○
A Celebrity or public figure	○	○	○	○	○	○	○
Adults	○	○	○	○	○	○	○

2

Section 2 Technology Use

In this section please tell us about your use of technology, by answering the following questions.

21) How often do you use digital devices for the following purpose?

	Never	Once a Month	Once a Week	2-3 times a week	Once a day	Several times in a day
Research	○	○	○	○	○	○
Study	○	○	○	○	○	○
Communication (Email, video chats)	○	○	○	○	○	○
Playing games	○	○	○	○	○	○
E book reading	○	○	○	○	○	○
Collaborating on projects	○	○	○	○	○	○
Buying stuff online	○	○	○	○	○	○

22) How often do you use the following?

	Never use	Almost never	Sometimes	Use once a month	Once a week	Everyday
Facebook	○	○	○	○	○	○
Twitter	○	○	○	○	○	○
Google +	○	○	○	○	○	○

My Space	○	○	○	○	○	○
Flicker	○	○	○	○	○	○
Blog	○	○	○	○	○	○

23) Tick the device that you own or share with Family members. Tick only one option for the liked the most category.

	OWN	Share	Liked the most
Computer	☐	☐	☐
Laptop	☐	☐	☐
Mobile Phone	☐	☐	☐
IPad / Tablet	☐	☐	☐
IPod	☐	☐	☐
GPS tracker	☐	☐	☐

24) How strongly do you agree or disagree with the following statements?

	Strongly disagree	Moderately disagree	Slightly disagree	Neutral	Slightly agree	Moderately agree	Strongly agree
The use of tech devices in school makes	○	○	○	○	○	○	○

learning easy						
Without the ability to connect to the internet, digital devices have limited use	○	○	○	○	○	○	○
Staying connected to the internet is important for me	○	○	○	○	○	○	○
No talking to strangers rule also applies while on digital journey	○	○	○	○	○	○	○
Children are protected by online child protection law	○	○	○	○	○	○	○

25) Describe different ways in which you use digital devices for communication and social interaction.

26) How much time do you spend on digital devices (outside school) per day including mobile phones and game consoles.

○ 0 minutes

○ 30 minutes

○ Less than 1 Hour

○ Approximately 1 Hour

○ At least 2 Hours

○ More than 2 Hours

27) Who has the right to use technology at school?

○ Only older students

○ Everyone

○ Only English speakers

○ Only students with good digital skills

3

SECTION   3   Digital   Citizenship

What should students do in the following situations? **(Select only one answer)**

28) John's cell phone rings during the lesson, so he should

○ Pick up the phone and answer the call in the class

○ Excuse himself to pick up the phone

○ Ignore the ringing phone

○ Switch off the phone

---

29) Michelle wants to check the IT Lab drive for the security setting. How appropriate are the different actions she takes

	Absolutely inappropriate	Slightly inappropriate	Inappropriate	Neutral	Appropriate	Slightly appropriate
She tries to check the security setting by accessing other peoples' folders	○	○	○	○	○	○
She decides to copy all the data on to her thumb drive	○	○	○	○	○	○

She asks the teacher or tech expert about the security setting and how they work	○	○	○	○	○	○
She deletes an old document that belongs to a friend who does not need it anymore	○	○	○	○	○	○

30) Anthony has a camera phone and he would like to use it for learning in class,so he

○ Secretly takes the photos of instruction given in class for later use

○ Uses the phone keyboard to type the instruction

○ Requests permission from the teacher to allow him to use the Camscanner functions to digitize the instruction

○ Offers to email scanned images of instruction to his friends so that they do not need to write them down

31) Chang has been given a task to create a diary using normal word processing software. He would like to try something new for creating the diary. What should Chang do?

○ Discuss it with the teacher and get permission to use some other digital tool for the purpose

○ Go on the internet and start surfing for a new digital tool when the teacher is not looking

○ Ask his friends about any available tool and try using that

○ Complain to his parents that the task is not good

○ Start the work but keep wasting time until the lesson ends

○ Refuse to work

32) Rini has found a cool music album and she wants to extract the background music using music editing software for her school project. What should Rini do?

○ Get permission via email from the original creator for educational use

○ Ask a friend to do it for her

○ She should extract the music as she is not putting her final project on the internet.

○ She should not extract the music

○ She should try and record a similar track herself

33) Jerry is not sure how the mouse works and he becomes upset when he tries to click open a program. What would Jerry do?

○ Ask for help

○ Bang the mouse as it is not doing what he wants it to

○ Stop using the mouse

○ Complain that nothing works

34) Scolly had a fight with a friend. Scolly writes an email to tell the friend how upset he was and he copies (cc) it to everyone in the class. How appropriate is Scolly's behaviour?

○ Absolutely inappropriate

○ Slightly inappropriate

○ Inappropriate

○ Neutral

○ Appropriate

○ Slightly appropriate

○ Absolutely appropriate

What would you do in following situation?

35) While working on the internet, a pop up window appears with the message "you have won an IPAD", so you would

○ Click on it and check out the deal

○ Click to fill-in all the required details and arrange for it to be delivered at home

○ Ignore it and check it out later

○ Close the popup immediately and tell an adult about it.

36) If someone you don't know approaches you on the internet and says he is a student from another international school and asks if you would like to have a play date, what would you do?

○ Chat with him to check whether he is really who he says he is

○ Check his internet profile by Googling his name

○ Call him over to your home

○ Ignore him

○ Talk to your parents about it

37) You are researching on your UOI topic and something inappropriate turns up when you click on a website that showed up in the searches. What would you do?

○ Quietly tell your friends to check it out

○ Tell the teacher or adult and report the website as a security breach

○ Close the website and explore it later

○ Keep quiet about it

38) An antivirus software message pops up while watching online video saying that the Antivirus has stopped working due to a security threat. What would be your next step?

○ Ignore the message and keep watching the video

○ Delete the message

○ Report it to your teacher or an adult

○ Try and explore the situation yourself

39) When using technology for learning at school, it is important for you to know

○ The rules of technology

○ How to work with others in collaboration

○ How different digital tools work

○ All of the above

40) You have received an email with an attachment from an unknown sender. What would you do?

○ Check it out as it could be someone you know but who is not on the contact list

○ Delete the email and attachments

○ Open the email but do not download the attachment

○ Open the email and download the attachment

○ Add the sender to your contact list

41) While communicating online using Skype , Gmail video, chat etc you would

○ Be aware who you are talking to

○ If you are not sure who you are talking to, tell an adult

○ Stop and report immediately if you feel uncomfortable

○ All the above

42) While playing Minecraft / Angry birds / Club penguin there is a pop up saying you can buy a new module at a good price. What would you do?

○ Think twice before clicking as the site might be dangerous

○ Ask your parents to get the module for you

○ Buy it as the payment details are already on the device and system.

43) How strongly do you agree or disagree with the following statements

	Very strongly disagree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Very Strongly agree
When working on Digital devices it Is necessary to take a break every 30 - 40 minutes.	○	○	○	○	○	○	○
Listening to loud music using headphones is harmful to your ears	○	○	○	○	○	○	○
You should be aware of the temperatur	○	○	○	○	○	○	○

e of digital devices and you should keep them away from the body							

44) How important is it to have proper lighting while working on a digital device ?

○ Not at all important

○ Somewhat important

○ Slightly important

○ Neutral

○ Moderately important

○ Very important

○ Extremely important

45) Which of the following services/ programs do you use for project presentation? Tick all the ones that you have used.

☐ Slide Share

☐ PowerPoint

☐ Prezi

☐ Animation

☐ Video

☐ Cartoon Strip

☐ Mind maps

☐ Blogs

☐ Glogs

46) Which of the following programs /services do you use for note taking and research?
Tick all the ones that you have used

☐ Microsoft word

☐ Pages

☐ Evernote

☐ Notestar

☐ Wiki

☐ Notepad

47) Which of the following elements of Digital literacy are important to you for the expression of your views and thoughts on a topic.

	Not at all important	Somewhat important	Slightly important	Neutral	Moderately important	Very important	Extremely important
Text related to the topic	○	○	○	○	○	○	○
Alignment of the document	○	○	○	○	○	○	○
Colour and Size of the font	○	○	○	○	○	○	○
Pictures and Tables	○	○	○	○	○	○	○
Audio	○	○	○	○	○	○	○
Video	○	○	○	○	○	○	○

48) How strongly do you agree with the following statement? Every member of my family has an equal right to access the computer and available shared WIFI network.

○ Very strongly disagree

○ Strongly Disagree

○ Disagree

○ Agree

○ Strongly Agree

○ Very strongly Agree

49) A family member forgot to log out of his/her Gmail account and you would like to check your emails- What would you do?

○ first check his/her Gmail account to see who he/she has been communicating with

○ Log him/her out and Login using your account and check the emails

○ Change his/her password to teach him/her a lesson

50) You would like to watch a new movie and it is not available yet on cable TV, so you would

○ Ask a friend to make a copy of DVD for you

○ Download it from a Torrent Website

○ Buy the DVD

51) Zaggora, E Bay, Group On and Amazon are examples of

○ E- Mail provider

○ E- commerce

○ E- Junk

○ E- Books

52) How appropriate is using the short form like CUL (see you later), ASAP (As soon as possible), etc. in your communication with your teacher regarding homework ?

○ Absolutely Inappropriate

○ Slightly Inappropriate

○ Inappropriate

○ Neutral

○ Appropriate

○ Slightly Appropriate

○ Absolutely Appropriate

53) How strongly do you agree or disagree with following statement.

Children around the world should have opportunities to work with technology and learn how to use digital devices for various learning activities.

○ Very strongly disagree

○ Strongly disagree

○ Disagree

○ Agree

○ Strongly Agree

○ Very strongly agree

54) Do you know the difference between URL and Search Bar?

○ Yes

○ No

55) Describe the use of

URL: [   ]

Search Bar: [   ]

56) Who owns the rights to publish a book written by a child?

○ Parent

○ The school

○ Child

○ The publishing company

○ The person who pays for publishing the book

57) What type of products can you buy online?

☐ Digital downloads

☐ Clothing

☐ Groceries

☐ Tickets for concerts, movies etc

☐ Airline and hotel booking

☐ House

☐ Car

☐ All the above and many more

58) List all forms of technology that you have access to in the classroom

1: [   ]

2: [   ]

3: [   ]

4: [   ]

5: [   ]

6: [   ]

7: _____

4
SECTION   **4**

some questions about you
59) What is your age?

○ 8

○ 9

○ 10

○ 11

60) Are you a

○ Boy

○ Girl

61) What is your Nationality?

_____

62) What type of internet connection do you have at home?

○ Broadband

○ Fiber

63) Do you like using digital devices?

○ Yes

○ No

64) What is your code?

_____

Appendix F- - Ten additional questions included in Post Test DCQ

01) Complete the sentence – What you do online*

☐ Is not important

☐ Affects your life offline

☐ Makes you look cool

02) Detechnologizing means

☐ Detective using the technology

☐ Stay away from all forms of technology

☐ Use only cell phones

☐ Use any and all digital devices

03) Using somebody else's login or identity to send inappropriate messages to their contact is an example of bad netiquette.*

○ True

○ False

04) Digital Literacy includes*

☐ Searching for information and analysing it

☐ Creating and publishing online or offline

☐ Using digital devices to type your assignment

☐ All of above

05) What would you do if you are exercising while listening to music on Ipod and somebody approaches you*

○ Keep the music on while talking to the person

○ Ignore and behave as if you have not noticed the person

○ Remove earbuds and talk to the person

06) How strongly do you agree or disagree with following steps to secure your data.*

	Strongly disagree	Moderately disagree	Slightly disagree	Neutral	Slightly agree	Moderately agree	Strongly agree
Using the equipme	○	○	○	○	○	○	○

nt properly							
Using virus protectio n	○	○	○	○	○	○	○
Strong phishing and spyware filters	○	○	○	○	○	○	○
Backing up regularly	○	○	○	○	○	○	○
Passwor d protect compute rs and docume nts	○	○	○	○	○	○	○

07) Complete the sentence- Using online resources in an ethical manner*

☐ Is digital responsibility

☐ Is important but not necessary

☐ Is important to avoid fights

08) Define Digital Access.*

09) How important are the following aspects of Digital communication for you?

	Not at all import ant	Somew hat import ant	Slightl y import ant	Neut ral	Modera tely Importa nt	Very import ant	Extrem ely Import ant

Think and Pause before click send	○	○	○	○	○	○	○
Use appropriate language	○	○	○	○	○	○	○
Type with readable font type, size and colour	○	○	○	○	○	○	○
Keep your audience in mind before posting on blogs or websites	○	○	○	○	○	○	○

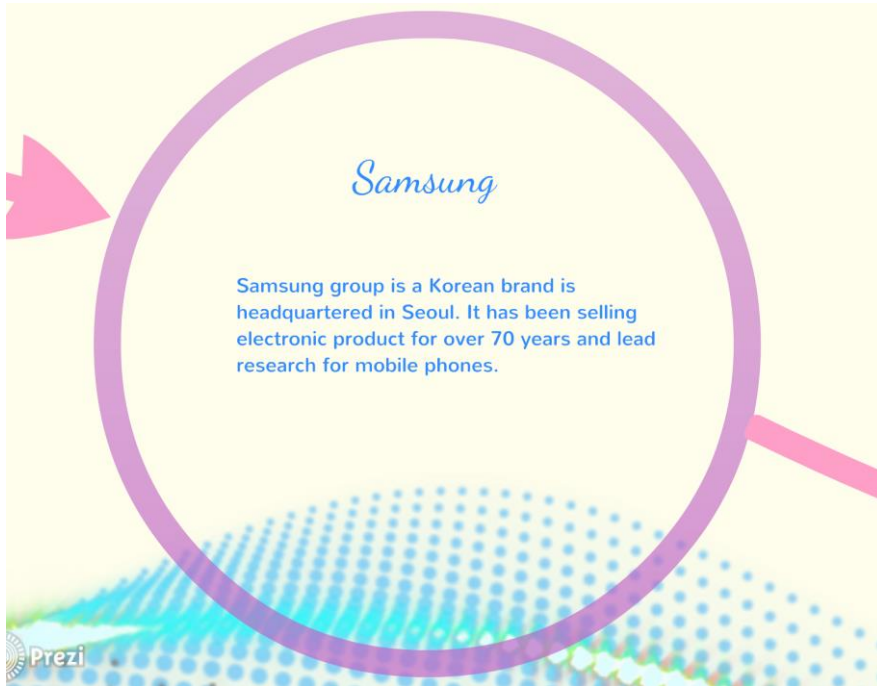**10) What are three steps to stop the cyberbully?**

Appendix G- Cyberbullying comic book made by the participant
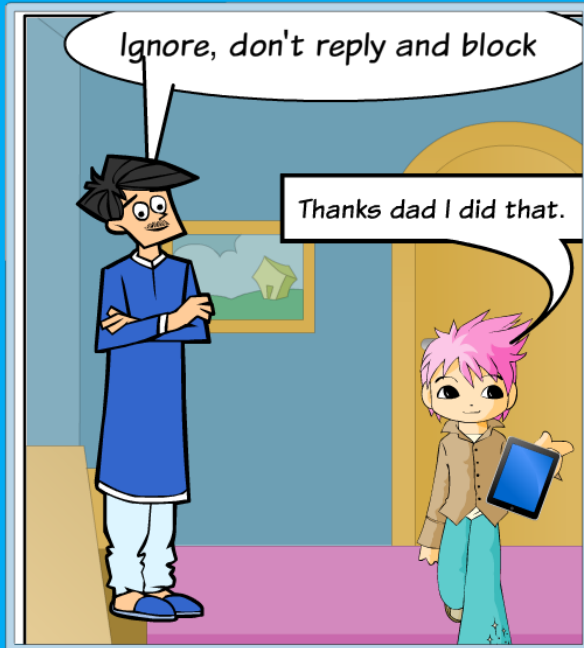
Appendix H- - Prezi presentation by participant on copyright fight between Apple and Samsung
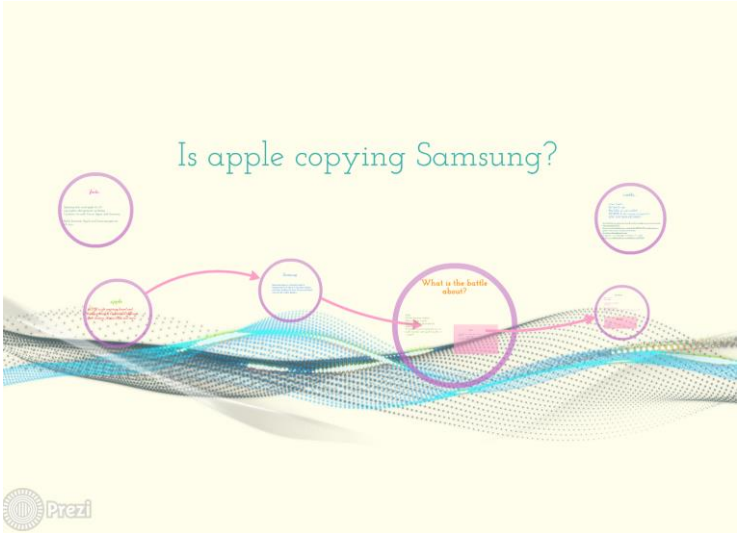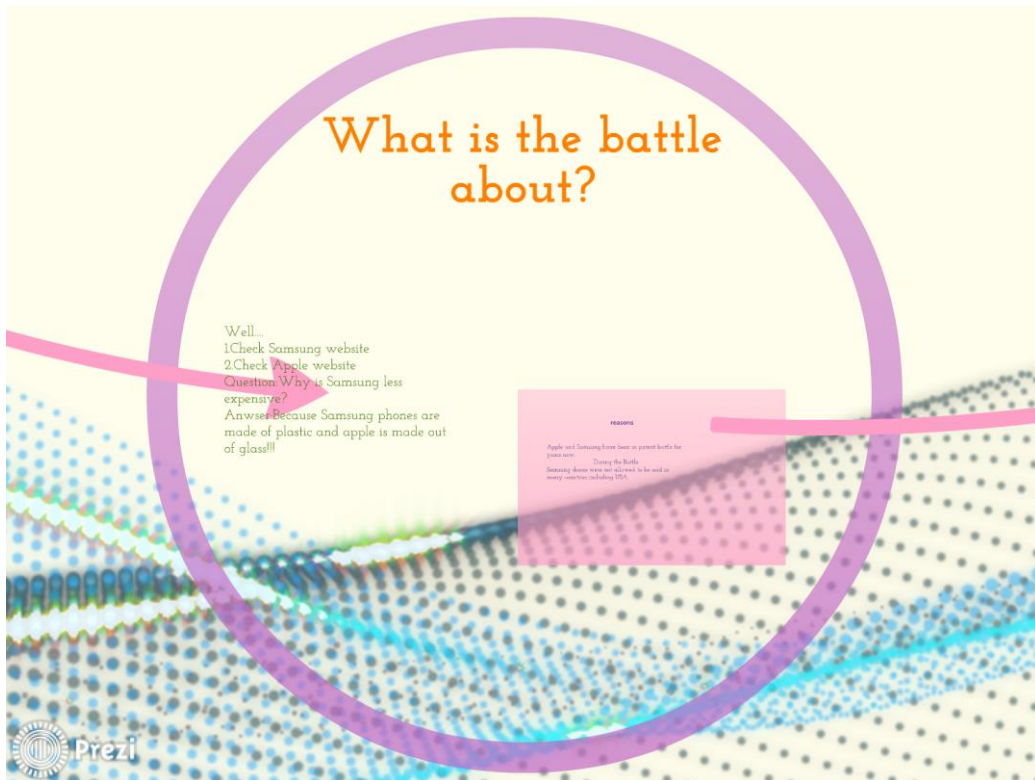
Well....
1.Check Samsung website
2.Check Apple website
Question:Why is Samsung less expensive?
Anwser:Because Samsung phones are made of plastic and apple is made out of glass!!!

questions

Who was first?
Answer:Apple

is glass the same as plastic?
Answer:NO

SO WHO IS COPYING?
Answser:Nobody knows for sure.My Dad says that's why they are both fighting in court.

what are the same in both devices?