



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**Faculty of Computing and Informatics**

**Department of Computer Science**

**Designing an Interactive Game for Preventing Online Child Abuse in Namibia**

This thesis is submitted in partial fulfilment of the requirements for the degree of

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at the

Namibia University of Science and Technology

|                        |                             |
|------------------------|-----------------------------|
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#### **DECLARATION**

I, **Josephina Mikka-Muntuumo**, born on the **17th December 1988** at **Okatope, Ohangwena Region**, hereby declare that the work contained in the report presented for the **Master of Computer Science** at the **Namibia University of Science and Technology**, entitled: **Designing an Interactive Game for Preventing Online Child Abuse in Namibia** is my own original work. All the sources I have quoted have been indicated, acknowledged by means of complete references and that I have not previously, in its entirety or in part, submitted it to any university or higher education institution for the award of a master's degree.

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## **DEDICATION**

I dedicate this thesis to my sons, Gerald and Kellan, for the joy they have given me, my mom Teopolina Mikka for her unconditional love and support, and my Aunt Rosalia Haufiku for motivating me and being there for me always. Finally, to my guardian angel, my grandmother Johanna Shindubu, for her prayers.



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## PUBLICATIONS

Muntuumo, J., Peters, A. & Jazri, H. (2018). CyberBullet – Share your story: An interactive game for stimulating awareness on the harm and negative effects of the internet. In *Proceedings of the Second African Conference for Human Computer Interaction: Thriving Communities (AfriCHI '18)*. ACM, New York, NY, USA, Article 54. DOI: <https://doi.org/10.1145/3283458.3283482>

## ABSTRACT

In the wake of digitalisation, technology has changed the world, connecting people with information and services at the touch of a finger. Regular Internet access, smartphones and other technological advances have made the world a global village by bringing people from various geographical locations together. Despite the positive changes, the pace and scale of this technological revolution have created space for nefarious actors. Identity theft, data breaches, fake news, phishing and hacking are among the many dangers many people face online. Namibia has been grappling with issues centering on cyber security education, policy and lack of online safety awareness. In recent years, Namibia has experienced cybercrime, money laundering and child abuse initiated on the online platform. As such, this study developed an interactive video game to teach online safety in Namibia to combat online child abuse. An online survey, game design challenge workshops, and focus groups were used to gather information. A total of 84 relevant stakeholders (students, parents, teachers, and game developers) participated in two game design challenge workshops and alpha and beta testing sessions. These workshops followed a solid co-design practice. We designed and developed two Namibian inspired game prototypes that were combined into one game which was implemented and tested during this study. All the game prototypes followed an iterative process of information gathering and sharing stories of online inappropriate behaviours, drawing storyboards, designing wireframes, and testing with cognitive walkthroughs and a think-aloud protocol, alpha and beta testing. The final game is called Onlinicus- Share your Story versioned in 2D and 3D respectively. The uniqueness of this game comes from the scenario design as the game concept is entirely story based. The use of predefined personas and utilising participants' own stories contributed to the richness of the stories and games developed.

**Keywords:** Internet, online child abuse, online safety, co-design, games

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## **CHAPTER ONE**

### **BACKGROUND AND INTRODUCTION**

#### **1.1. Introduction**

This chapter provides the background and introduces the topic of the study, it then discusses the statement of the problem, and highlights the research objectives, significances and the impact that the study has towards the prevention of online child abuse in Namibia.

#### **1.2. Overview**

The Internet has not only brought the world closer together, but it has increased efficiency within the world's economies (Nakamura, Samuels, & Soloveichik, 2018; Nica, 2015). It was predicted by (Harasim, 1993) that sharing information will be quicker and more reliable and barriers of language and geographic boundaries are brought down with the advancement of technology (Lipnack & Stamps, 2008; Shachaf, 2008). Young people, especially children, have taken full advantage of the Internet (Livingstone, 2011). Bill Gates, one of the world's richest men, was only 21 when he first wrote his first program code (Cusumano & Selby, 1998) and Mark Zuckerberg, a college student, along with his roommates founded Facebook (Kirkpatrick, 2011). Facebook has 2.27 billion monthly active users as of September 30, 2018. It is evident that the opportunities the Internet offers are open to everyone (Stork, Calandro, & Gamage, 2014).

The vast development of the Internet over the past 20 years may have given birth to new industries. One noteworthy industry is the pornography business (Lane, 2001). In 2005, TopTenReviews, Inc. estimated that child porn generates over \$US 3 Billion annually (Schell, Martin, Hung, & Rueda, 2007). In 2013, there were some four million websites devoted to pornography, containing more than a quarter of a billion pages (Cellan-Jones, 2013). Furthermore, that the website PornHub has 16 million viewers a month (Cellan-Jones, 2013). An increasing number of young children and teenagers often log on to these porn websites illegally (Freeman-longo, 2000; Dombrowski, Gischlar, & Durst, 2007; Stieler-Hunt, Jones, Rolfe, & Pozzebon, 2014; Rothman, Kaczmarzsky, Burke, Jansen, & Baughman, 2015; Albertson, Moreno, Garrison, Evans, & Ahrens, 2018). Efforts have been made to place pornographic sites in a special "xxx" web domain so that software can easily trace and render them invisible to children (Sheu, 2017). However, children are still exposed to the abundant adult material on the Internet (Flood, 2007; Chang et al., 2016).

Wadhwa and Arora (2017) defined cybercrimes as “any violence action that has been conducted by using computer or other devices with the access of Internet” (p.2217), while cyber abuse has been defined by Mishna, Cook, Saini, Wu, and MacFadden (2011) “as an umbrella term that encompasses a wide range of activities including cyber bullying, cyber stalking, cyber sexual solicitation, and cyber pornography” (p.5). Many people feel that putting their information on social media networks could be an invasion of their privacy (Regmi, Alsadoon, Withana, Ali, & Elchouemic, 2018). This has proven true on many occasions as cases like Facebook-Cambridge Analytica data breach, online fraud and identity theft keep increasing (Isaak & Hanna, 2018; Regmi et al., 2018).

With the growing popularity of social media sites such as Instagram, Facebook and Twitter, hackers target these networks to conduct their illegal activities (Décary-Héту & Dupont, 2012). The reality is that the nude selfie(s) or picture(s) people exchange with one another can be shared with someone else on their computer or mobile device, edited and used for revenge porn or whatever purpose the culprit pleases (Stroud, 2014). Profile information can be copied and used to impersonate another person – a practice many celebrities fall victim to (Smith, Smith, & Blazka, 2017; Goga, Venkatadri, & Gummadi, 2015). Major efforts have been made by the International Telecommunication Union when it launched the Child Online Protection (COP) initiative late 2008. COP is an international collaboration promoting online protection of children worldwide (Wamala, n.d.).

### **1.3. Background**

Nowadays, people prefer surfing the Web more than watching TV as it was decades ago. (Mishna et al., 2011). The 2018 Global Digital reports from We Are Social and Hootsuite show that the number of Internet users in October 2018 was 4.176 billion, a 7% increase per annum, compared to previous years. The number of social media users in 2018 was 3.397 billion, 13% increase per annum. The number of mobile phone users in 2018 was 5.118 billion, 4% increase per annum. The report reveals that Africa has experienced rapid growth rates in internet penetration, with the number of internet users across the continent increasing by more than 20 percent in 2018 (Wearesocial, 2018). Africa’s Internet users’ growth has been driven by affordable smartphones and mobile data plans provided by service providers (Mumbere, 2018).



Figure 1: Global digital users (Wearesocial, 2018)

In the so-called developing world, the high mobile penetration rate means that more teenagers are exposed to the Internet (Mishna et al., 2011). Firstly, teenagers going online via mobile internet are not taught online safety and do not realise the dangers of the Internet. Secondly, cyber security legislation in the country such as Namibia has not been enacted in Namibia (Kamutuezu, 2017), thus, online criminal acts are hard to prosecute. Namibian children and the society at large tend to trust easily as privacy is virtually non-existent in Namibian communities. Furthermore, Namibians accept all types of friendship requests (Peters, Winschiers-Theophilus, & Mennecke, 2015). This makes Namibia not only a major tourist destination within Africa, but also a virtual tourist destination for cyber criminals.

According to a local operator, Mobile Telecommunications Limited (MTC), mobile phone coverage across Namibia is at 95% (MTC, 2018) and mobile phone penetration is at 119%. Namibian Internet users comprise 31% of the total population and Namibians are exceptionally active on social media such as WhatsApp, Facebook and Instagram. Facebook has an overall 22% user population over the total Namibian population (Internet World Stats, 2017), but within the target demographic of Facebook users, the figure is much higher. However, the negative side of this connectivity is that more Namibians are exposed to the darker side of the Internet. Teenagers are especially active on the Internet and on social media, and they are vulnerable to all types of lurking dangers such as child online exploitation or victimisation.



Indeed, a survey conducted in 2016 by UNICEF and the Namibia University of Science and Technology with a sample of 735 Namibian youth between the ages of 13-17 in four rural regions of Namibia revealed that 93% of the youth use mobile phones and have access to the Internet (Bhunu Shava et al., 2016). The study further found that 63% of children in Namibia have seen violent content that they did not want to see, 29% had seen sexually explicit images of people that they did not wish to see, and 29% have seen sexual content involving children in Namibia (Bhunu Shava et al., 2016). Although the Internet Watch Foundation has launched a national online reporting portal and a child helpline exists, these reporting channels merely address the underlying problem of non-reporting (Bhunu Shava et al., 2016).

Mishna et al. (2011) identified the following strategies to combat youth online victimisation:

- *Technological and software initiatives used to block or filter access to inappropriate online content;*
- *Online and offline cyber abuse preventive interventions delivered through any medium, including face-to-face presentations, video games, and interactive software.*

Some of the Internet platform's effectiveness depends on users' willingness to adopt and use them (Zaunbrecher, Kowalewski, & Ziefle, 2014).

An alternative to addressing child online victimisation is through a game-based approach by sensitising, creating awareness (Kritzing, 2017; Jin, Tu, Kim, Heffron, & White, 2018; Alotaibi, Furnell, Stengel, & Papadaki, 2016). However, there has been limited research on gaming to encourage children to open up and report online child abuse. In past years, we have witnessed the adoption of a game-based approach in different areas such as for learning, for change, and for social motives in different countries for various reasons (Stieler-Hunt et al., 2014). Games and simulation play a role in engaging children and provide them with emotional experiences in a low-risk environment through the narrative presented in the game, game characters, and immersion in the audio-visual environment (Stieler-Hunt et al., 2014). The game-based approach aims to captivate children's attention and engage them in a simulated experience. This is envisioned to trigger children's understanding, hence making conscious decisions when online and report any unwanted behaviour or attention. Another reason for designing games around child abuse is that parents, caretakers and teachers' digital skills are regarded lower than children in some countries (Livingstone, Kroeger, Stoilova, & Yu, n.d.).

#### **1.4. Problem Statement**

According to the Internet Watch Foundation (IWF, 2019), statistics shows that, about 78,589 child exploitation websites were confirmed as containing child sexual abuse images, having links to the imagery or advertising it in 2017. In 2016, Bhunu Shava, Chitauro, Mikka-Muntuomo, Nhamu, and Gamundani 's exploratory study on knowledge, attitudes and practices of ICT use and online safety risks faced by children between the ages of 13 and 17 years old reported that 63% children have seen violent content that they did not want to see, 29% had seen sexually explicit images of people that they did not wish to see, and 29% have seen sexual content involving children in Namibia.

Although Namibia has launched an online reporting portal in 2017, the low rate of reported online child abuse across this country poses significant challenges to the wellbeing of children in Namibia. It has been established in previous studies that there is no educational material of these inappropriate online behaviours (Bhunu Shava et al., 2016). Additionally, there are too few games that can sensitise, create awareness, encourage children to open-up and report cyberbullying, harassment and repeated requests for explicit sexual images and many more pertaining to online child abuses. This has resulted in children being continuously vulnerable to predators online (Bhunu Shava et al., 2016).

There is limited evidence that a game-based approach has been explored to create awareness for Namibian children to avoid child online victimisation.

#### **1.5. Research Objectives**

The main objective of this study was to co-design a game-based approach to sensitise and prevent children from becoming victims of online abuse.

To achieve this objective, the following milestones needed to be met:

1. Design a customised interactive game prototype with Namibian children to sensitise, create awareness and encourage children to report online abuse.
2. Evaluate the interactive game prototype for usability and effectiveness.

#### **1.6. Research Questions**

To achieve the above-mentioned objectives, we answered the following research questions:

1. How can we design a customised interactive game prototype with Namibian children to sensitise, create awareness and encourage children to report online abuse?
2. How do we evaluate the effectiveness and usability of the interactive game prototype?

#### **1.7. Significance of the Study**

This study is significant to the Namibian University of Science and Technology; the Republic of Namibia and specifically the youth. The Ministry of Education and professionals with careers involving child care

and guidance may also benefit from this study. On a technical level, this study has potential applicability for research and development in respect to a game-based platform for education. Similarly, it will potentially benefit the Namibian school curriculum. Regarding child online protection, the study can be considered as an intervention for preventing online child abuse by influencing children's behaviour and attitudes towards use of the Internet. This intervention will help Namibian children in becoming more resilient and proactive to report online abuse incidents. We further expect to contribute to the literature on online child protection, co-design with youth, and enrich citizen online safety.

### **1.8. Delineations and Limitations**

The study was constrained by several factors:

- Limited resources to conduct the workshops around the country, hence, results are not generalisable to other areas as our study was based on an urban sample: Windhoek.
- Games usually also have the limitation that only those interested in games would play them.
- We have chosen to develop the games to accommodate various types of users. The game can be played on a workstation and on mobile devices; however, some of the fun activities are not present on the mobile version. Nevertheless, children can still learn from the game content.
- Another limitation of this study is that the game prototype developed was only demonstrated and tested to the schoolgoing children in Windhoek due to limited monetary resources.

### **1.9. Thesis Outline**

The thesis is divided into six chapters. **Chapter One** introduces the topic and gives the background information of the study. It then deliberates on the statement of the problem, highlights the research objectives, the significances and the impact that the study has towards the prevention of online child abuse in Namibia.

**Chapter Two** discusses the literature review which provides an extensive critical evaluation of different published materials. The literature review explains what online child abuse is; why we need to take a proactive solution to the online child abuse issue, and why a game approach has the potential to provoke interest in learning about online safety for children. The chapter also evaluates the effectiveness of the current initiatives regarding online safety and analyses the problem of reporting online child abuse case in Namibia. The pros and cons of studying computer studies in schools are also accessed. Lastly, the chapter reviews the impact of a game-based approach solutions in combatting online child abuse.

**Chapter Three** discusses the methodology, methods and design processes which were followed to carry out the study; these includes research philosophy, research through design approach and data collection techniques. The surveys and game design workshops are also elaborated on in this chapter.

**Chapter Four** covers the game design process.

**Chapter Five** concentrates on describing the prototype's game concept, the game engine, game play, game world and genre. The chapter concludes with an architecture of how the game was implemented.

**Chapter Six** presents the results from the game testing and evaluation.

The last chapter, **Chapter Seven**, provides a brief discussion of the outcome of the thematic data analysis, and concludes by providing areas and directions for future research.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1. Introduction**

This chapter centres on an extensive critical review of different published materials. It provides a thorough definition of online child abuse, and tackles questions of why we need to take proactive solutions regarding online child abuse issues. Furthermore, it reviews why and how a game approach has the potential to provoke interest in learning about online safety for children. The chapter also discusses the current initiatives regarding online safety both locally and international and analyses the pros and cons of the school curriculum on computer literacy. The effectiveness of the BrainHex Model is scrutinised and studied and concludes by highlighting the gap in knowledge concerning online child abuse, and how the proposed game can best address this predicament.

#### **2.2. Factors Influencing Online Child Exploitation in Namibia**

##### ***2.3.1 Social media exposure***

Online child sexual exploitation is a global phenomenon that is rapidly growing with the increased access to social media. The European International Criminal Police Organization (Interpol) describes child sexual exploitation as soliciting children to exchange sexually explicit images and then blackmailing them to send more images by threatening to release their images to their friends or relatives (Peters, Winschiers-Theophilus, & Mennecke, 2015). Predators have unprecedented access to young teens who join social media sites such as Facebook, Instagram, Snap Chat and WhatsApp. The official age to join social media sites such as Facebook or Google Plus is 13 years old (Peters et al., 2015). Teenagers who open their first social media accounts are vulnerable in that they do not yet realise the lurking dangers.

In 2012, Peters et al. (2015) discovered Namibian students complained that although they found sexually explicit materials inappropriate on social media, and have encountered these frequently, they were rarely exposed to ways to report such incidents. In fact, they found that reporting behaviour when encountering grooming, online sexual harassment and exploitation are understudied as very limited literature exist. Therefore, this chapter explores ways on reporting incidents of online child abuse using co-designed technological games.

### **2.3.2 Risky online behaviour**

Teens and college students are highly active on social media. Globally, 92% of children are reported to go online daily, and 71% between the age of 13 and 17 are on Facebook (Lenhart & Page, 2015). Even though teens are on social media sites constantly, that does not mean that they all do the same things. Different studies show that most children are exposed to various risks while online (Bhunu Shava et al., 2016; Mishna et al., 2011; Peters et al., 2015; Steen, 2013). Risks include violent content, sexually explicit images, or cyberbullying (Wisniewski, 2016). Peters, Winschiers-Theophilus and Mennecke (2015) conducted a study on cultural differences between Namibian students and American students on social media. The study showed that the American students' sample would self-censor their posts, post less, more group pictures instead of individual, and more of the demographic information would be hidden or less accurate. There was an element of self-preservation in American students. The Namibian equivalents posted more filtered selfies and the demographic content posted was more honest and accurate. However, the Namibian students' sample was more exposed to sexually explicit content but failed to report it, whereas the American equivalents immediately reported such content and were less exposed (Peters et al., 2015).

The type of disclosing of honest personal information can be problematic because it creates a vulnerability for Namibian children for being taken advantage of by the information available on social networks. There have been situations where American children have been taken advantage of by celebrities, like Austin Jones (Reuters, 2017). While children on social media have been solicited for sexually driven pictures, sexually driven images have also been sent to children (Bhunu Shava et al., 2016).

### **2.3. Online Exploitation and Grooming**

EU Interpol describes online exploitation as crimes against children facilitated by the Internet (Interpol, 2019). Fire, Goldschmidt, and Elovici (2014) specify that the type of harm associated with exploitation includes:

- *Harm from content (A child's exposure to pornography or other harmful sexual content);*
- *Harm from contact (A child contacted by an adult or another child for sexual abuse); and*
- *Harm from conduct (The child as the initiator of such acts of abuse or risky behaviours).*

There are materials distributed among offenders online which the IEEE defines as an *Internet Paedophile* (Fire et al., 2014). Not only can offenders distribute and access child abuse material more easily, but they

can also come into direct contact with children – via chatrooms and social networking sites (Fire et al., 2014). Behaviours regarded as sexual exploitation of children include adults using children to produce child pornography, consumption of child porn, and the use of the Internet to initiate online or offline sexual exploitation.

The situation with the celebrity exploiting of Austin Jones (Reuters, 2017) consisted of him allegedly soliciting sexually explicit pictures and videos from 14-year-old girls. However, teens are also prone to doing risky things to cause themselves harm out of ignorance. Some of these risky behaviours include children posting personal information, interacting with strangers in chatrooms, placing strangers on buddy lists, sending personal information to strangers like photos, visiting X-rated sites, and talking about sex with strangers (Fire et al., 2014).

An article from the Backpage website presents an interesting incident in which two girls had been abducted due to leaving home for their own reasons and trusting strangers to give them rides back home, only for them to find out that the drivers have devious intentions of sexually abusing them (Fire et al., 2014). The newness of this nature was the fact that these minors were being solicited on Backpage's website without any resistance from the company itself. It seems that if a company is profiting from the website, they will try to push for every dollar they can obtain regardless of the risks and ramifications it can have. There was even a point where the moderators were instructed that they should accept any posting of media without considering the actor's age. These factors cause risks for children on normal websites and some of these risks include child predators especially on social media sites that have chatrooms and capabilities to have sexual conversations and send photos: (Fire et al., 2014).

This leaves room for the process known as grooming. Grooming involves a clever process of manipulation, typically initiated through a nonsexual approach, which is designed to entice a victim into a sexual encounter (Brown, Steele, & Walsh-Childers, 2001; Berson, 2003; Gámez-Guadix et al., 2018). Some predators can tell by the look and feel of a profile or by the child's online behaviour if he or she might be a perfect candidate for a relationship (Fire et al., 2014). Teens who are active on social media, blog or journal about their personal problems may be easy prey for predators who seek to isolate children from their caregivers and friend circles to exploit an emotionally vulnerable child (Fire et al., 2014).

The studies summarised above focused mainly on the risky behaviour of young people being exposed to sexual online content and, to a limited extent, the cultural significance behind the behaviour of these

young people. However, there is limited literature that focuses on ways to resolve child online exploitation as well as addressing the issue of reporting and empowering young people to curb online abuse.

#### **2.4. Cyber Security Laws in Namibia**

Due to high usage of ICT, it has now become necessary more than ever before to have laws that will govern cyberspace. Namibia is currently in the vacuum of the necessary cybersecurity legislations that are needed to combat cybercrime at all levels (Kamutuezu, 2017). Government, the private sector and civil society disagree with drafting cyber laws (The Namibian, 2018) as citizen protection measures are almost non-existent. Cybersecurity education are yet to be organised, reorganised and institutionalised. Law enforcement agencies are to be trained or re-trained and case laws on cybercrimes are needed urgently to be tested in Namibia. The government recognises that it is vital that the country enhance cybersecurity and protect information infrastructure and equally important is ensuring that the Internet is safe and the growing numbers of Internet users are protected (Kamutuezu, 2017).

The government has made progress in the drafting of the Electronic Transaction and Cybercrime Bill to address problems pertaining to safety and security of digital communications of any mode. The Electronic Transaction Bill has been finalised and sent to Cabinet for approval, while the Cybercrime Bill is still under discussion at parliament level (Namibian, 2017; MICT, 2018). However, Namibia is currently using Namibian Communications Act, 2009, Overarching ICT Policy 2009, Telecommunications Policy, and Broadcasting Act 1990 among others to fight cybercrimes (Kamutuezu, 2017). Offenders can intercept communications between users to record information exchanged, thus causing data interference whereby users depend on the availability of data and interferences that result in financial losses. This is an example of the cybercrimes occurring in Namibia (Kamutuezu, 2017).

Regarding content-related offences, Namibia is still faced with issues of child pornography and xenophobic material, libel and false information, spam, copyright-related offences, and trademark-related offences, etc. (Kamutuezu, 2017). One of the contentious and difficult factors is that child pornography possession and distribution are not criminal offences in Namibia, merely the production thereof is criminalised (MICT, 2018). This creates a challenge in the combatting of child pornography especially online (Bhunu Shava et al., 2016).



Governments mostly have weak technology, vulnerable or unauthorised software, limited accountability, inconsistent and incomplete legislation or regulations, difficulty tracking and prosecuting criminals, limited jurisdiction, uninformed misguided and malicious users – who use weak passwords, divulge passwords, and open unknown emails (Fire et al., 2014). The common challenges facing Namibia in addressing cybersecurity include lack of a legal and regulatory framework to ensure cyber security (The Namibian, 2017). “The penetration and wide use of social network has also not helped matters because it has been proven that cybercrimes are on increase on such the Internet platforms” (Bhunu Shava et al., 2016). Social media monitoring includes the Social Media Public Policy (MICT, 2019) which stipulates no posting of pictures on social media by the Ministry of Defense. These are among the main challenges facing the country’s cybersecurity efforts.

Namibia has a high mobile phone penetration rate, especially smartphones, and a 95% mobile Internet broadband capability (MICT, 2019) and affordable mobile data plans (Stork et al., 2014). However, as a country, Namibia is at risk of creating a haven for cyber criminals due to the lack of national cyber laws, poor citizen protection and inadequate education. The public is insufficiently educated on online risks and how to protect itself from threats.

## **2.5. Online Safety**

According to de Lange and von Solms (2012), children use the Internet from an early age, but they do not have the necessary knowledge and expertise to protect themselves. Children are thus at risk if they do not understand the potential dangers of their online activities (Von Solms, 2015). It is therefore vital that children are educated on online safety and that methods that resonate with children are used to educate them on this matter.

There are numerous cyber-risks and threats such as cyberbullying and identity theft that can harm learners (Kritzinger, 2017). In Africa, even though many children are active on the Internet, there are few initiatives towards online safety awareness (Von Solms, 2015). In addition, there is a rapid growth in the use of the Internet on the continent, which makes children more vulnerable to cyber-attacks due to lack of knowledge and insufficient laws (Grobler & Dlamini, 2012). The Internet is seen as a great platform for entertainment and social interaction, but there are potential dangers such as cyber-bullying, identity theft, xenophobia, sexual solicitation and exposure (Whitaker & Bushman, 2009).

Online safety is becoming a priority worldwide and some developed countries, such as the United Kingdom and Australia, have already included online safety in their school curriculum (de Lange, 2012; Farrell, 2014). Conversely, various developing countries still have limited knowledge on online safety (Dlamini, Taute, & Radebe, 2011) and do not have measures in place to ensure proper online safety for children (von Solms & von Solms, 2014).

Although cyber safety is an ongoing issue in several parts of Africa, one study is worth reviewing more in-depth for this review. Kritzinger (2017) outlines the challenges faced by developing countries in fostering and implementing cyber security measures. The study specifically explains the gaming-based approach as a short-term initiative to improve ICT and cyber safety awareness specifically at schools (Kritzinger, 2017). Kritzinger's (2017) findings include that 82% of learners have access to the internet from inside their bedrooms; 35% hide their online activities from their parents; 15% use their cell phones during school hours, even if this is against school rules; 61% of parents and teachers do not monitor learners' Internet use; 62% of learners have no parental guidance software installed on their devices to regulate their Internet access; 63% of learners access inappropriate Internet material; and 93% of learners believe that there are possible dangers and threats associated with Internet use.

According to Kritzinger (2017), in South Africa there exist very few programmes aimed towards students' education of cyber security. Further barriers that have a direct impact on cyber-safety in South Africa include language, access to technical infrastructure and geographical location (Kritzinger, 2017). There is also lack of commitment from the South African government to enhance cyber-safety awareness among school learners, nor are there any policies that protect learners if cyber incidents occur.

Educational research has shown that school learners prefer games as learning tools. As such, "an integrated school curriculum should therefore be adapted in developing countries to focus on online and offline games, while also ensuring that school learners are well aware of cyber-risks" (Kritzinger, 2017).

### **2.5.1 Online safety in Namibia**

In 2006, majority of Namibia's schools were connected to the Internet and have equipped computer labs. SchoolNet Namibia has supplied a great deal of the computer training to the 300 or so schools that are SchoolNet partners (Burns, 2006). Hopes are high that Internet access will change the education process and enhance student learning. Before plunging into the ocean of information found on the World Wide Web, teachers and administrators need to plan for success (Burns, 2006). Namibia also has an IT Policy for Education which focuses on investigation and development of appropriate ICT solutions, deployment

of ICT, maintenance and support of ICT, ICT literacy and ICT integration. Large numbers of educators and their students are using the Internet to collaborate globally with other schools, researchers, students and other individuals (Burns, 2006).

In Namibia computer literacy teaches young learners how to use a computer but are they being taught how to protect themselves? The Computer Literacy and Computer Practice curriculum from grades 8 to 9 aims to equip learners with the skills of using communication and computer technology (hardware and software) and to do basic computer programming (Ministry of Education, 2006). In grades 11-12, the curriculum focuses on teaching learners to acquire a general understanding the use of computer technologies (Ministry of Education, 2006). Online safety issues and cyber security are not being taught in Namibian primary, secondary and high schools today, but a revision for online safety is to be included in the curriculum (UNICEF, 2018). As ICT use expands rapidly and as determined from the literature reviewed for Namibia, Namibian schools need to teach online safety to learners, and they need to be supported.

## **2.6. Strategies to Address Cyber Abuse**

There are different strategies which can be used to address cyber abuse and online safety. One strategy that can be used is the use of social media to advocate for online safety. Cyber abuse can be addressed using social media and online programs. According to Notar, Padgett, and Roden (2013), some social media provide platforms to allow users to report online abuse. Facebook allow users to report any abuse by writing an email to the Facebook Help Center ([abuse@facebook.com](mailto:abuse@facebook.com)). In addition to social media, Notar et al. (2013) also identified different websites such as [www.stopcyberbullying.org](http://www.stopcyberbullying.org) and [www.stopbullying.gov](http://www.stopbullying.gov) which provide information about identifying, preventing and handling cyber abuse.

Several technologies and software (mobile apps) can be used to filter and block improper content found online (Mishna et al., 2011). For example, the Bully Block app is designed to block unwanted text messages, pictures and calls on Android phones. The app also allows the user, especially children, to record information to a secret file which they can forward to parents (Notar et al., 2013). The software can be used by parents and schools to block improper online content using different categories such as certain websites and keywords (Notar et al., 2013). Through the process of co-designing with children, McNally et al. (2018) investigated children's understanding of different mobile technologies used by parents to

monitor. During the study, the children reviewed a mobile application used for monitoring, redesigned it and also created different ways they can make use of the monitoring software when facing online abuse (McNally et al., 2018). The results showed that the children preferred different controls that focus on restriction compared to monitoring and which encourage parent-child communication, together with automated interactions. The results are believed to benefit other designers who wish to develop mobile technologies for parent monitoring, which will be accepted by children and be of benefit to them (McNally et al., 2018). Online and offline cyber abuse preventive interventions can also be provided using different means not limited to interactive software, video games and presentations (Mishna et al., 2011). Interactive websites provide enlisted psychologists to help end cyber abuse (Notar et al., 2013). Furthermore, online resources need to be made accessible to youth who want to be in control of their online experiences without the intervention of parents (Espelage & Hong, 2017). Face-to-face presentations about cyber abuse can help create a positive climate at school and at home, allowing the learners to be comfortable with reporting cyber abuse and talk about them openly (Notar et al., 2013).

Applications of gamification for online safety is another strategy to address cyber abuse. Gamification is a design technique whereby several game features in a context not related to gaming are used in order to support the motivation to learn to increase the user's engagement and motivation (Gjertsen, 2016; Dodero et al., 2014; Alsawaier, 2018). Gamification is commonly used as it is considered to promote engagement and productive learning environments in education (Gjertsen, 2016) and it also supply means for students who are limited by the traditional ways of intrusions (Alsawaier, 2018). Past studies (Gjertsen, 2016; Cook, Smith, Maglaras, & Janicke, 2016) have concentrated on gamification for cybersecurity training; however, the extent of the online safety is limited.

In conclusion, different strategies can be used to address cyber abuse and online safety. Social media is particularly relevant to address cyber abuse as most of the abuse can happen on social media. Moreover, online resources need to be available for people, especially children, who have the need to be in control of their online experiences, with no parents involved. Gamification can also enhance motivation and learning; thus, it can also be a major strategy which can be used to address online safety for children.

## **2.7. Technologies Used in Developing Games**

When it comes to developing games, game engines are considered to be crucial for building 3D applications and games (Mishra & Shrawankar, 2016). According to Mishra and Shrawankar (2016), game

engines duplicate the actual world in the digital world, and they quicken the process of game development by using templates and reusable assets, minimising or removing the need to have a deep knowledge of programming (Christopoulou & Xinogalos, 2017). There are different game engines which can be used. Christopoulou and Xinogalos (2017) carried out a comparative analysis of several game engines. They found out that an individual game engine cannot fit all purpose and therefore users can choose the most suitable game engine depending on their specific needs (Christopoulou & Xinogalos, 2017). Additionally, one of the important conclusions from the study is that Unity was found to be a more suitable for novices as it provides a less complicated user interface, has several assets, and also has available tutorials. Moreover, Unity's installation does not require high-performance hardware (Christopoulou & Xinogalos, 2017). Jiyuan and Wenfeng (2016) also support the use of Unity3D for developing game as it is a very popular and easy tool used for 3D games, real-time 3D animation and other interactive projects. Due to the highlighted strengths of Unity, Unity must be considered for developing games to promote online safety with children, as it uses a simpler user interface and is suitable for beginners compared to other game engines.

## **2.8. Online Safety Games**

Studies have shown how games can teach people about protecting personal information, thus protecting themselves from online theft (Hendrix, Al-Sherbaz, & Bloom, 2016; Jin et al., 2018; Kumaraguru et al., 2007). Children are naturally attracted to and motivated by games (Kirriemuir & Mcfarlane, 2004). Games that involve adventure, storytelling, fantasy and decision-making stimulate children's imagination and thinking (Baranowski, Buday, Thompson, & Baranowski, 2008). Developmental psychologists and educators have noted that children are intellectually motivated to learn about a subject through games and other thinking activities (Herout, 2016; Ke, 2016). Games can reflect many aspects of culture as the values, interests and activities of the specific groups who played the game are studied (Ke, 2016; Kritzinger, 2017; Sorcar, Strauber, Loyalka, Kumar, & Goldman, 2017).

The importance of dealing with online harassment behaviour is currently being recognised by the online game industry (Alotaibi et al., 2016; Battistella, 2016; Le Compte, Elizondo, & Watson, 2015). These studies have found that there is a positive impact on designing an online safety game and children like games that reflect their culture and values. Chapter Seven contains an evaluation of our game prototype with existing online safety games.

## **2.9. HCI Methods and Games**

Games are considered to be the early adopters of new Human-Computer Interaction (HCI) technologies and innovators (Nguyen, 2012). HCI can be considered as the core of many game elements and therefore HCI has a significant role when it comes to creating games (Cai, 2009). Different aspects of HCI practices show their relationships with computer games, and there is a possibility of using some of the HCI processes, methodologies and tools for game design (Nguyen, 2012). According to Cai (2009), the quality of the game can be improved if the HCI in the game is improved.

A study by Dodero, Gennari, Melonio, and Torello (2014) blended gamification and cooperative learning into co-design. The study was carried out in Merano at Luigi Negrelli Middle School with a sample of 19 learners between the ages of 11 to 14 years old and 3 teachers together with 4 game designers (Dodero et al., 2014). The participants used different practices of HCI such as Userexperience (UX) design, co-design and low-fidelity prototypes to design games (Dodero et al., 2014). The use of HCI methods in developing games is considered to be a good way of designing games, as HCI practices play a major role in the successful development of games (Cai, 2009; Dodero et al., 2014). To conclude, different HCI methods and techniques can be used when developing games as used in different studies. The HCI techniques and methods used in developing games can help the developed games to be of good quality, thus meeting the users' needs.

## **2.10. Designing Technologies with Children**

A significant number of studies have emphasised that involving children in a design of service or technology intended for their use is crucial to meet their needs and well-being (Barendregt et al., 2018; Bartholomew & Ruesch, 2018; Druin, 1999.; Duytschaever & Conradie, 2016; Itenge-Wheeler, Kuure, & Winschiers-Theophilus, 2016; McNally et al., 2018). Druin (1999) suggests considering children and adults to be equals when designing together. This partnership should enable them to compromise when making group decisions (Alborzi et al., 2000; Taxén, Druin, Fast, & Kjellin, 2001). Children can take on different roles as design partners, users, testers or informants (Druin, 1999).

Two different studies by (Itenge-Wheeler et al.; Ribeiro, Sylla, Iurgel, Müller, & Ressel, 2017) designed reading technologies with primary school learners. They involved teachers and students to gain insights of the reading setups suitable for educational and reading purposes. Itenge-Wheeler et al. (2016) focused on the social, physical and technological space aspects while Ribeiro et al. (2017)'s approach was to create augmented e-books for enhanced story reading. In both studies, children were primarily involved as design partners using the participatory design approach combined with other methods. They argued that

enhanced reading experience promotes reading culture and it is beneficial to design tools that can engage learners to promote reading culture and skills with both learners and teachers (Itenge-Wheeler et al., 2016; Ribeiro et al., 2017). These studies validated the importance of children and stakeholders involved throughout the design process. Our study welcomed students with coding skills to act as developers. In the role of developer, they were given responsibilities to code specific games based on a specific scenario because of their interest of learning.

### **2.11. Think- aloud Protocol**

The think- aloud is a method in which participants talk when performing a task or solving a problem (Jaspers, Steen, Bos, & Geenen, 2004). The quality of data that can be obtained from the think- aloud methodology makes it commonly and widely used in research (Nguyen, 2012). The think-aloud protocol was used in a study by Johnstone et al. (n.d.), together with video recording to collect data and obtain a detailed perception about how paediatric oncologists searched for patient records. They used the think-aloud method because it is a unique source of information and used to obtain insight in the way humans solve problems (Johnstone et al., n.d.). Baauw and Markopoulous (2004) used the think- aloud protocol on a sample of 25 children aged 9-11 who carried out a testing when evaluating two products. The products included a game that aids children with learning biology (Baauw & Markopoulous, 2004). The products were evaluated with the aim of finding usability problems, and the study found that children of all genders were good at exposing different usability problems using the think-aloud method (Baauw & Markopoulous, 2004).

Alhadreti and Mayhew (2017) investigated the concurrent, speech-communication and active intervention think-aloud methods used for testing website usability. The three methods were compared according to performance, cost, participants' experiences and quality of problem. A total of 60 participants completed tasks according to a total of 9 tasks. The results showed that think- aloud methods allowed usability problems to be identified (Alhadreti & Mayhew, 2017).

A study by Baauw and Markopoulous (2004) revealed that using the think-aloud method is advantageous compared to other usability testing such as questionnaires and observation because during think-aloud, participants are not required to remember what they thought about during the process after the usability test is completed. Additionally, Jaspers et al. (2004) concluded that the think- aloud method is a valuable source of information of human behaviour when carrying out tasks, as well a useful technique for requirements analysis. On the other hand, Baauw and Markopoulous (2004) highlighted the drawbacks

of the think- aloud method. One drawback is that during the testing, a child participating is required to use cognitive resources when using the system under test (Baauw & Markopoulous, 2004). Additionally, the think- aloud method can provide a socially awkward and uncomfortable environment for a child taking part in the testing since the child's interactions with the product being tested needs to be explained by the child (Baauw & Markopoulous, 2004). In conclusion, the studies which made use of the think- aloud protocol for testing found it to be good to use as it was able to derive rich data from the participants and the method allowed a deep insight into the way participants interact with products.

## **2.12. BrainHex Model**

BrainHex is a player satisfaction model which uses a top-down approach and it is influenced by neurobiological research (Nacke, Bateman, & Mandryk, 2011). The BrainHex model recognizes 7 types of players, namely achiever, conqueror, daredevil, mastermind, seeker, socialiser and survivor (Nacke et al., 2011, Orji, Vassileva, & Mandryk, 2014). Several studies have used the BrainHex model.

Nacke et al. (2011) conducted a survey among 50,423 players using the BrainHex model to compare demographic data to the different BrainHex archetype. The survey presented players with seven statements for each BrainHex archetype and asked them to rate them. In relation to the BrainHex model, the findings of Nacke et al. (2011) show that the seeker, survivor, socialiser and achiever should show a greater incidence of feeling preference. However, BrainHex as a model might have produced inherent biases when respondents were asked to provide their Myers-Briggs a personality type if known.

Orji, Vassileva, and Mandryk (2014) proposed an approach for designing interventions for different game personalities. The guidelines were based on a study which involved 1,108 gamers of seven types identified by the BrainHex model. This work made use of the BrainHex model as it can be validated, and it accepts the different types of gamers. The different types of personalities are mutually exclusive and players usually only possess one type at a time. Although BrainHex's player topology has been shown to be reliable, it can produce low test-retest reliability in this study.

Busch et al. (2016) also investigated the power of two player types of the mastermind and seeker player type model. Participants' scores of the BrainHex player types were assessed in two online studies conducted six months apart. The BrainHex player type model was found to be weak when it comes to predicting player experience.



The studies perceived the BrainHex model to be useful when it comes to players' personalities and also prediction of power of player types. Although the BrainHex model is helpful in the previously mentioned aspects, the model's limitations include low test-retest reliability and being weak in carrying out some predictions such as the prediction of player experience and for personalised missions. These limitations caused some of the studies to not provide anticipated results of predictions and cause bias in the study.

### **2.13. Summary**

From the reviewed papers, we have seen that online harassment is a prevalent issue, but we specifically wanted to understand why this persists. In most literature, we have, however, observed that there have been no recount of reporting and education of these inappropriate online behaviours. Therefore, there is an acute need for a study that focuses on the creation and designing of a game-based solution that children hopefully will enjoy while changing their behaviour and their mental models of handling inappropriate content, and education of unsuitable online behaviour. Hence, this study aims to address this.

In this thesis, we have co-designed an interactive game that included culture-based considerations. Sorcar et al. (2017) argues that culture, as a design construct, is integral to educating people and enhancing the design process. Thus, we adopted the HCI co-design as the design process for it allows the researcher to: research the qualities of the target audience; communicate across and within the Namibian children contexts; screen for bias; design an authentic Namibian-based game; create generic or specialised design, and integrate features of culture throughout the game. The game also incorporates elements of engagement and motivation. The next chapter will discuss the research methodology.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1. Introduction**

This chapter discusses how the study was conducted in terms of research philosophy chosen as opposed to other philosophies, the research strategy, the methodology used to collect data, ethical considerations, as well as the participants' recruitment processes.

#### **3.2. Research Philosophy**

Philosophers expect to find absolute standards to truth, beauty and goodness (Johnson, 1944). According to Bajpai (2011), research philosophy is associated to the growth of knowledge. Three major ways of how researchers think about the world are ontology, epistemology and axiology. These three ways impact how researchers think about the research process. Ontology is the study of being, existence or reality (Coffey, 2018). Epistemology involves reality and how knowledge works (Lehrer, 2018). Axiology, on the other hand, is the study of values and beliefs (Hart, 1971). Four important research philosophies include positivism, realism, interpretivism and pragmatism (Saunders, 2009; Cresswell, 2017). This statement and the following four important research philosophies (namely positivism, realism, interpretivism and pragmatism) were considered in choosing the appropriate research philosophy for this study.

##### **3.2.1 Positivism**

Positivism is a philosophical paradigm whereby the world is not influenced by humans, with one absolute truth, and the researcher finds the world through observations and measurements (Wahyuni, 2012). Furthermore, with positivism, the researcher is unbiased and mostly objective, research is built on the factual testing of theories, and the research looks for generalisation (Wahyuni, 2012). The aim of positivism is to use deductive reasoning and confirm a theory engaging primary data analysis (Parvaiz, Mufti, & Wahab 2016).

Positivism takes knowledge that is gained through observation using senses to be trustworthy, making a positivist study positioned on facts and objectivity (Wilson, 2010). Using the positivist approach in research makes the researcher and the research independent, allowing the research to be objective (Wilson, 2010). Lastly, positivism limits data collection and interpretation in an objective way (Wilson, 2010).

### **3.2.2 Interpretivism**

Interpretivism is a research philosophy that identifies, explores and describes how factors in a social setting are connected (Oates, 2005). The Interpretivism philosophy also looks at how people perceive their world (Oates, 2005) and frequently makes use of inductive reasoning with the aim of putting a theory in existence (Parvaiz et al., 2016). Interpretivism is epistemologically mandatory for researchers to know the differences between participants (Saunders, Lewis & Thornhill, 2009). Researchers who make use of the interpretivism approach suppose that access to reality is carried out only through language, meanings and instruments (Myers, 2011).

Additionally, Interpretivism characteristics include several realities, which include subjectivity, reflexivity, carrying out qualitative data analysis and interpreting a situation with several interpretations (Wahyuni, 2012). This philosophy was not suitable for this study because interpretive knowledge is entirely based on understanding rather than action or practices.

### **3.2.3 Realism**

Realism is part of epistemology, similar to positivism, since it makes use of a scientific approach to expand knowledge (Saunders, Lewis & Thornhill, 2009). Realism stands on the epistemological position which correlates to scientific enquiry (Saunders et al., 2009).

Direct and critical realism are the two types of realism. Direct realism advocates that what one sees is what they get and the world is depicted through human senses (Novikov & Novikov, 2013; Saunders et al., 2009). Critical realism advocates that humans get in contact with images of real-world items, but do not see those items directly (Saunders et al., 2009; Novikov & Novikov, 2013). Realism was not suitable for this study as it is much informed by the ontological question which asks about what exists in social reality. It basically switches from the focus of knowledge to the focus of what exists.

### **3.2.4 Pragmatism**

Pragmatism philosophy recognises that there are several different ways of explaining the world and there may be multiple realities (Saunders, Lewis, & Thornhill, 2012). For pragmatism, the truth is regarded to be what works at the time (Creswell & Creswell, 2017). Pragmatism also supports the utilisation of the mixed-method approach and regards the researcher's values to be significant when it comes to interpreting research results (Saunders et al., 2009). When using the pragmatism philosophy, the researchers are entitled to opt for research methods, techniques and procedures that are ideal for their research (Creswell & Creswell, 2017). In this study, pragmatism research philosophy was more suitable as

different methods such as focus groups, surveys and co-design workshops were used to help in designing the interactive games for online safety.

One of the key reasons for selecting pragmatism is that it points attention to people's practices, experiences, promotes cooperation, empowers people to improve, and focuses on people's practices and experiences (Steen, 2013). Pragmatism allowed the research participants to feel empowered to communicate effectively, reflect on their online experiences, cooperate and design their games to improve their online experiences.

### **3.3. Research Approach**

#### **3.3.1 Deductive**

The deduction research approach involves drawing logical consequences from premises (Yu, 2006). Deductive restricts the conclusion to either a true or false answer (Yu, 2006) and deductive reasoning is not able to help locate knowledge which is not present in the premise (Yu, 2006). Deductive was not used in this research as it is associated with the positivism philosophy and this study has not tested any theory.

#### **3.3.2 Inductive**

This leads a researcher into beginning with observations and moves to detecting themes and patterns in the data. The researcher's observations allow an early hypothesis to be inquired (Soiferman, 2010). The inductive research approach is used in this study as the researcher first collected data considered to be applicable and significant to the research. A substantial amount of data was collected through workshops and then the researcher looked for patterns in data, working to co-design a customised interactive game for online safety awareness and to develop a proof of concept in form of an interactive game prototype.

#### **3.3.3 Abductive**

Abductive research approach is balanced in the fixation of beliefs, looks for a pattern in a phenomenon and suggests a hypothesis (Yu, 2006). The abduction approach is defined as a process that involves finding hypotheses or theories which could give an explanation about an observation or a fact (Yu, 2006). Although researchers claim that the abductive approach is best compared to the deductive and inductive, it was not a feasible approach as it takes a considerable amount of time to find and analyse theories. A masters' degree research may be time constrained for abductive approach.

### **3.4. Types of Research**

#### **3.4.1 *Applied research***

Applied research aims to come up with a solution for a problem present in a society or an organisation (Kothari, 2008; Bajpai, 2011). Applied research is used in this study as the researcher aims to find a solution to help create awareness and encourage children to open up and report online abuse through gaming. In Namibia, there are limited platforms that can sensitise, create awareness, encourage children to open up and report cyberbullying.

#### **3.4.2 *Fundamental research***

Fundamental research is concerned with generalisations as well as the formulation of a theory (Kothari, 2008). Fundamental research can be driven by a researcher's need and desire to increase their understanding about a specific research area. This type was not best suited to the study as we were designing games for online safety.

### **3.5. Research Design**

A Research through Design (RtD) method is used in this study. RtD is a design paradigm where new knowledge is found through practice to tackle complicated scientific or design problems. RtD makes use of the methods, practices and processes of design practice as a method of inquiry (Zimmerman, Forlizzi, & Evenson, 2007; Zimmerman, Stolterman, & Forlizzi, 2010), with the aim of generating new knowledge (Zimmerman & Forlizzi, 2014). RtD can provide a chance for research participants to communicate about the favoured state of research outcome, allowing consideration of the ethics of what is to be designed (Zimmerman et al., 2010).

This study employed the RtD strategy. Processes of design practices such as co- design are used in designing the game. Additionally, the study involved coming up with a design prototype game, which was the central part of the design process. Philosophical pragmatism can be used to understand and to organise co-design processes effectively (Steen, 2013). Pragmatism ideas consist of four phases which are addressed through a repetitive process, namely exploring the problem, defining the problem, perceiving the problem and conceiving possible solutions, and finally trying out and evaluating solutions. Qualitative data was collected for this study. Qualitative collection methods aim to gain deep insight about reasons and motivations. Data was collected through surveys, focus groups, games and workshops. As opposed to qualitative design, collecting data using quantitative methods is mostly based on random sampling using closed-ended questionnaires or experiments (Christiansen, Bjørk, & Hessevaagbakke, 2011).

### **3.5.1 Data collection**

#### **Surveys**

A survey is defined as a systematic method which is used to gather information from a population, and a qualitative survey aims to establish the meaningful variations within that population (Jansen, 2010). This research was conducted using a survey that was ethically approved by the Faculty of Computing and Informatics and permission for data collection was granted by the Ministry of Education. The survey was circulated to the first game design workshop participants. Three distinct methods of collecting data were used for this research: survey, focus groups and a workshop. Two surveys were administered: the first survey what meant for exploration and understanding Namibian children's online behaviour and experiences. The second survey was used to evaluate the online safety game's effectiveness. Empathy for potential users began with inviting school learners from Windhoek to the game design challenge. The essence of this was to understand the online problems and various challenges that children may face while online in order to investigate why online crimes are not reported and how we can prevent children from falling victim to predators. After talking to the children, we started co-designing games with them.

#### **Focus groups**

A focus group is defined as a collection of data in a group where a moderator guides a discussion with a limited number of people (Christiansen et al., 2011). Focus groups are considered to provide detailed information and provide high response rates (Christiansen et al., 2011). The focus group size is usually between 3-12 participants and can be multiple groups. The number of focus group and survey participants is reflected in Table 1.

Table 1: Participants (5 participants per focus groups)

| Participants                            | Male    | Female      | Prefer not to say |
|---|---------|-------------|-------------------|
| Online behaviour and experiences survey | 6 (60%) | 4 (40%)     | 0                 |
| Game evaluation survey                  | 7 (41%) | 10 (58.8 %) | 1 (10 %)          |
| Focus groups                            | 6 (60%) | 4 (40%)     | 0                 |

### Game Design Challenges

In this study, researcher conducted three Game Design Challenges workshops for over a period of one year. The workshops gathered all relevant stakeholders (University students, high school students, parents, teachers and game developers) via Google Forms. During the workshops, we asked about their ideas of what design is and they drew low fidelity and medium fidelity prototypes to illustrate their ideas in terms of online safety issues.

### Participants and research site

The participants consisted of high school learners, university students, high school teachers, parents and caregivers. The age range was between 7-35 years old. The research sites comprised of the Namibian Business Innovation Institute (NBII), Windhoek Industrial Trade Fair at the Windhoek Showgrounds, and the ICT Summit at the Safari Conference Centre.

### Participant recruitments

We accepted all the Google Forms applications and allowed everyone to attend the workshops. Google Forms are one of the most widely used tools for creating surveys and saving data directly to a spreadsheet, and share the forms via social media or any other platforms (Zapier, n.d.). Participation was on a voluntary basis.

A total of 29 participants (12 females and 17 males) of ages ranging between 12 – 28 attended the first Game Challenge Workshop. It was attended by 1 computer studies teacher, 2 female caregivers, and two female parents and one male parent. The total of 17 participants were university students and 6 were high school students.

Of the 17 participants (ages ranging from 12-24) attended the second Game Challenge Workshop, 4 were female and 9 male, 1 teacher, 2 female caregivers, and 2 parents. In total, 4 participants were university students and one high school learner who is a coder too as well as six vocational training students.

In the final workshop, Bring-your-Own-Device (BYOD) Testing, we needed the playtesters to bring their personal mobile phones to play the 2D version game. The researchers also provided two laptops for playtesting the 3D game version. Playtesters are people that play the game and provide feedback on the experience (Gray, Brown, & Macanufo, 2010). A total of nine playtesters (three males, six females) and two facilitators attended the Game Design Challenge Workshop.

The number of participants totals up to 84. A total of 43.8% participants were under the age of 18; 18.8% were between the ages of 18 – 25, and 37.5% were between the ages of 25 – 35 as shown in Table 2 respectively.



Table 2: Total participants for all workshops

| Institution/Role     | Gender | Game Design Jam Number | Game Design Challenge Number | Bring Your Own Device (BYOD) | Beta Testing Number |
|----------------------|--------|------------------------|------------------------------|------------------------------|---------------------|
| University students  | Female | 6                      | 2                            | 4                            | 1                   |
|                      | Male   | 11                     | 2                            | 2                            | 4                   |
| VTC students         | Female | 0                      | 2                            | 0                            | 0                   |
|                      | Male   | 0                      | 6                            | 0                            |                     |
| High school learners | Female | 2                      | 0                            | 2                            | 13                  |
|                      | Male   | 4                      | 1                            | 1                            | 11                  |
| High school teachers | Female | 1                      | 0                            | 0                            | 0                   |
|                      | Male   | 0                      | 0                            | 0                            |                     |
| Caregivers           | Female | 1                      | 1                            | 0                            | 0                   |
|                      | Male   | 1                      | 1                            | 0                            |                     |
| Parents              | Female | 2                      | 1                            | 0                            | 0                   |
|                      | Male   | 1                      | 1                            | 0                            |                     |
| Total                |        | 29                     | 17                           | 9                            | 29                  |
| Total participants   |        |                        |                              |                              | 84                  |

### 3.5.2 Data analysis

Qualitative data comprises all non-numeric data including words, images and sound, and therefore the process of data analysis involves making sense out of text and image data (Oates, 2005). During qualitative data analysis, firstly data is prepared for analysis, then the data is understood, represented and finally interpreted to derive meaning (Oates, 2005). Qualitative data analysis can be rich, detailed and allows possibility of alternative explanations, rather than one correct explanation (Oates, 2005).

### 3.6. Ethical Considerations

Ethical consideration in the research problem statement is considered as the researcher needs to identify a problem that will benefit individuals participating in the study (Creswell & Creswell, 2017). Ethics are considered during data collection as researchers need to respect the participants together with the sites where the research is conducted (Creswell & Creswell, 2017). The researcher is expected to respect the

participants, not put them at any risk, and to develop an informed consent form for participants to sign before they engage in the research. The consent form acts as the acknowledgement that participants' rights will be protected during data collection (Creswell & Creswell, 2017). For this study, permission was obtained from the Ministry of Education, Arts and Culture for data collection among school learners. All educational and parental both informed consent and assent was obtained prior to the data collection phase.

During the analysis and interpretation of the qualitative data, good ethics are needed. The researcher needs to consider how the study will protect the individuals' anonymity such as by using pseudonyms for individuals and places to protect identities (Creswell & Creswell, 2017). Additionally, during the data interpretation, researchers need to provide an accurate account of the information (Creswell & Creswell, 2017). Ethics do not end with data collection and analysis; ethics are also considered during the writing and dissemination of the final research report by not using words that are bias against people because of race, ethnic group, gender, age or disability (Creswell & Creswell, 2017).

### **3.7. Reflexivity**

The researcher is a black African woman, middle class, cisgender, straight, non-disabled Namibian woman. She was a co-researcher for the Child Online Protection research project in collaboration with UNICEF.

### **3.8. Summary**

Chapter Three discussed the methodological approach of this study. The research was based on a pragmatism philosophy and adopted an inductive approach. The research followed a qualitative method and the RtD strategy. The RtD strategy uses a variety of methods such as surveys, focus groups and game design workshops. The next chapter outlines the game design process.

## **CHAPTER FOUR**

### **GAME DESIGN PROCESS**

#### **4.1. Introduction**

Chapter Four presents a description of the iterative process used in this study. This involved two game design challenge workshops and how the game prototype was developed. It also provides the results generated while creating and refining the Onlinicus - Share Your Story game prototype during the workshops. We start by describing our design team and responsibilities and the activities that were carried out throughout the research process and conclude with the testing of the Onlinicus - Share Your Story game prototype.

#### **4.2. Co-design Team Roles and Responsibilities**

##### ***4.2.1 University and vocational training students***

The university students' role was to interview the high school learners about how they use the Internet and what type of problems they encounter while using it. University students used sticker notes to record the type of online abuse and problems raised by the high school learners. They then identified links between different users and their online behaviour. University and vocational training students were regarded as expert game designers and developers, and were grouped with at least three game designers per group of learners. They took care of illustrating the organisation of the work, coaching and scolding, proper development (e.g. resolving possible doubts and explaining some concepts to high school learners) and taking notes (Dodero et al., 2014).



Figure 2: Group of students brainstorming

##### ***4.2.2 High school learners***

High school learners shared information about their Internet usage and any problems that they have encountered while online. Children were the main focus of the research since they acted as informants,

game prototype designers, prototype coders, playtesters and users of the game, thus children were our research partners (Itenge-Wheeler et al., 2016).

Initially, high school learners were organised into smaller groups to act as informants to each team member. Firstly, they informed the design process individually, shared their own stories individually, then they joined the teams to act in the other roles of design partners, coders, playtesters and users. They were encouraged to participate and share their ideas, including ‘crazy’ ideas (Read, Fitton, & Horton, 2014).

#### **4.2.3 Teachers and caregivers**

Teachers and afterschool caregivers accompanied high school learners to the workshop venue. They engaged well with the high school learners, therefore breaking the communication barrier between the two groups, and assessed whether game prototypes developed meet the pedagogical needs.

#### **4.2.4 All team members**

Each member had to write a story about a negative online experience that they had heard of or experienced themselves. The team members then took those narratives and turned the story characters into game characters. The child user was then exposed to different scenarios and groups created their games based on those stories.



Figure 3: Stakeholders

### **4.3. First Game Design Challenge Workshop**

#### **4.3.1. Concept overview**

Our first research question was: How to co-design Namibian inspired games which aim to sensitise, create awareness and encourage children to report online abuse? We took the first step to answer this research question by conducting game design challenge workshops. The purpose was to help us learn more about online behaviour and experiences in our community by discussing in more detail about online behaviour

and experiences of children in Namibian schools. This included how the society deals with issues of online victimisation and what improvements can be made to make online experiences safer for children. Secondly, participants were required to share any bad online experiences that they had heard or read about and document a storyline based on their shared online behaviour and experiences. The storyline or plot was then converted to a game that they created using cartoon characters of their choice. Thirdly, we wanted to involve stakeholders to help us decide what types of games Namibian children play and then select the game genre. However, stakeholders were not familiar at the time with how to properly turn their storylines into a game. Subsequently, we presented on what constitutes a good and bad design and User Experience (UX).

#### **4.3.2. Approach**

In order to gain insight into the current good and bad online experiences and its challenges in Namibia, we invited interested stakeholders such as high school students, university students, teachers, parents, and game developers to participate in interactive workshops at the Namibia Business Innovation Institute (NBII). These workshops allowed us to further empathise with our participants by first discussing our findings from the literature with them, giving them a presentation on what constitutes a good and bad design. A brainstorming session followed where new, creative and unexpected stories as well as game design ideas for online safety were discussed. The rationale behind the workshop was to design an online safety game and to explore existing technologies as a suitable solution or to provide further design guidance.

#### **4.3.3. Participants**

Originally, we invited participants to the workshop through social media (Facebook, WhatsApp groups) and word-of-mouth. Participants signed up online via online Google Forms. The first Game Design challenge workshop was attended by 29 participants ranging between 12 – 28 years old, where 12 were female and 17 male. It was also attended by one computer studies teacher, two female caregivers, two female parents and one male parent. A total of 17 participants were university students and six high school students; one of the high school students was also a game developer and coder which is contrary to Druiin's method (developed in 1999) of designing with children where they are only users, testers, informants and design partners. All participants spoke fluent English and they were all living in Windhoek.

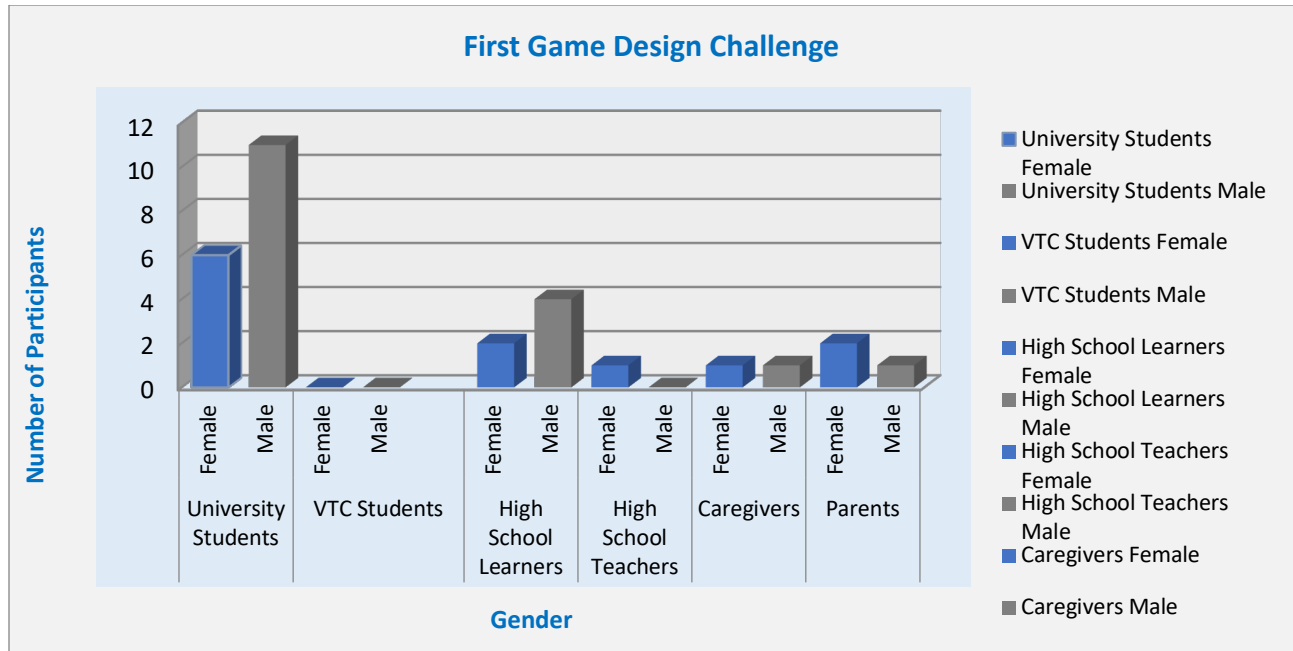


Figure 4: Number of the Game Design Challenge participants per role and gender

#### 4.3.4. Procedure

The game design challenge consisted of four parts: firstly, a presentation on the good and bad designs and UX; secondly, a cyber security word guessing game was introduced for participants to play for 20 minutes. The brainstorming session lasted for one hour. The entire design process took one – two days.

#### 4.3.5. Design process

##### 4.3.5.1 Presentation on good and bad designs

To introduce the main topic of the workshop, we showed our participants a 20-minute PowerPoint presentation on good and bad designs. The presentation also gave us the opportunity to explain to our new participants the purpose of our research, allowed the participants to ask questions about the research study, and why we were organising the workshops. We provided the participants with pre-developed personas which we later learnt was a bad idea because users needed to create their own personas to deepen their understanding of who they were designing for (Cabrero, Winschiers-Theophilus, & Mendonca, 2015; Itenge-Wheeler, Winschiers-Theophilus, Soro, & Brereton, 2018). For the next topic – what are we designing – we explained what games are made of and how to design it; here the facilitators showed participants some examples of good and bad designs. However, in this workshop we did not teach the participants about any design techniques and what tools and concepts to use; rather they were free to use their own ideas.

#### **4.3.5.2 Exploration**

Two focus groups were organised to explore and define the problem at hand: online child abuse. As co-design is an iterative process, exploration was carried throughout the process during brainstorming and game-storming sessions. Some team members, especially university students, participated in focus groups with the children who shared their stories. The different scenarios helped the participants to empathise with others' bad online experiences, and to imagine in detail the possible problems that the game aims to solve. Therefore the ethics of co-design helped participants to express and share their own experiences and to empathise with other people and their experiences (Steen, 2013).

#### **4.3.5.3 Brainstorming session**

The brainstorming session comprised 10 participants. We asked the participants several questions pertaining to online safety and experiences (see Appendix D). During the brainstorming session, participants were required to describe any bad online experiences that they had heard or read about. This was aimed to identify how much they know about online safety and the impact that cybercrimes have on their everyday life, and hopefully to allow the participants to relate themselves to the issue that they are trying to solve. Another important aspect of this question was to mimic these stories into games that they can teach someone else on how to deal with similar cyberattacks.

Table 3: Shared stories by the participants

| Things that bother you online | Any bad online/Internet experiences that they have heard/read about   | How did it make you feel?   |
|-------------------------------|---|---|
| Exposing                      | <ul style="list-style-type: none"><li>• An 18-year-old girl was filmed by her boyfriend naked while they were having sex and was exposed on Facebook and WhatsApp with photos and videos. When she saw that, she never went back to school and later attempted suicide.</li><li>• A girl got very drunk that she could not recognise where she was. Some guys took pictures and videos of her</li></ul> | <ul style="list-style-type: none"><li>• Lost</li><li>• Regretful</li><li>• Wrath</li><li>• Embarrassed</li><li>• Upset</li><li>• Depressed</li><li>• Suicidal</li></ul> |

|                |  |  |
|----------------|--|--|
|                | vomiting and peeing. They then circulated them on social media.  |  |
| Grooming       | <ul style="list-style-type: none"> <li>I was very lonely. So, I usually use the Internet to communicate and socialise with people. One Sunday, I had a good talk with a friend online. He was good looking and I could do anything with him.</li> </ul>  | <ul style="list-style-type: none"> <li>Regretful</li> </ul>  |
| Bullying       | <ul style="list-style-type: none"> <li>My friend was playing GTA5 online and he came across another player online who would just start swearing and roasting (a word used by Namibian children to refer to cyberbullying) him. Whenever he joined a new online session, the cyberbully also joined the session and would just continue swearing at him and threatening him a lot.</li> </ul> | <ul style="list-style-type: none"> <li>Embarrassed</li> <li>Upset</li> <li>Depressed</li> </ul>  |
| Cyber stalking | <ul style="list-style-type: none"> <li>A girl had a lot of people texting her inappropriately. She changed her number to avoid this. The problem started when she found a hot guy's photo on her phone; she then decided to catfish her friends, only to have her friends block her. She ended up having to switch numbers again due to people targeting her.</li> </ul>                     | <ul style="list-style-type: none"> <li>At first, she felt unsafe, then she felt confident, then she felt unhappy, and she felt unsafe once again.</li> </ul> |
| Catfishing     | <ul style="list-style-type: none"> <li>A girl wanted a boyfriend to show off to her friends. She thought they did not think she could get a boyfriend. She created a fake Facebook profile</li> </ul>  | <ul style="list-style-type: none"> <li>Disgraced</li> </ul>  |



|              |  |  |
|--------------|--|--|
|              | account to create an illusion of an online relationship. She was cyberbullied because people found out. She deleted her social media account and became shy.   |  |
| Blackmailing | <ul style="list-style-type: none"> <li>• A girl in my primary school had a problem where her father owed money to a gang group. People then started blackmailing and constantly raising the price, if the price were not paid, they would threaten the family's life.</li> </ul> | <ul style="list-style-type: none"> <li>• Shame</li> <li>• Embarrassment</li> </ul> |

#### ***4.3.5.4. Demographics, device and Internet usage***

Participants responded to questions about their online behaviour and experiences through a survey. Two participants were in grade seven, one was in grade nine and seven were at university or vocational training centres as shown in Table 2. When the participants were asked about the type of devices they use to go online, 90% indicated that they use smart phones and one uses a feature phone. A total of 80% of participants use mobile phones, 30% use tablets, 20% use iPads, 70% use laptops and desktops, while one participant does not go online.

Table 4: Types of devices used

| Device Used      | Percentage |
|------------------|------------|
| Mobile Phone     | 80%        |
| Tablets          | 30%        |
| iPad             | 20%        |
| laptop / desktop | 70%        |

Regarding Internet usage, 50% of the participants use the Internet many times a day, 30% use the Internet many times every hour, and 2 use the Internet excessively (constantly on their phone). All participants indicated that they use social media, whereby 30% of the participants use Snapchat, 60% use Instagram, 70% use Facebook, 20% use Twitter, 10% use WhatsApp, 80% use YouTube, and 30% use other social media platforms.

Table 5: Type of social media

| Social Media | Percentage |
|--------------|------------|
| Snapchat     | 30%        |
| Instagram    | 60%        |
| Facebook     | 70%        |
| Twitter      | 20%        |
| WhatsApp     | 100%       |
| YouTube      | 80%        |
| Other        | 30%        |

Apart from using their phones for social media, 90% of the participants indicated that they also use their phones to make calls; 80% for Internet browsing; 10% to video chat; 90% for the Short Text Messaging function (SMS); 70% participants to play games; 30% for cell phone banking; 90% to take photos and selfies; 80% to play music; 50% for networking; 50% for WhatsApp video calls, and 90% for WhatsApp chats.

Table 6: Mobile phone usage

| Mobile Phone Usage   | Percentage |
|----------------------|------------|
| Make calls           | 90%        |
| Internet browsing    | 80%        |
| Video Chat           | 10%        |
| SMS                  | 90%        |
| Games                | 70%        |
| Banking              | 30%        |
| Photos               | 90%        |
| Music                | 80%        |
| Networking           | 50%        |
| WhatsApp video calls | 50%        |
| WhatsApp chats       | 90%        |

### 1. Sharing of information on the Internet or social media and online experiences

When the participants were asked about the information they share on the Internet or social media, most (80%) indicated that they share information about their hobbies, 60% gender, 50% share their actual name, and 40% their age. The least most shared information is 10% physical address, 20% race and their school.

Table 7: Types of information shared by online users

| Information shared | Percentage |
|--------------------|------------|
| Hobbies            | 80%        |
| Gender             | 60%        |
| Real names         | 50%        |
| Age                | 40%        |
| Physical address   | 10%        |
| Race               | 20%        |

#### 4.3.5.5 Domain knowledge

Other important questions asked in the survey are based on the participants' domain knowledge to challenge them on how they can improve on making their online experiences safe. In this case, we assessed on the technologies that they may think of, the change of behaviour on how they use the Internet, and what channels they can use to report if they may encounter a cyberattack. The questions were focused on identifying the current practices of cyber safety education and asking the high school learners what they have learned about online safety at school. Essentially, we assessed the effectiveness of current cyber safety education platforms based on the participants' response. Nearly all (90%) of the participants reported that they attend online safety courses at school and 10% reported that they do not know.

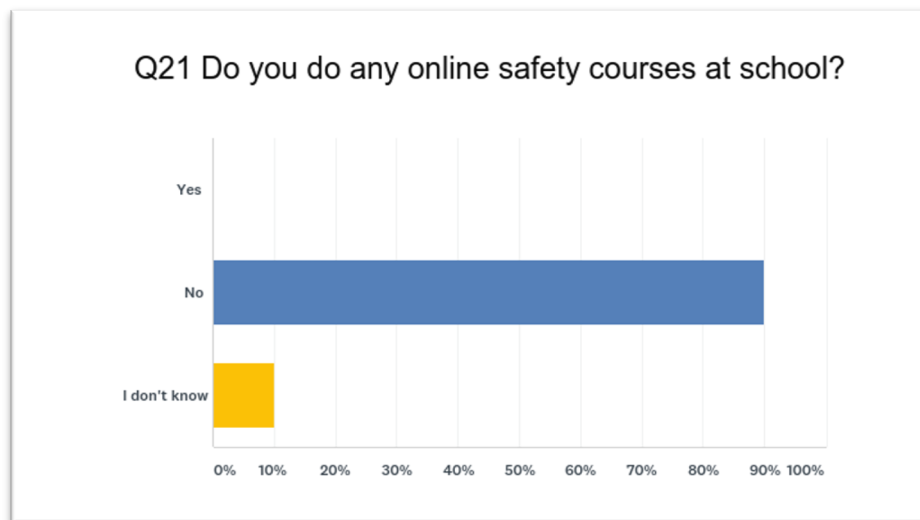


Figure 5: Online users who uses online safety courses Vs those who do not

The initial questions that participants were surveyed on addressed serious topics and concerns, i.e. online safety, cybercrimes, cyber education and cyber security in general (see Appendix D), with the initial topics' questions asked during the game design challenge. The essence of this is to understand the challenges that children may face while online in order to investigate why online crimes are not reported and how we can prevent children from falling victim to predators. This is known as exploration where we explored and defined the problem at hand to gain better understanding (Steen, 2013). Thus, we sought first to understand the non-game element (online safety) and then proceed to design a game, as we needed to

establish that there was indeed a lack of online safety awareness in Namibia from the participants' perspectives (Landers, 2014)..

#### ***4.3.5.6 Game preferences***

The participants were asked questions about games. The questions centred around computer games they play and why they play those types of games. They were also asked, amongst others, the frequency of playing games and what they use to play the games. The reason for these questions or the assessment on children's game behaviour and preferences was to assist selecting the game genre (Action, Adventure, Simulation, Sports, Strategy/Puzzle).

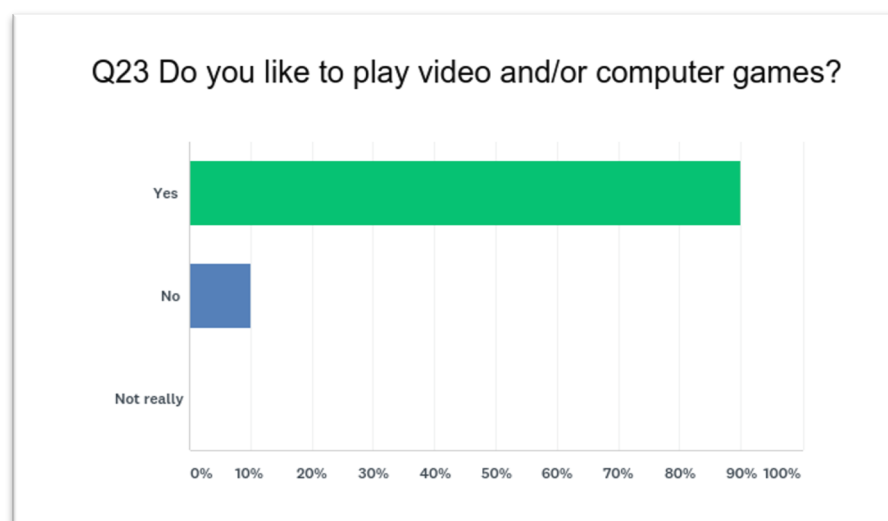


Figure 6: Number of participants who likes playing video games

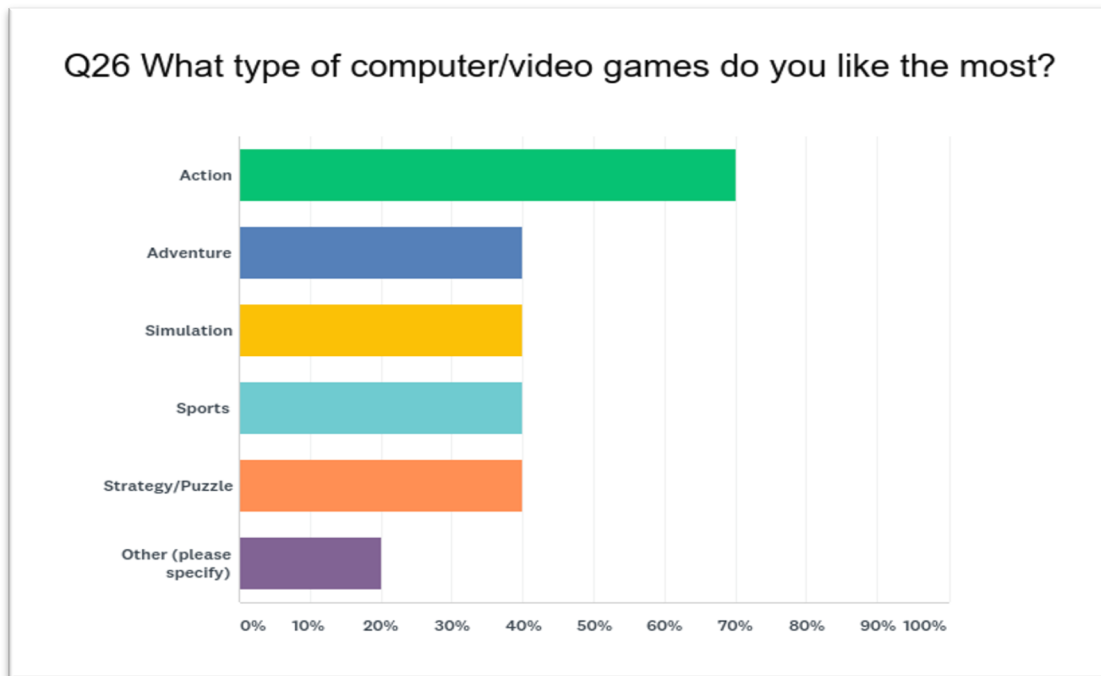


Figure 7: Video games preferences

#### ***4.3.5.7 Develop game prototypes***

After talking to the children, we started co-designing games with them. We created a cybersecurity game that creates awareness among teenagers on social media activities, especially on the prevention of inappropriate behaviour and encounters. The game simulates a real-life experience, letting the player choose in which location they want to play the game, for example their bedroom, living room, on a patio, etc. The player can choose the social media and create an account. The game then adds friends and presents players with various scenarios such as stranger friend requests, random pictures and solicitation emails. The game then simulates various scenarios depending on the player's selections. The game incorporates motivational messaging, awareness tips, virtual money for right actions, videos and penalties such as playing your way out of negative situations. The videos feature stories of children who fell victim to abusers. We also incorporated augmented reality features into the game.

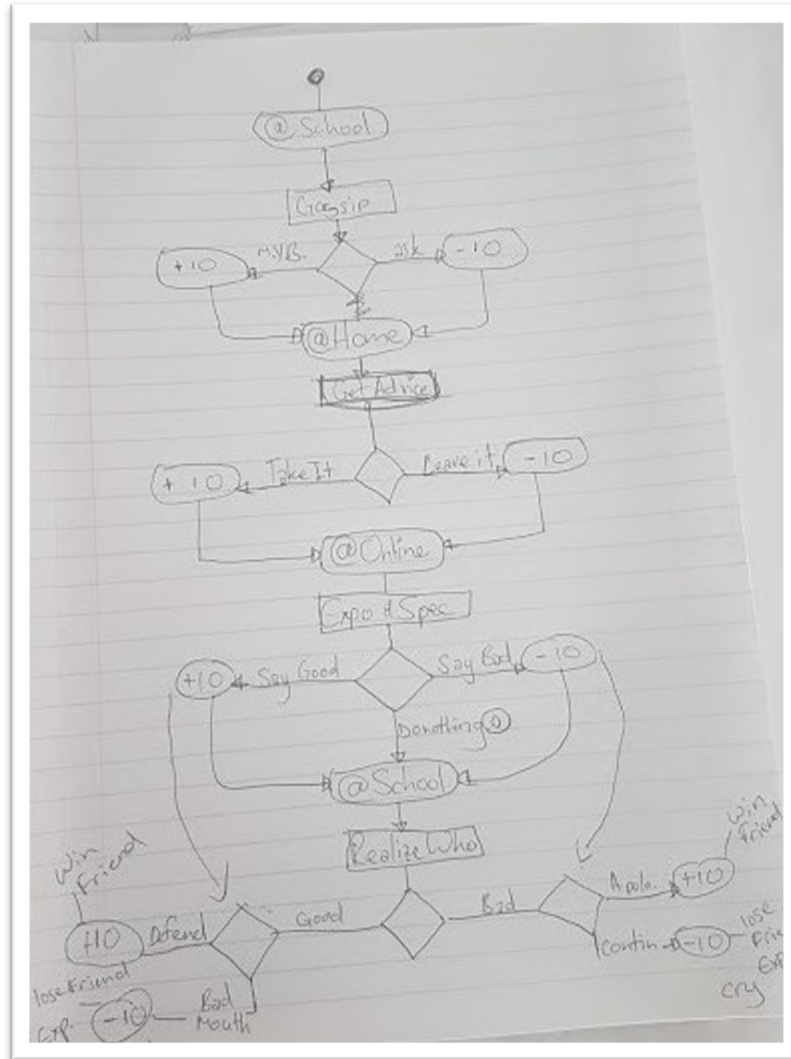


Figure 8: The game flow for Game eXpose

#### 4.3.6. Second Game Design Challenge Workshop

##### 4.3.6.1 Concept Overview

The second Game Design Challenge workshop aimed to deepen our understanding about online behaviour and experiences in our community by discussing in more detail about online behaviour and experiences of children in Namibian schools. Exploring an introductory design class was a guide to help participants with their game prototype. In the first Game Challenge Design workshop, we established that without exposure to several existing design techniques the youth's creation of technology design ideas and decisions will be minimal. The second Game Design Challenge workshop followed the HCI co-design techniques and concepts to redesign the initial games if possible.

#### 4.3.6.2 Approach

Once again, the event aims to bring together students and high school learners to demonstrate their problem-solving and design skills while trying to address online safety problems through gamification and by sharing best practices and letting the participants experience some of games, for example a cyber security word guessing game.

#### 4.3.6.3 Participants

The second Game Design workshop was attended by 17 participants ages ranging from 12-24; four were females and nine males, one teacher, two female guardians/caregivers, one parent and one female parent. Four participants were university students and one high school learner who is also a coder and six vocational training students. Due to examinations that were held in June, the second workshop's attendance was very low although it was as productive as the first one.

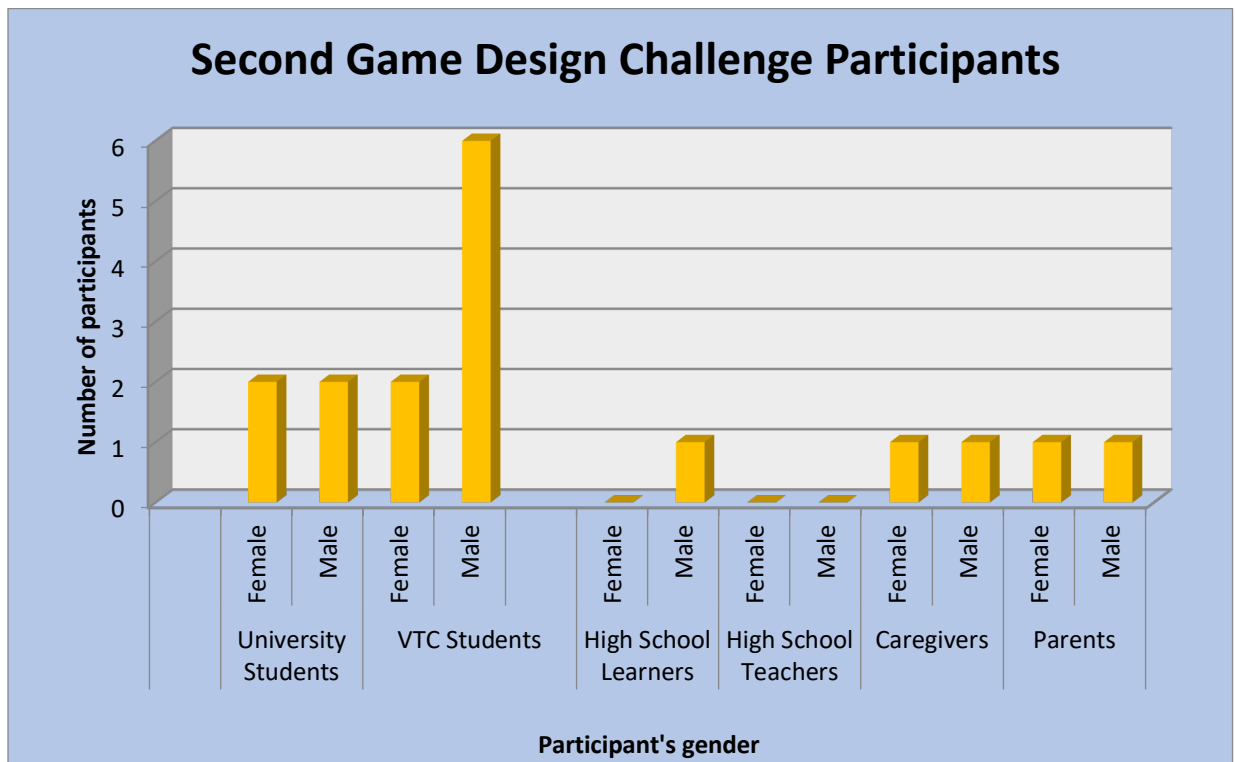


Figure 9: Second Game Design Challenge participants



#### ***4.3.6.4 Procedure***

The second Game Design Challenge took place at the Namibia University of Science and Technology in Windhoek. Participants were arranged into focus groups. Each group was instructed to document a storyline(s) of an online abuse that they know or have heard/read about and how it was handled. The participants then captured these stories via audio as well as note-taking. Together with the researchers, the participants had to use their stories to design and build a game that incorporates video, still images, background music, and narration, reward structure. This game could be customised further by adding titles, transitions and video effects. Participants could create their own characters/ names /pictures, etc. After their games were completed, they shared them with the researcher and other teams, receiving comments and praises on their work.

The second workshop consisted of two stages: Firstly, the co-design techniques were briefly explained to the participants and games were played with the participants by giving different online experience. The participants were asked to guess the name of the cybercrime based on a scenario, following which they had to create their own personas to design a game for and write about a bad online experience that they had heard about. They then shared their story with other participants leading into a group discussion. Then round-table group discussions were facilitated with a set of semi-structured questions followed by a whole group discussion.

#### ***4.3.6.5 Design process***

##### ***4. 3.6.5.1 Online Safety Word guessing game***

As an icebreaker and discussion trigger, the “Online Safety Word guessing game” was played, – a game that was invented by the facilitators. One of the facilitators read out a short online experience scenario, for example “You receive an email asking you to open up a link and log in or to reveal personal details”. Participants wrote down the type of cybercrime it is and how it can be prevented and shared their answers. The participants then decided on the correct word and the best way to prevent that online abuse. The answers differed from each other. This demonstrated clearly that the youth lack the knowledge of online safety and how best they can avoid danger. Thus, the youth learnt new words used in cyberspace through a simple and fun activity.

Following the game, the youth were asked to share any bad online/Internet experiences that they had heard/read about and engaged them in round-table discussions on how they could design a game to solve each of experience. The aim was to assess the youth’s understanding and knowledge on online safety as

well as to establish how they feel about handling such online abuse. The youth were asked to design using these techniques.

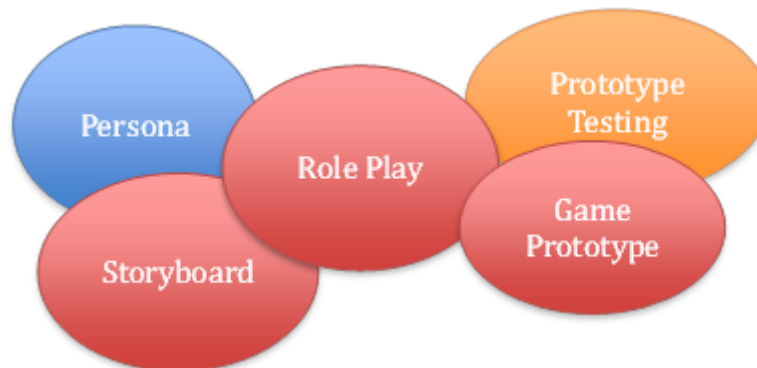




Figure 10: Design techniques

#### 4. 3.6.5.2 Creating personas

Creating personas is a way of making your observations humane (Cabrero et al., 2015). Personas are normally created for two reasons: it helps the researcher “as an outsider” emphasise deeper and think of the subject in study as a human. Secondly, it helps in the design process. We decided to create personas with the participants’ inputs because they have a deeper understanding of children’s personalities. We created two personas of the various possible characteristics of a typical Namibian child. The participants used !xnanes and Ndesy as their personas as shown in Table 8. The persona captured important information such as device ownership, Internet access, hobbies and affinity towards mobile games.

Table 8: Personas

|   |   |
|---|---|
|  | <p>Name: Ndesy</p> <p>Age: 15 years old</p> <p>School: AShipena</p> <p>Hobbies: singing, dancing, reading, playing games</p> <p>Residential address: Havana</p> <p>Hobbies: Art, dance</p> <p>Technology usage: Mobile phone, school computer lab</p> |
|---|---|

|   |  |
|---|--|
|  | <p>Name: Inxanes</p> <p>Age: 13 years old</p> <p>School: Academia High School</p> <p>Town: Windhoek</p> <p>Hobbies: Music, soccer</p> <p>Technology usage: Smart phone</p> |
|---|--|

#### 4.3.6.5.3 Draw storyboarding

The following figure shows the participants' storyboards where they developed online experiences stories.

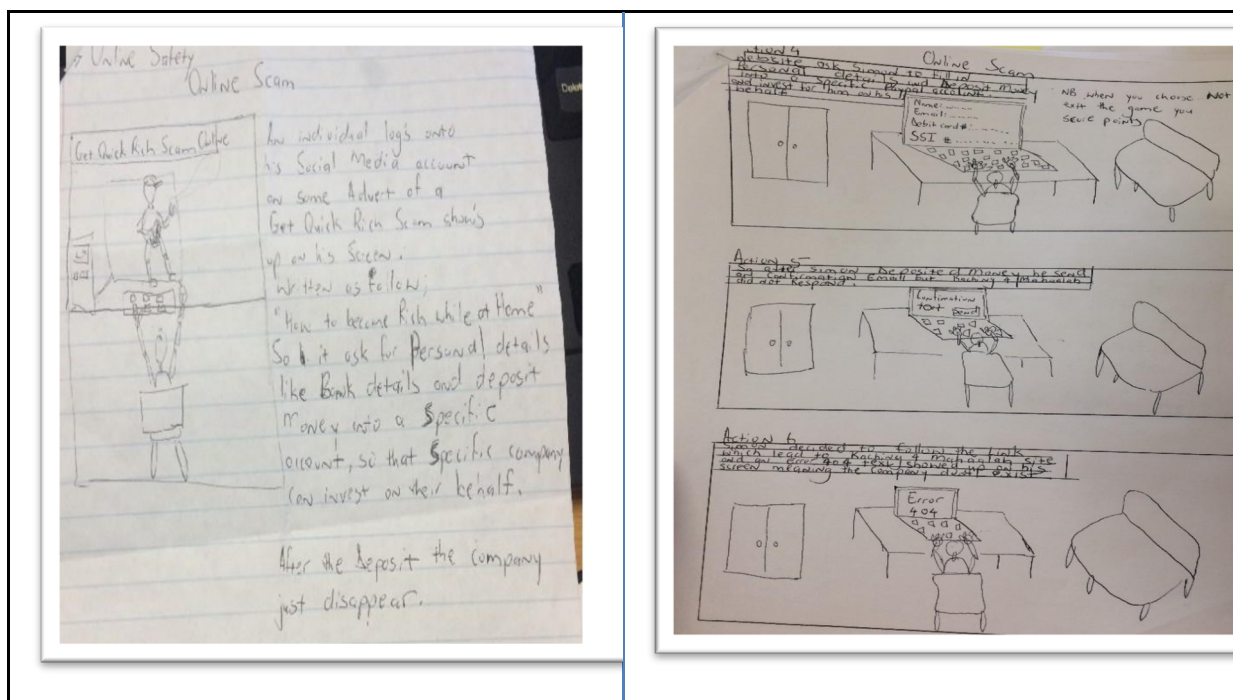


Figure 11: Storyboard story about online scam

#### 4.3.6.5.4 Design wireframes

After the storyboard, the participants continued with drawing wireframes. The paper wireframes showed the flow and interfaces of the mobile games designed. Figure 12 shows some of the interfaces emanating from the storyboards.

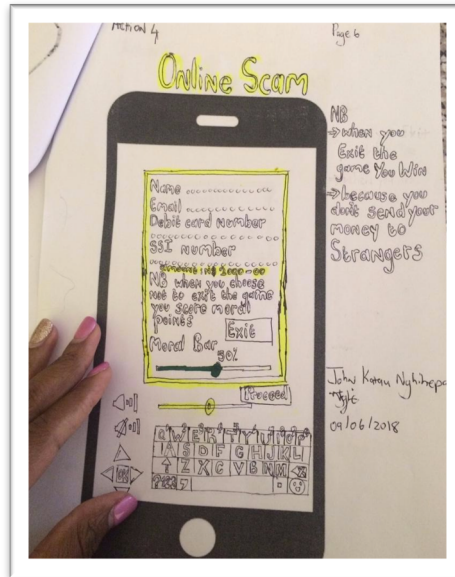


Figure 12: Wireframe mobile interface

#### 4.3.6.5.5 Cognitive walkthrough

Cognitive walkthrough (CW) is a method used for evaluating the interfaces of a software applications to identify design issues (Spencer, 2000). CW is mainly used to test the learnability of the application and they are carried out on paper or on finished applications focusing on interface usefulness, usability, visibility, and feedback (Clamann & Kaber, 2004).

The participants tested their wireframes using CW. After the paper wire framing, two participants from a different group performed a CW to test another group's designs. The walkthrough showed that some screens were not clear enough as users became confused at some points and they did not know what was required of them in some screens. The changes suggested were incorporated in the design afterwards. The CW illuminated many errors on the interfaces but helped participants realise just how much a user could struggle with their designs. Wireframes were created, serving as a reference during the implementation, and these can be seen in Figure 13.



Figure 13: Testing using cognitive walkthroughs

Participants refined the wireframes, and had it re-evaluated by different users. Once they were satisfied, they translated the designs to code.

#### ***4.3.6.5.6 Develop game prototype***

The participants from the second Game Design Challenge came up with online stories which they designed into a game to teach online safety. That game is called CyberBullet - Share Your Story – an educational cyber awareness game aimed at preventing child online victimisation by sensitising, creating awareness, encouraging children to open-up and reporting of online child abuse. This science fiction adventure game simulates the online experience of an individual (the player) being exposed to various online dangers and stimulating awareness on the harm and the negative effects that such dangers could portray.

The gameplay incorporates elements of adventure and quizzes. CyberBullet – Share your Story presents a fun learning and awareness experience through visualisation and roleplaying, where online aspects such

as fraud, online scam, social media, cyberbullying, search engines, viruses and the likes are represented as characters and models. The gameplay is based on decision-making which leads to various outcomes taken from real-life experiences or stories.

#### **4.4. Bring your Own Device (BYOD) Testing Workshop**

In the BYOD, a think-aloud protocol was used to evaluate the game that emanated from the previous design workshop. Potential enhancements were made if necessary.

##### ***4.4.1 Concept overview***

The previous two Game Design Challenge workshops focused on designing, developing and testing low and medium fidelity prototypes. The third workshop focused on answering the second research question: How do we evaluate the effectiveness and usability of the child online protection interactive game prototype?

##### ***4.4.2 Approach***

The BYOD testing session took place at the NBII Mobile Lab. The workshop's main aim was to test the game using the think-aloud protocol and to give further feedback by filling out the evaluation survey.

##### ***4.4.3 Playtesters***

In this workshop, we needed participants to bring their personal mobile phones to play the game. The researchers also provided two laptops for play testing the 3D version. Playtesters are people that play a game and provide feedback on the experience (Gray et al., 2010). A total of 9 playtesters, two game coders and two facilitators attended the Game Design Challenge workshop.

##### ***4.4.4 Procedure***

Playtesting is at the heart of the design process and the feedback received during this session helped us transform the game into a fun, educative and interactive experience for the players. We began by welcoming the playtesters to the game design session and the facilitators explained what is expected from the Game Design Workshop. There were two games developed: a 2D and 3D version to be tested. The playtesters firstly had to install the game on their computer, and we had to share the Android Application Package (APK) via Bluetooth for the 2D version. The installation process for Cyber Bullet-Share Your story is simple and straightforward. Cyber-Bullet 3D is a portable application (app), sometimes called standalone. It is a program designed to read and write its configuration settings into an accessible folder in the computer, usually the folder where the portable app can be found. This makes it easier to transfer the program with the user's preferences and data between different computers. CyberBullet runs on both

Windows and Mac Operating Systems. CyberBullet - Share Your Story 2D version game is available on Play Store as a beta version for testing and users can download and play it.



Figure 14: BYOD testing session

We observed the playtesters' experience and recorded the playtesting with a web camera. We paid attention to how they move the direction arrows and the mouse; we also tried to see if they followed instructions, identified when they got stuck, frustrated or bored, and we wrote down everything they told us (Lemarchand, 2014). Playtesters played a crucial role in guiding us in identifying any issues lurking that surfaced from the design perspective.

While CW helped a lot as the essential elements of the design were included in the game, it is recommended that playtesters be involved in the entire design process to give feedback earlier as it can save them considerable time, money and creative heartache (Lemarchand, 2014). Lemarchand (2014) compared a game to hosting a party: Developers and designers never really know how playtesters will feel about the game because they request the players over to play the game and they must listen and observe what they say as they experience the game. Lemarchand (2014) stressed that this is the best way to understand how the game is working, hence game designers are advised not to influence how players

play the game. We applied these techniques throughout the 3<sup>rd</sup> Game Design Workshop including asking the right questions and openly welcoming criticism for the betterment of the game.

#### ***4.4.5 Survey***

The evaluation survey was used to provide further feedback on the game design. Only 6 out of the 9 participants above the age of 18 participated in the survey. In this thesis two computer game prototype types were developed. The design of the game prototypes was co-designed with stakeholders. The survey results will be presented in Chapter Seven.

#### **4.5. Summary**

Chapter Four has covered the design process in depth. The next chapter will discuss the game prototype in terms of game engines, development and deployment, game flow and game play.



## CHAPTER FIVE

### GAME PROTOTYPE

#### 5.1. Introduction

Chapter Five presents an interactive game that teaches children how to deal with online safety issues. The chapter comprises of the game concept, high concept statement, Unity3D engine, game play, game world and genre.

##### 5.1.1. Game Concept

A game concept includes a high concept, principal gameplay mode, player and character roles, challenges for the player, game genre, target audience, game machine, competition modes, summary of game progress from start to finish, and short description of the game world (Rollings & Morris, 1999). In this thesis, two computer game prototype types were developed.

##### *5.1.1. High concept statement*

CyberBullet - Share Your story is a third person 3D adventure game designed primarily for Windows PC, where the player has to play through a virtual world known as Onlinicus which mimics the Internet, and acquire online safety knowledge and instructions by means such as videos, links and stories which will be paramount to the player in order for him/her to complete the game successfully. The player also obtains rewards through completion of quizzes and other game obstacles.

##### *5.1.2 Unity3D engine*

The game was developed using the Unity 3D game engine (free version). It was the most suitable for its ability to be deployed both on the Web and on Windows platforms. The game was coded using the C# programming language. Unity 3D is a game engine that allows people to create games easily and faster. It has a visual editor that allows the developer to see changes in real time (Creighton, 2010). It is an interactive game engine and it is good for rapid prototyping. Unity 3D is component based, and this enables modularity and extensibility (Creighton, 2010).

Unity 3D games are divided into scenes which are basically empty spaces that can be filled with game objects. Everything inside a scene is a game object (Menard, 2014). Initially, game objects are stationary, and the developer needs to add components to add functionality – that is what defines the game objects

(Menard, 2014). Once the scene is prepared, there is a play button to test how the scene works. The figure below shows the main components of Unity 3D.

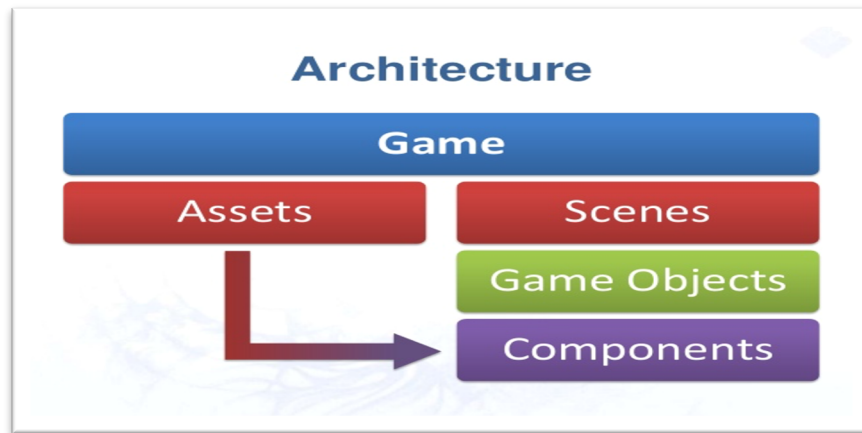


Figure 15: Unity 3D game architecture

### **5.1.3 Game play**

Onlinicus3D-Share Your Story is a third person adventure game. The camera angle is similar to “The Legend of Zelda: Breath of the Wild” game, where the player plays in single player mode (Nintendo, 2018). The player’s main objective is to find a map that leads him out of Onlinicus after being teleported into this virtual world. The player will have to make use of the game clues and pay attentive attention to instructions throughout the game. These instructions hold information that the player needs to get him closer to finding the map and leaving the Onlinicus world.

### **5.1.4 Game world**

The game has a mixture of different scene environments, such as the modern 3D style home setting. The main scene style adopts a mixture of a somewhat unearthly, science fiction surrounding. The game also incorporates a 2D slideshow-like image effect when the player finds him/herself in the story mode part of the game.

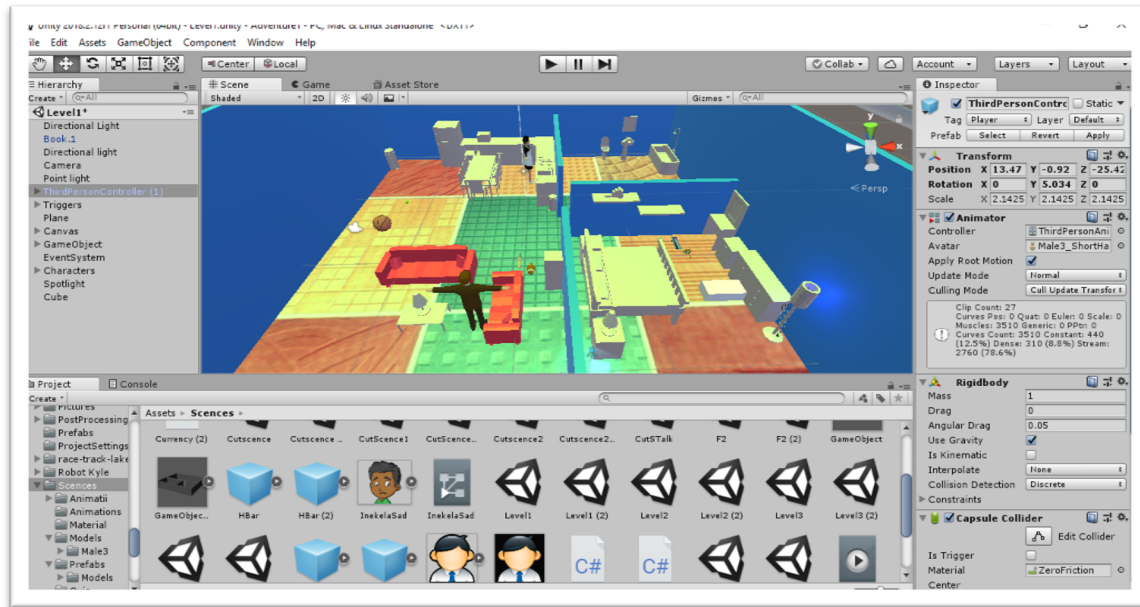


Figure 16: Unity 3D scenes creation

### 5.1.5 Genre

The game's genre was selected from the game design challenge workshop as different stakeholders decided on the best game genre for teaching online safety. Boys prefer action and adventure games and the girls prefer role playing and storytelling games. Because the player changes scenes when he/she plays the game, it contains many instructions and guides on how to navigate. The 2D version allows the player to take different quizzes as well.



Figure 17: 2D story mode

#### **5.1.6 Target audience**

Although CyberBullet - Share Your story was initially targeted for children aged 8-15, the design can also capture the interest of people between the ages of 4-24, adventure game fans. It was originally developed in the interest of teenagers or younger learners to enhance their education on online safety measures in a more non-traditional way. It can be concluded that anyone with basic computer skills who is willing to play can successfully play the game by following the self-explanatory instructions presented during game play.

### **5.2 Gameplay and Mechanics**

#### **5.2.1. Camera**

The game's view will be from an angle of about 60 degrees, slightly following the player from behind. The player will then be able to see everything from a near 180-degree angle on the 3D environment.

#### **5.2.2. Controls**

The available keys in the game are as follows in Table 9:

Table 9: Game control keys

| Function            | Key                      |
|---------------------|--------------------------|
| Movement: Left      | left arrow key           |
| Movement: Right     | Right arrow key          |
| Movement: Forward   | Up arrow key             |
| Movement: Backwards | Down arrow key           |
| Jump                | Space bar                |
| Pick up             | Key (E)                  |
| Look around         | Mouse<br>keypad/Touchpad |
| Talk to people      | Key (E)                  |

### **5.2.3. Obtaining information**

The player needs to move towards the NPCS (non-player characters) to interact with them. The player then enters a 2D environment, depicting the ongoing interaction. During such interactions, the player's main role is to pay special attention to the information being disseminated as this will come in handy when answering quizzes and facing other obstacles.

### **5.2.4. Rewards**

After the successful completion of the quizzes and different levels, the player is rewarded with incentives such as health, money, higher morale and several security gadgets for motivation and experience.

### **5.2.5 Good attributes**

The player has a moral bar that increases with every successful gameplay. It is imperative that the player keeps their morale bar high as a depleted morale bar would result in the player losing the game and eventually becoming stuck in Onlinicus. Completing a quiz increases the player's morale by 30% and following instructions increases the player's morale by 5% each time.

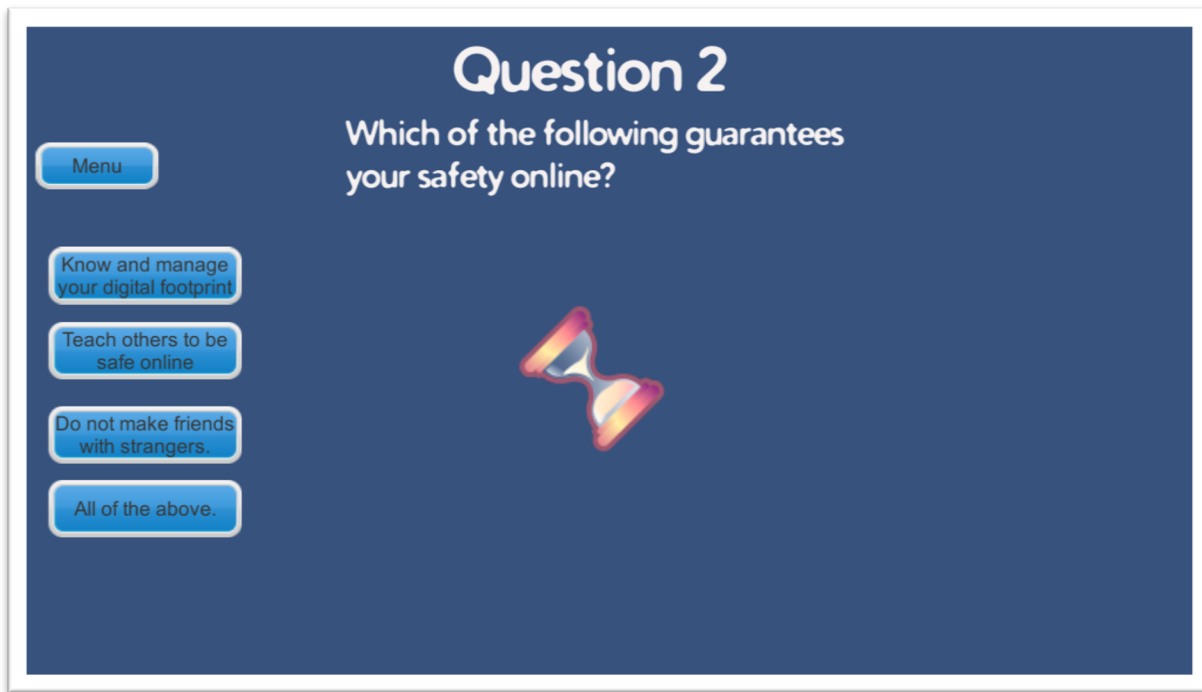


Figure 18: Samples of quiz questions

### 5.2.6. Characters description

There are many characters in Onlinicus-Share Your Story. Below is the brief description of the main characters:

- Ndesy: An introvert young child who loves art, singing, dancing, reading and playing video games. She is a playable character(s) and chief protagonist. She invented a machine that transports her into the online realm world called “Onlinicus”.
- !Nxanes: A tech savvy child, who wants to be famous one day, that lives in a humble modern-day home setting. He is a playable character(s) and chief protagonist. He invented a machine that transports him into the online realm world called “Onlinicus”.
- Mom: A character that acts as a parent who interacts with the player at home and is responsible for teaching online safety tips.
- Dad: A character that acts as a parent who interacts with the player at home and is also responsible for teaching online safety tips.
- Google: A fictional search engine that helps the player get through the various locations found in the game.
- Spiders: These are fictional web crawlers (also known as a web spider or web robot) which allow the player to browse the World Wide Web (www) effortlessly.

- Security guard: A character that requests the player to provide credentials before visiting any “social media” locations.
- Mr Robot works together with Gooble to provide further guidance to the player.
- Social media friends: Players that create social media groups that the player will join.
- Social media bullies: These are social media friends that are known to cyberbully other social media users.
- Inekela: A 14-year-old boy who has a deep love for his smartphone. Since he can register his phone on MTC Awah, he can surf the Internet anytime. He literally finds the phone as his best friend and likes to chat with people he does not know. They ask him to do many things with his phone like sending his personal details, his family and friends’ details, his school details and all the information that they want to enable them to know him better in exchange of free cool apps that he can download to his phone.
- Lukaku: Inekela’s friend and classmate who takes cyber security/online safety classes.



Figure 19: Home page of Onlinicus-Share Your Story with Characters

### 5.2.7 Game flow

The game begins with a scenario where the player is a regular teenager living with both his parents inside their home. After selecting a character, the player starts off by moving around the room with the objective

of finding and interacting with both parents (Mom and Dad); this helps the player acquire information that will aid in his gameplay throughout the course of the game.

After interacting with both parents, the player finds the computer and gets teleported into a fictional world known as Onlinicus, which mimics the Internet. Before reaching Onlinicus, the player answers a set of quiz questions to test the player's knowledge acquired throughout the first level. The player is then instructed to find Mr. Gooble, a fictional search engine that helps the player get through various locations found in the game. After finding Mr. Gooble, the player is presented with a menu of locations namely, "Social Media", "Book Stories", "Videos" and "Links". Each of these locations lead to a different set of adventures as depicted in the flow chart below.



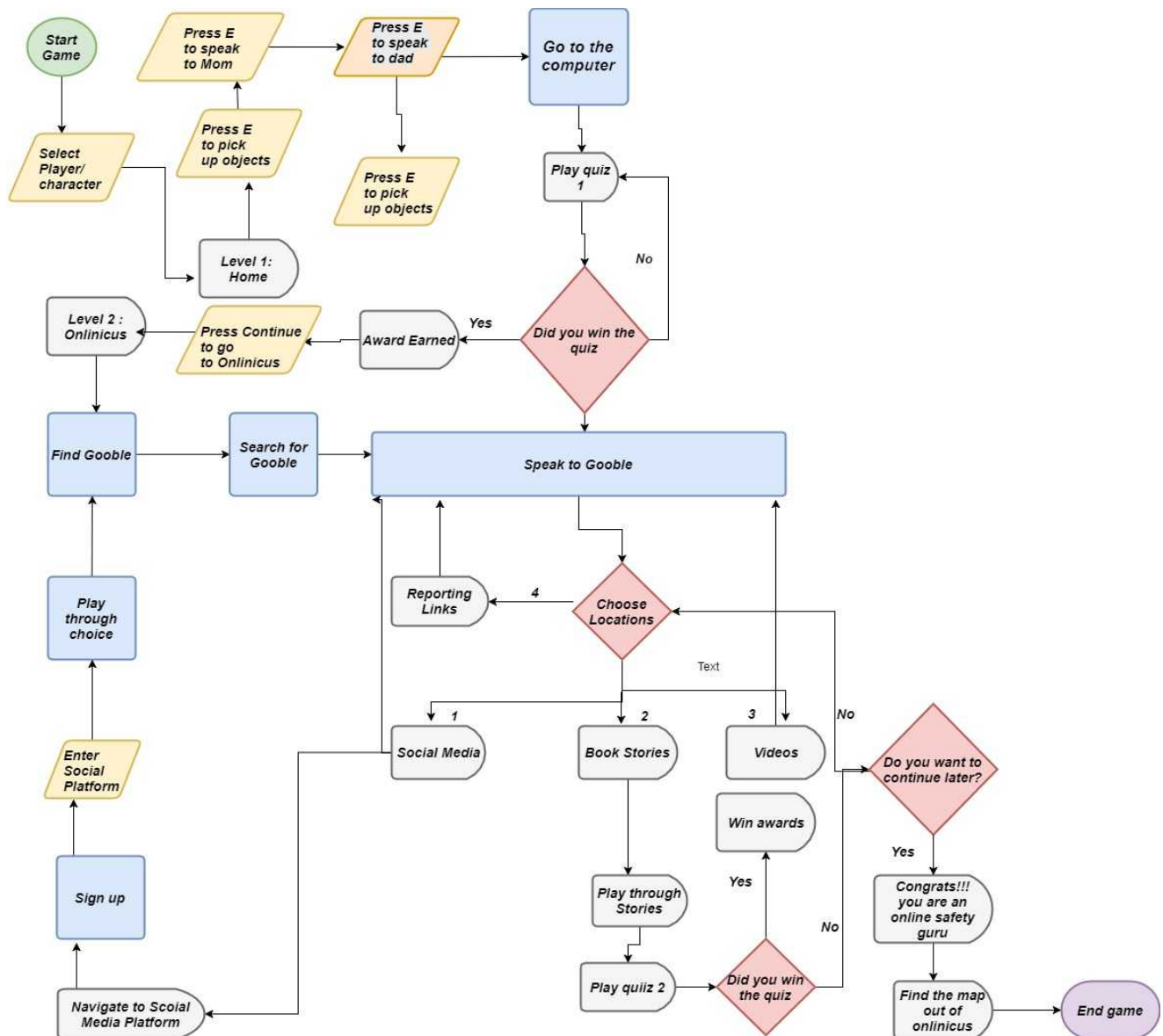


Figure 20: Onlinicus flowchart

Upon the selection of the social media location, the player will have to sign up to enter the fictional Facebook mimic location. Pop-up instructions guide the player through this stage, and the player gets tested in some social media interactions. Upon the completion of this level, the player gets redirected back to the Onlinicus level 2.

When the book stories location is selected, the player plays through a set of predefined stories and gets to perform a set of simple decisions. A quiz is found at the end of this level too. The overall prize is a

winning a badge called Online Safety Guru and the player is freed out of the confusing world of Onlinicus by being awarded a map to direct him/her home back to the apartment where the game ends.



Figure 21: Onlinicus navigation interface

### 5.3 Implementation

The game interface was developed using C#. The 2D interface is seen on a player's mobile device and the 3D interface is played on any Windows based PC. The user interface changes as the user navigates in the game environment on the 3D version. For Windows PCs, the game can be played with game controllers or with the standard mouse and keyboard.

```

using UnityEngine;

using UnityEngine;

namespace UnityStandardAssets.Characters.ThirdPerson
{
    [RequireComponent(typeof (UnityEngine.AI.NavMeshAgent))]
    [RequireComponent(typeof (ThirdPersonCharacter))]
    public class AICharacterControl : MonoBehaviour
    {
        public UnityEngine.AI.NavMeshAgent agent { get; private set; } // the navmesh agent required for the pa
        public ThirdPersonCharacter character { get; private set; } // the character we are controlling
        public Transform target; // target to aim for

        private void Start()
        {
            // get the components on the object we need ( should not be null due to require component so no need to check )
            agent = GetComponentInChildren<UnityEngine.AI.NavMeshAgent>();
            character = GetComponent<ThirdPersonCharacter>();

            agent.updateRotation = false;
            agent.updatePosition = true;
        }

        private void Update()
        {
            if (target != null)
                agent.SetDestination(target.position);

            if (agent.remainingDistance > agent.stoppingDistance)
                character.Move(agent.desiredVelocity, false, false);
            else
                character.Move(Vector3.zero, false, false);
        }
    }
}

```

Figure 22: C# code for game object

## 5.4 Summary

Chapter Five mainly looks at how a player can interact with the game prototype, the game play and flow. It briefly explained how Unity3D works and the implementation of the game. The next chapter discusses the game testing results by the playtesters during beta and alpha testing.

## CHAPTER SIX

### GAME TESTING RESULTS

#### 6.1 Introduction

This section describes the result of the written surveys that testers took after completing a test run of playing the Onlinicus game. The BYOD testing session and beta testing of the game took place at the Namibian Business Innovation Institute (NBII), Windhoek Showgrounds, and ICT Summit in Namibia.

#### 6.2 Demographics of the Playtesters

Testers were varied, comprising of both females and males from different age groups. The BYOD testing session testing had 9 participants: 2 were below 18 and the rest were above 18, and 7 were female and 2 were male. The beta testing had a total of 29 people, with 14 males and 15 females. After completing a test run of the game, testers were asked to take a survey.

Table 10: Number of playtesters

| Gender       | BYOD Playtesters | Beta Testing (In the Wild) |
|--------------|------------------|----------------------------|
| Female       | 7                | 15                         |
| Male         | 2                | 14                         |
| <b>Total</b> | <b>9</b>         | <b>29</b>                  |

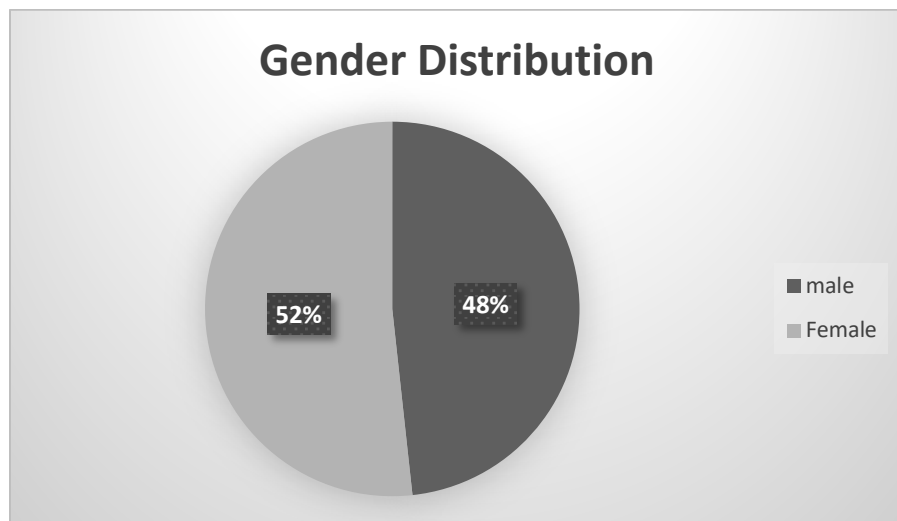


Figure 23: Playtester gender distribution

### 6.3 Purpose of the BYOD Testing Session

The survey was used to capture the testers' feedback which could not have been captured using the videos and their transcription. The survey consisted of 14 questions, of which, eight were open-ended and six were multiple choice questions. Participants were asked to assess the whole game concept.

### 6.4 Procedure of the BYOD Testing Session

The BYOD testing session testing was conducted in a classroom at the NBII) in Windhoek, Namibia. Testing stations comprised of three laptops, of which two of the laptops were used for testing and the third was used for note-taking and recording. No joysticks or other peripheral devices were used; the testers played using the laptop's keyboard and touchpad. The testers played the game while articulating their thoughts and their expressions, which were noted down as well. There was a total of nine participants who registered through Google Forms to participate in the testing session, but only 6 completed the survey. The researchers assisted the testers at various points in the game. The sessions were recorded with an iPhone 5s camera.

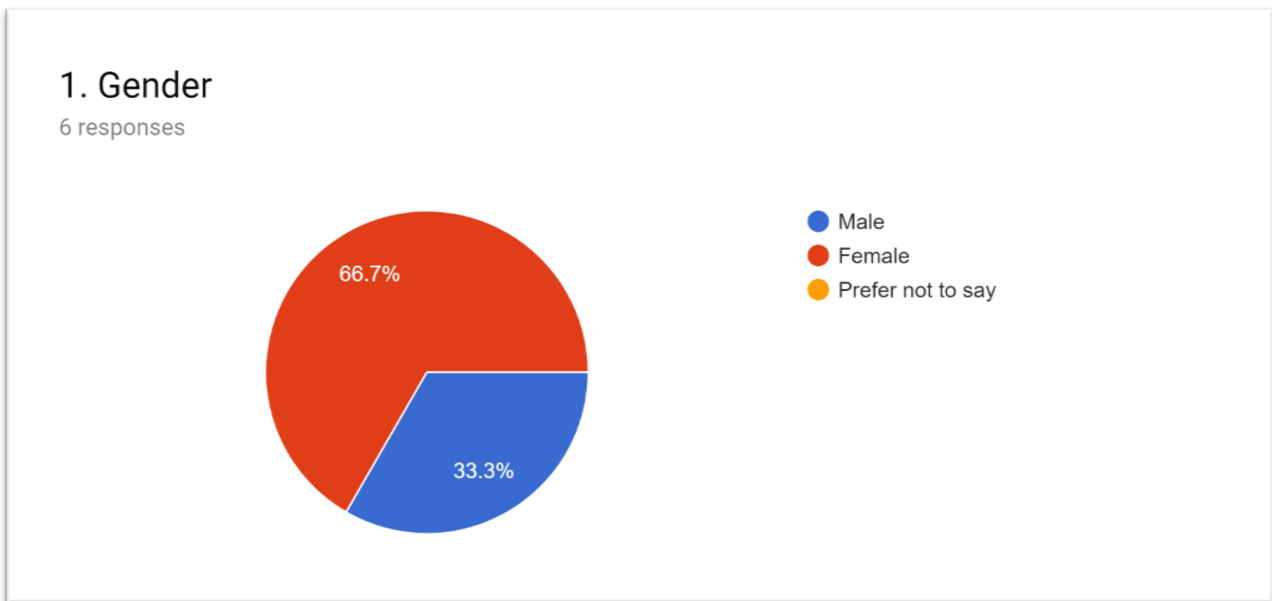


Figure 24: BYOD participant gender

The beta testing was conducted at the annual events, namely Windhoek Industrial and Agricultural Show, hosted at the Windhoek Showgrounds and at the 5th National ICT Summit of 2018 which was hosted at the Safari Conference Centre in Windhoek, Namibia. A total of 20 randomly recruited testers participated in the demonstration at those events. Passersby were recruited randomly to participate as testers. Their

ages varied between 7 and 29 years old. Those testers above the age of 18 signed consent forms, while the parents of those underage children signed assent forms.

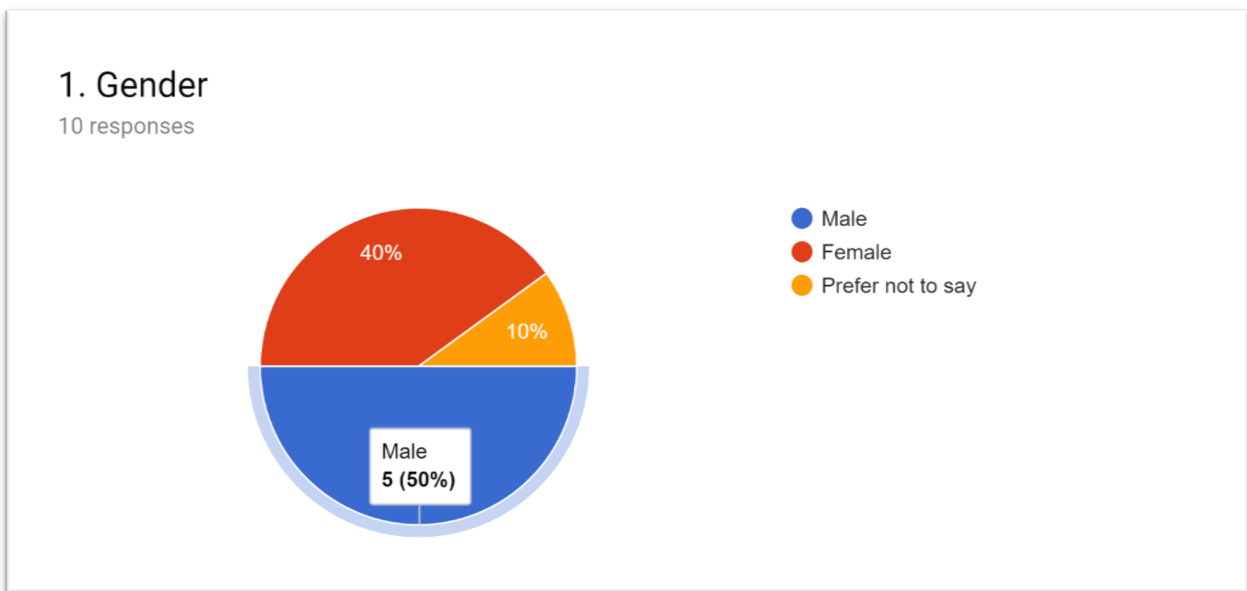


Figure 25: Beta Testing Participant Gender

Testers filled in the same survey after their game sessions. There was one limitation: not all the testers completed the survey. In the BYOD testing session, six testers (four females and two males) took the survey. All the testers were above 18 years of age. During the beta testing, 10 testers took the survey. One of them was between the ages of 8 to 13, three of them were above the age of 18, and six were between the ages of 14 to 17.

#### 6.5 BYOD Testing Session Phase

During the BYOD testing session, four testers (66.7%) described the game as well designed. Four testers (66.7%) also said the game was easy to read and play. Furthermore, two testers (33.3%) stated that help screens were available; 1 tester (16.7%) stated that the instructions were clear; none of the testers described the game to be poorly designed and organised, and none of the testers described the game as difficult to read and play.

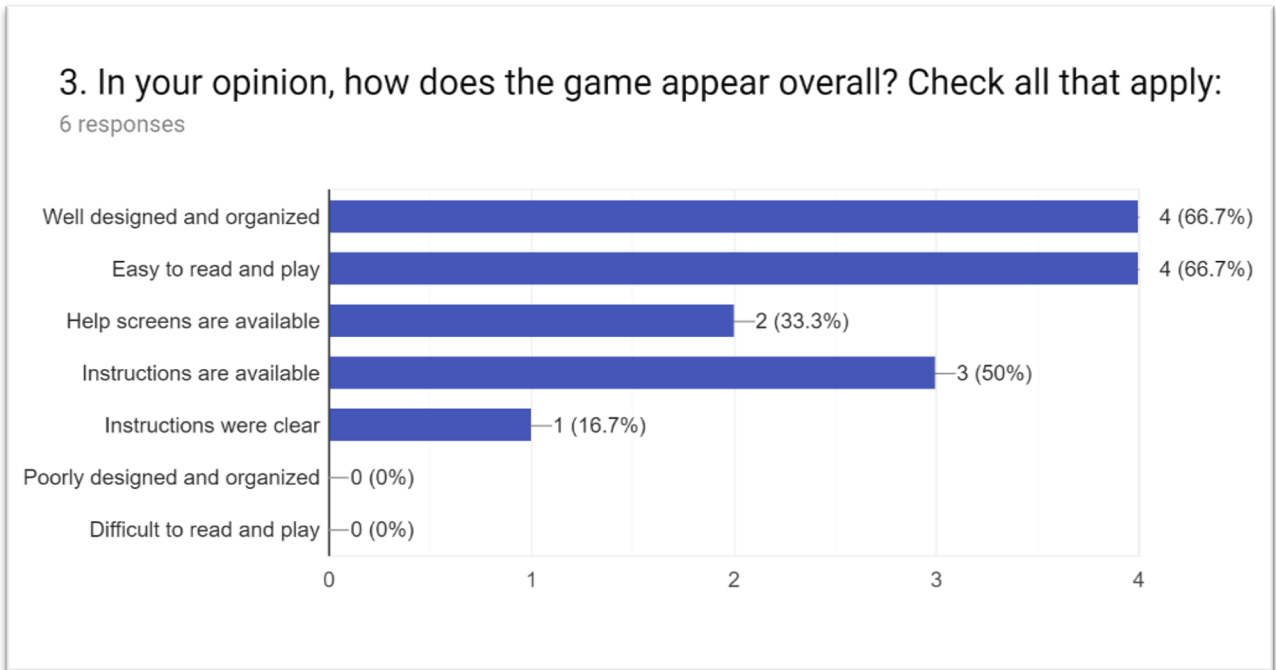


Figure 26: Game appearances

When asked for their overall assessment of the game, five testers (83.3%) described it as very good, while one tester (16.7%) described it as being adequate.

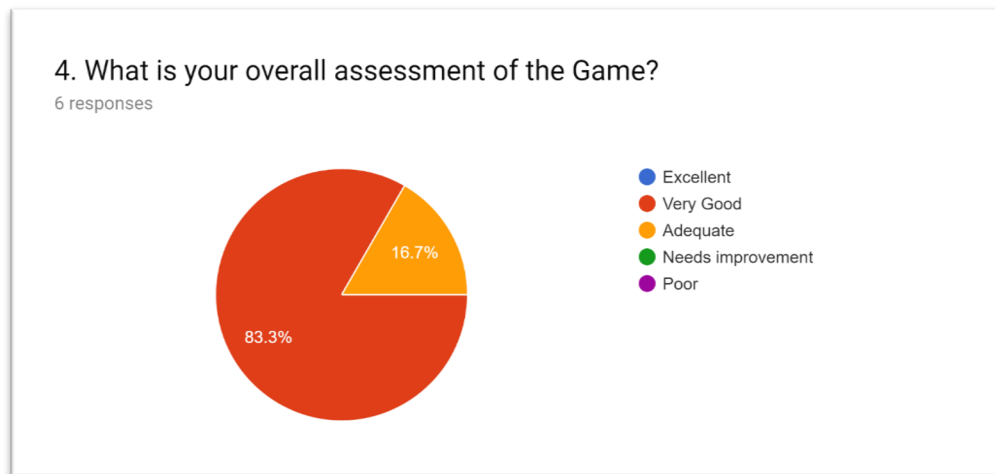


Figure 27: Overall assessment of the game

When asked whether the content met their expectations, four testers (66.7%) answered 'yes, most Definitely'. One tester (16.7%) answered 'mostly', while another tester (16.7%) was 'not sure'.

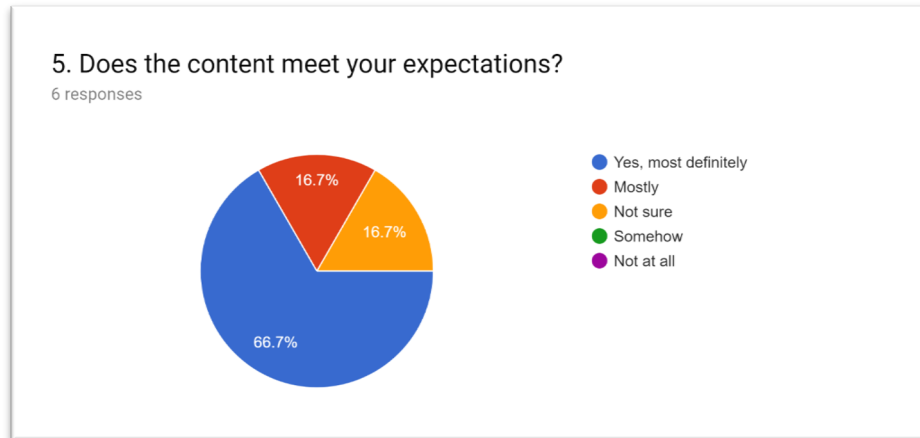


Figure 28: Content expectation

When asked whether the game managed to teach the users about online safety, five testers (83.3%) answered 'yes, most definitely', while only one tester answered 'mostly'.

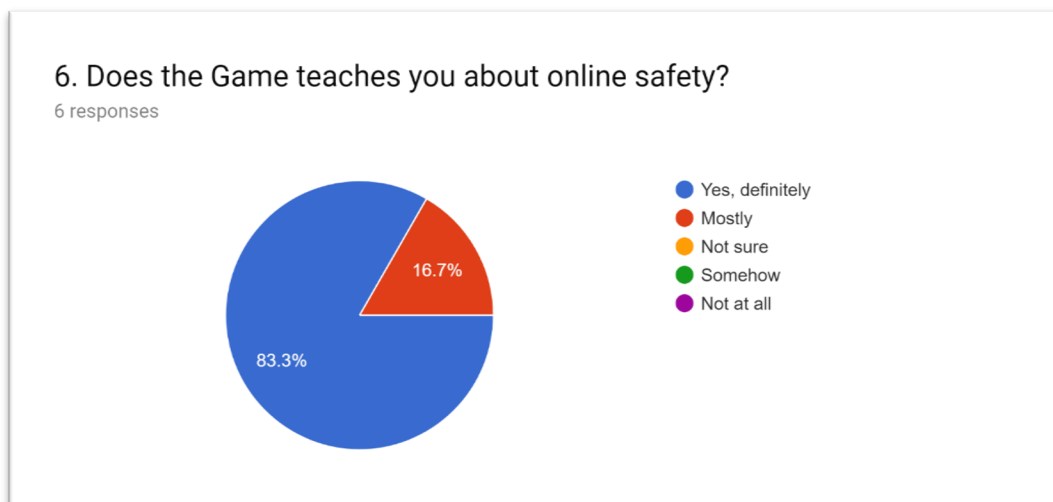


Figure 29: Game teaches online safety

## 6.6 Beta Testing Phase

When asked about the game's overall appearance, six testers described the game as being well designed and organised. Nine testers described it as easy to read and play. Only three testers indicated that help screens were available during the game. Seven testers stated that the instructions were available, while six described the instructions as being clear. No tester claimed that the game was poorly designed and difficult to read and play.



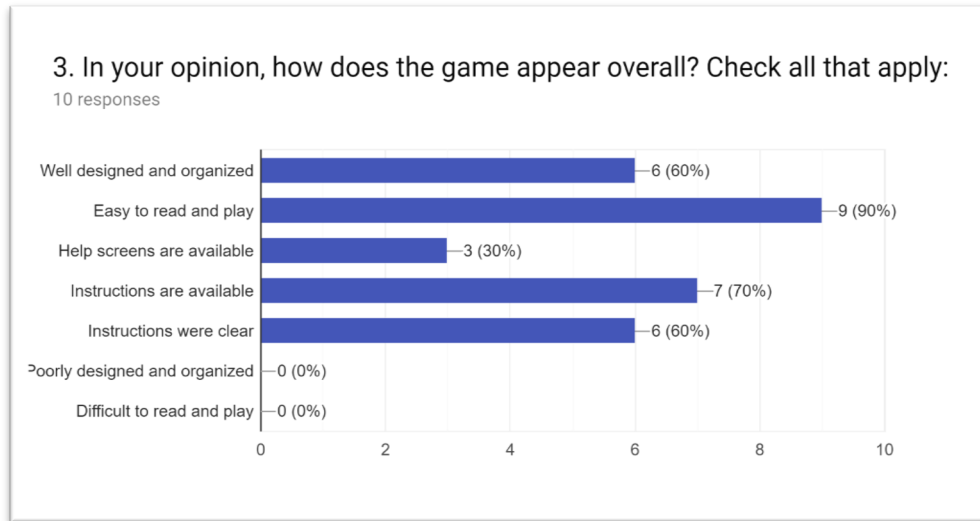


Figure 30: Game appearance during beta testing

For the overall assessment, seven testers (70%) described the game as 'very good'. One tester (10%) claimed the game needed improvement. Two (20%) described it as being 'excellent'.

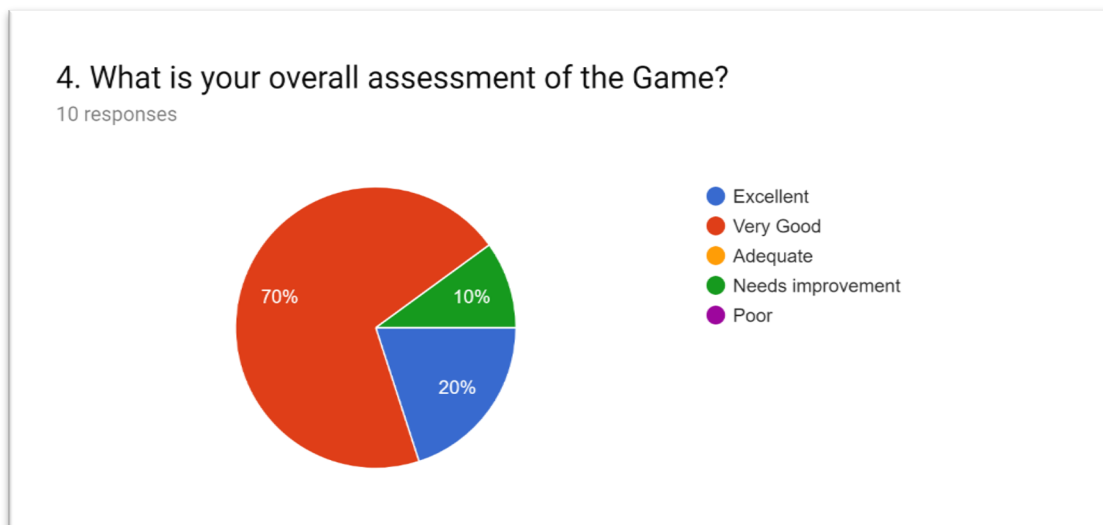


Figure 31: Game overall assessment during Beta

When asked whether the content met the tester's expectations, six (60%) answered 'yes, most definitely'; one (10%) said their expectations were mostly met, and another one (10%) answered 'not sure'. Two testers (20%) said their expectations were 'somehow' met.

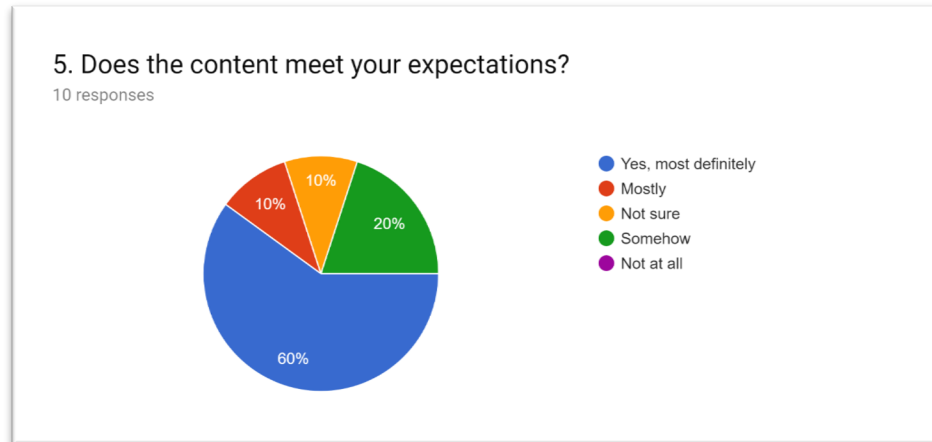


Figure 32: Game content during Beta testing

When asked whether the game teaches the players about online safety, eight testers (80%) answered 'yes' while two (20%) felt the game mostly taught about online safety.

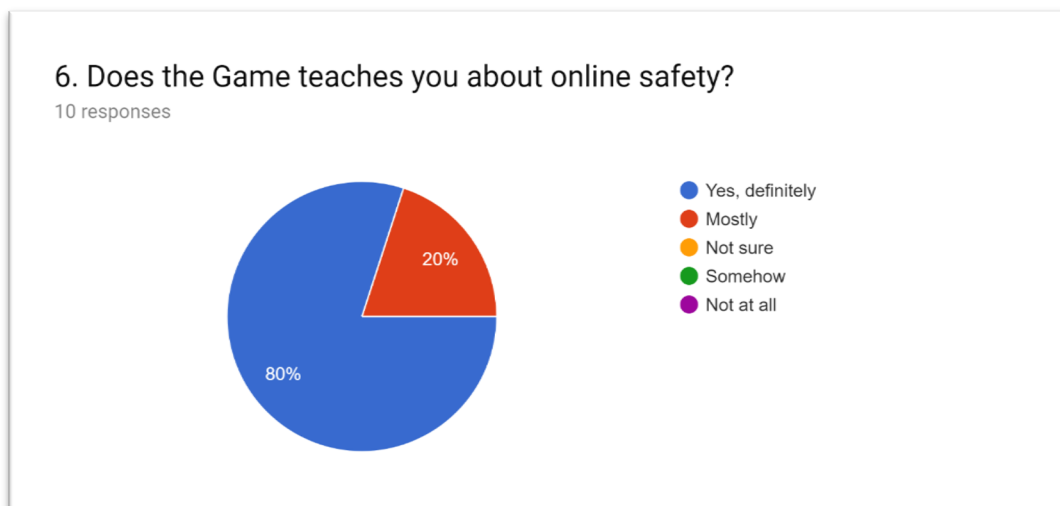


Figure 33: Game teaches online safety during Beta testing

### 6.7 Summary of the Game Testing

In this section, we present the findings from testing the final game prototype (Mobile based and Windows based Onlinicus – Share Your Story). The game was tested at the NBII, Windhoek Showgrounds, and ICT summit in Namibia. Testers were varied, comprising of both females and males from different age groups. The BYOD testing session had 9 participants: 2 were below 18 and the rest were above 18, 7 were female and 2 were male. The beta testing had a total of 29 people, with 14 males and 15 females. The think-aloud protocol, which is a method where participants articulate their thoughts out loud while performing the task, was used to carry out the playtesting (Nintendo, 2018). The researchers further used

thematic analysis (TA) to categorise the information gathered from the video transcription. Video transcriptions from both the BYOD Testing session and beta phase of the testing were used. The BYOD testing session testing was conducted in a classroom at the NBII in Windhoek, Namibia. Testing stations comprised of 3 laptops, of which 2 were used for testing and the third was used for note-taking and recording. No joysticks or other peripheral devices were used; the testers played using the laptop's keyboard and touchpad. The testers played the game while articulating their thoughts and their expressions, which were noted down as well. There was a total of 9 participants who registered through Google Forms to participate in the testing session. The researchers assisted the testers at various points in the game. The sessions were recorded with an iPhone 5s camera.

The beta testing was conducted at the annual events, namely Windhoek Industrial and Agricultural Show, hosted at the Windhoek Showgrounds and at the 5th National ICT Summit of 2018 which was hosted at the Safari Conference Centre in Windhoek, Namibia. A total of 20 randomly recruited testers participated in the demonstration at those events. Passersby were recruited randomly to participate as testers. Their ages varied between 7 and 29 years old. Those testers above the age of 18 signed consent forms, while the parents of those underage children signed assent forms. That was considered a "real environment" and these events provided the researchers with an opportunity to carry out what is considered as formal user acceptance testing (Jamil, Arif, Abubakar, & Ahmad, 2016). The testers were also considered "real end users" (Naeem, Syed, Xiang, Shokrane, & Munsh, 2015). However, that "real environment" also presented "real challenges", for instance, poor audio and, to a lesser extent, poor video quality. There was also loss of data due to limitations in the know-how and technical expertise in using the equipment. One tester's (female, early teens) entire session was lost due to the researcher mistakenly not pressing the record button.

## **6.8 Summary**

The beta testing proved to be effective as it provided substantial data and deeper insights about the game design were discovered. The next chapter will discuss the think-aloud protocol and thematic analysis, conclude the thesis and propose future work.

## CHAPTER SEVEN

### DISCUSSION AND CONCLUSION

#### 6.8 Introduction

This chapter will discuss the results using thematic analysis, conclude the study and propose future work.

#### 6.9 Overview

During the Game Design Challenge workshops discussed in Chapter Four, the prototype was completed, and BYOD testing sessions were conducted. The following is a sample of the testers' comments:

1. *Do not make it too easy to go find Gooble; make the game very challenging; add more characters.*
2. *Add components of human trafficking.*
3. *Quite good and informative.*
4. *Where do you get more information?*
5. *What is the first step? What should I do to report? What is access? Explain more about social media? Make it available to schools?*
6. *Why won't Facebook allow blocking of content before it's posted?*
7. *A law to arrest/sue these criminals.*
8. *Depression among youth needs to be addressed.*
9. *Instructions need to be clear (how to navigate when you click on some of the buttons).*

Before the beta testing, the following sample suggestions were implemented:

1. *Rename to CyberBullet-Share Your Story to Onlinicus - Share Your Story (There is a company named CyberBullet already <http://arabmotorworld.com/cyber-bullet/>).*
2. *Add two characters (a girl and a boy).*
3. *The play button was small.*
4. *Take out the logo of the university (NUST) and put the globe because the Internet is everywhere.*
5. *'Find Mr. Gooble' font is not clear.*
6. *Before you experience social media, enter log in details for Facebook.*

It was decided to combine the data during thematic analysis due to the small sample sizes, as combining it allows a broader analysis and makes any discrepancies clear.

These findings were guided by the study's primary objectives to design a customised interactive game prototype with Namibian children to sensitise, create awareness and encourage children to report online abuse. The findings are illustrated based on the subsequent sections.

#### **6.10 Thematic Analysis (Themes and subthemes)**

The survey from the BYOD testing session results were analysed, compared and triangulated. The video transcripts were analysed for major overlapping themes, and the survey's open-ended questions were transcribed and coded for keywords. The keywords were then grouped into major themes which form the basis for the findings. Two researchers independently coded 20% of the data and obtained 80% agreement for the purpose of establishing interrater reliability using the Jaccard Similarity method (Seaman, 1999). One researcher then continued coding all the data. Fields notes were integrated to augment the discussions that the researchers had with the playtesters.

Five themes were identified, namely: Player exhibited different reactions while playing the game; players used different strategies; players learned about online safety; players suggested design improvements on the game, and players interacted with the game. The theme "Player reactions while playing the game" described the testers' emotional response while playing the game. The testers' body language, facial expressions and exclamations were used as indicators for the emotional reactions incurred (Nacke et al., 2011).

Under the "Players used different strategies" theme, the testers looked at the ease or difficulty with which the testers played the game. This section also attempted to group the players into their respective BrainHex categories. BrainHex is a top-down approach (similar to psychometric evaluations), taking the inspiration for its archetypes from neurobiological research, previous typology approaches, discussions of patterns of play, and the literature on game emotions (Nacke et al., 2011). The theme also took into consideration the level of understanding that the testers displayed with respect to the gaming environment and how they chose to interact with it.

Under the theme "Players learned about online safety", the testers' positive feedback was noted. This included verbal and nonverbal displays of approval, satisfaction and enjoyment. It was in this section that the testers revealed their favorite aspects of the game and what they learned about online safety.

For the theme "Players suggested design improvements on the game", the testers revealed the shortcomings that they felt the game has. It was in this section where the game's problematic

sections were identified, i.e. areas where several testers struggled or frequently asked for help from the developers. Testers also voiced their opinions as to how they felt the game could be improved. The suggestions included improvements to game play, design and the controls. Lastly, the theme players interacted with the game. Subthemes were also identified.

#### ***6.10.1 Player exhibited different reactions while playing the game***

**Excitement:** Testers showed excitement when choosing the name for the game's main character. This is one of the earliest displays of excitement in the game. Testers also showed excitement when the character first responds to the tester's instruction/controls. Testers also showed excitement when they first witnessed an interaction amongst the characters in the game, particularly when the main character first interacts with the father character in the game. Most of the testers were smiling and laughing while playing the game. Most testers displayed feelings of victory and elation when completing stages in the game, for example when saving the parent's account from being hacked. One tester was impressed when the statement 'Internet security 2018' popped up on screen after an interaction. Testers enjoyed navigating through the game as several showed excitement while moving the character in the virtual environment. One tester labeled the game's 360° view to be aesthetically pleasing. One tester was very animated while playing the game as she gasped and held her hands up in surprise. Another tester performed a celebratory dance and another stated that they were happy with the game's content.

**Confusion/Frustration:** There was some confusion that arose pertaining to the direction in which the tester must direct the character in the game. One tester had to ask the developer which direction they were supposed to go to. One tester jokingly mentioned how they did not like the game during a particular moment when they lost. Several testers reacted negatively to reading the on-screen instructions within the game. There were a few displays of slight frustration as one tester ended up pressing the keys aggressively on the keyboard. Testers seemed distressed and confused when having to make decisions within the game, especially when choosing 'accept' or 'decline' options in the game. Testers also had difficulty expressing or pronouncing the word 'Onlinicus'. The developer had to explain extensively to a few testers on how to play the game, or the developer had to explain the on-screen instructions in more detail to the testers. One tester was annoyed at being disturbed while playing the game.

**Attention-grabbing:** The game appears to be attention grabbing by nature as it attracted the attention of bystanders and people walking past. One young boy (about 7 years of age) watched with keen interest while a different tester played the game. One tester described the game as "very nice" and seemed highly impressed with the overall quality of the game. While most of the testers showed excitement when

playing the game, one tester displayed very little emotion. Many testers showed confusion at the beginning of playing and required assistance from the developers.

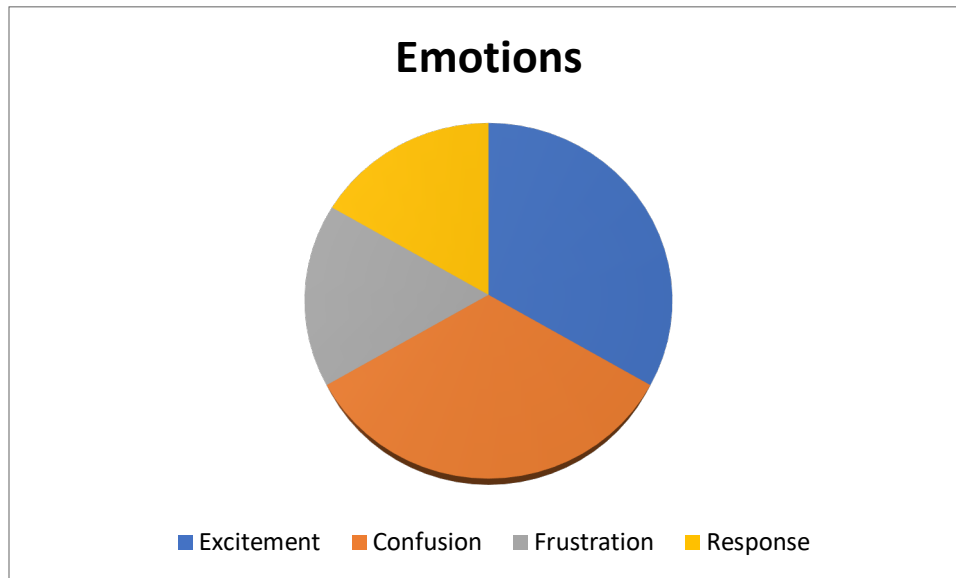


Figure 34: Players exhibit different reactions

#### **6.10.2 Players used different game strategies**

**Attention/Engagement:** One tester seemed slightly disengaged, as she appeared distracted while reading the instructions. Another tester read the instructions loudly and encouraged his peers to read the instructions as well. One tester pointed to the screen in shock and awe. Another was not keen on reading the instructions as she browsed through and just selected random options.

**Fluidity:** One tester played the game with absolutely no interruptions. One phenomenon that was noticed was that the developers had to explain the game's instruction extensively at the beginning stages of the game. A few testers put extra time and effort into reading and understanding the on-screen instructions. The testers also showed excitement at finishing the game.

**BrainHex Categories:** Three testers were identified as Seekers. They were the testers who were more interested in exploring the virtual environment. They displayed the most excitement when encountering new challenges in the game. None of the testers could be grouped as Survivors as no one displayed any emotions of fear or worry. Perhaps due to the nature of the game, this element must be explored more as to appeal to more Survivor type of users. Two testers were identified as the 'Dare Devil' type. These

were the testers who would frequently try to go beyond the bounds of the game and were the ones to suggest that more challenges (and more villains) be added to the game. Two testers fit the 'Mastermind' category as they seemed to enjoy the puzzle solving aspect of the game. They did not ask for help from the developers but rather chose to figure out the solutions by themselves. They seemed to want to play more after completing the game. The rest of the testers (9) could be grouped under the 'Socialiser' group as they seemed more interested in the interactions between the on-screen characters. They displayed more emotion at these points in the game and seemed more eager to follow conquests that lead to social interactions between characters. Another two males were identified as 'Achievers'. The rest of the testers could not be grouped as not enough information could be gathered to complete an assessment. This is either due to lack of video footage of the actual gameplay or because the audio was inaudible.

### **6.10.3 Players learned about online safety concepts**

One tester stated, *"I learnt the negative effects of social media."* This was after the social media section in the game which shows that the game managed to communicate the lessons to the user. Another tester remarked at how the game refreshed her memory of the aspects of cyber security and online safety. It was noted that the more experienced testers, i.e. those who have played similar games before and are familiar with the genre, gave good reviews with little or no negative feedback. Meanwhile, the less experienced testers were at times frustrated at the game play and having too much to read. Two testers described the game as being "really fun", while another described it as "quite informative". When queried about the nature of the game, one tester said that the game is about cybersecurity. This was shortly after they began playing the game. Testers were asked whether they felt the game achieved one of its primary objectives, which is to teach users about online safety. One tester learnt that they can easily get lost and stray into dangerous/unwanted territory while browsing the Web. The same tester also learnt that stalkers can use games as bait to get young, naïve children to share their information. Several testers announced that they learnt not to share personal information on social media and the Internet in general and how much risk comes with sharing personal information online. One tester reported having learnt to report online bullies, to only stay online a maximum of two to three hours at a time, and to make use of strong passwords. Another tester learnt how they would be able to protect themselves against bullies. One tester felt they had not learnt anything as an adult as they already had knowledge of online safety precautions, which shows the game is better suited for children or adults with no cybersecurity experience.

All testers were able to easily deduce the purpose of the game. They all had responses which included cyber safety or security. One tester said it proved to be an easy but concise platform to teach players



(target audience, young children) about online safety. Several testers also singled out the game's take on safety on social media sites/apps, which shows the game covered a broad spectrum of the Internet user experience.

Testers described it as being specifically able to teach young children not to give out their personal information to strangers online. The game also touched on issues such as cyberbullying, and testers were able to attest the game's ability to empower inexperienced Internet users against such a danger. Testers also described the game as being able to raise awareness and educate people about cybercrime. The consensus was that it ultimately teaches the player how to use the Internet safely.

#### ***6.10.4 Players suggested design improvements on the game***

**Navigations and control:** Several testers had problems finding the 'spiders' in the game. At times, the testers had difficulty determining the direction in which the character must move. They also found difficulty with following the guidance light on the screen. Several testers were also confused as to where they would find the kitchen. It seemed a trend that some testers had problems navigating the game's 3D environment. On several occasions, the developers had to remind testers to walk straight or make the character run. One tester suggested the game should have directions showing the player where to direct the character.

**Visuals (Colours and graphics):** One experienced tester suggested improving the graphics. He mentioned how the character's head seemed too large or the camera zoom seemed too near so the user's peripheral vision was impeded. At least half of the testers felt that the visuals were of a satisfactory standard. One tester complained about the dimness of the game and suggested more light be added. Another tester suggested the addition of directional arrows as a visual aid.

Testers were also asked what improvements they thought could be made regarding the colours within the game. Two testers felt that the colour scheme and aesthetic of the game did not need changing. Another tester suggested a more visible and prominent mission indicator. One tester felt the character's skin colour could be rendered better as it lacked consistency at different stages of the game. Testers also suggested an emphasis be placed on colour coding and to make the aesthetic bright to capture young children's attention. Only one tester would have preferred the colour to be of darker hues. Another suggested the use of less colour and another complained about the images being too large. At least half the testers felt satisfied with the visuals.

**Characters:** The size of Inaxes's (main playable character) head was described as being too big and the camera too close behind him so the tester cannot necessarily see the environment in its entirety. Testers also requested that more characters to be added, particularly more antagonists. It was suggested that the main character's back story be enriched and made more intricate. Testers also revealed that they wanted to name the characters themselves as they would wish to use names from their vernacular languages. They also mentioned drawing original characters and adding them to the game. One tester suggested the game add a feature that enables the players to choose their avatars, stating particular interest in being able to choose a female character. Testers wished to have more options regarding choosing a character, as they would wish to have more accurate representations from their avatars. A couple of testers desired the characters to be more realistic and active. They also complained that the character's movements were slow and moved around too much. One tester suggested that the developers have a look at other games designed in Unity to gather inspiration to help create better characters. A minority of the testers described the characters as perfect in their current design.

**Instructions:** Some testers had difficulty with reading on screen instructions. Some testers have difficulties understanding on- screen instructions. Instructions should be made clear as they can be confusing and cumbersome to read. Some of them missed instructions and went too far in the 3D environment without navigating to other pages. Testers also wished for more instructions on how to navigate.

### **Design and game flow**

It was observed that testers required numerous instructions from the developer when starting the game. This was the common case, except in a few cases where testers discovered the game by themselves. Some testers complained about a lack of fluidity of gameplay. They became frustrated at pauses required for reading and understanding the on-screen instructions. The testers wished the game to have smoother transitions between screens. One tester suggested a mini map would be useful to navigate the game environment. Another tester complained that the game was not challenging enough. One tester suggested that the corridors be redesigned to be more appealing. In the dialogue with the parents, testers suggested the ability to scroll down the dialogue using the arrow buttons (keyboard) instead of clicking with the mouse cursor. Testers suggested adding more help screens or possibilities to see the instructions again. Less than half the testers felt the game's design and flow was satisfactory.

### **Game play**

An experienced tester suggested the preferential use the keyboard instead of a mouse as experienced gamers do not like using the mouse/touchpad. He also suggested adding more challenges: *“Don’t make it too easy to go to Gooble (the robot) for the game to be more challenging and add more con artists, hackers [and] viruses like trojan horses.”* Testers also requested the addition or option of making the character run instead of just walking. Testers also suggested more real-world examples and scenarios be used. One example suggested was the scenario of losing one’s information to hackers. The testers also stated how the game’s instructions should be more clear and easier to follow. Another suggestion was the addition of audio soundtrack, particularly when the characters are narrating or during a dialogue in the game.

One user brought up the issue of children dealing with depression and how organisations like ChildLine can be contacted to help. The game already has a link that takes the player to ChildLine, UNICEF and Lifeline websites with contact details. They also suggested that the game include aspects of human trafficking and educating parents on how to monitor children’s online activity. They emphasised on the importance of parent’s involvement in monitoring a child’s Internet activity and how dangers such as fraudsters using the child’s social media photos to create fake passports can be avoided. Another tester stated something similar and said that scenarios involving human trafficking should be incorporated within the game. Another tester suggested including information on how to contact different authorities to report online abuse. It was also suggested that Facebook should automatically block any inappropriate images. Regarding the gameplay, another user mentioned how girls generally prefer games with more intricate storylines while boys prefer high paced action and adventure.

### **Graphics suggestions**

Some testers initially thought that the mom who is busy in the kitchen looks like someone who is taking a bath. This could be remedied by rendering the graphics differently. Another tester also described the laptop as looking more like a TV. Several testers suggested the text within the game to be of a larger font size, while another suggested the use of less dense words and make the option of skipping texts possible. Less than half the testers felt that the content, formatting and text of the game was satisfactory. One tester, however, preferred the text to be of a smaller font size. Some testers did not want to interact with spiders in order to navigate.

#### 6.10.5 Players interacted with the game

Players liked the game elements: One tester wished the gameplay to be smoother but claimed to enjoy the interactive nature of the game. Another tester described the game as being well designed, with good graphics and good content. One tester exclaimed, *“That is cool, I won the antivirus, Internet security 2018”*, after completing a challenge in the game. Most of the testers displayed elation when making progress in the game. The majority found it difficult at the beginning stages, but all of them gave positive feedback regarding the content of the game.

#### 6.11 Evaluation of Onlinicus -Share Your Story with Other Internet Safety Games

To design an effective game, we analysed six previously designed online games to educate children about online safety, their perspective gaming element,s and what aspects of online safety they cover is also included.

Table 11: Evaluation of the game against other online safety games

| Online Safety Games            | Online Concepts  | Game Design | Interactive | Text | Voice/Music | Shared links to report online abuse |
|--------------------------------|--|-------------|-------------|------|-------------|-------------------------------------|
| How Cybersmart Are You?        | The game educates children about the dangers of online advertisements, unsettling videos, emails, and passwords. | Quiz based  | No          | Yes  | Yes         | No                                  |
| The Case of the Cyber Criminal | Using strong passwords, knowing the identity of the person one is talking  | Quiz based  | Yes         | Yes  | Yes         | No                                  |

|                             |  |            |     |     |     |     |
|-----------------------------|--|------------|-----|-----|-----|-----|
|                             | to online, and keeping antivirus software up to date.  |            |     |     |     |     |
| Webonauts                   | Decisions about password security, social media sharing, bullying, and more.   | 3D         | Yes | Yes | Yes | No  |
| Internet Safety Hangman     | Educates children about password security, social media sharing, and bullying.   | Quiz based | No  | Yes | No  | No  |
| Cyber Security Crossword    | Helps children become familiar with online terms.  | Crossword  | No  | Yes | No  | No  |
| CyberAware                  | Educates and make children aware about cybersecurity required to protect their devices from cyber-attacks, malware and spam. | 2D         | Yes | Yes | Yes | No  |
| Onllinicus-Share Your Story | Online concepts  | Yes        | Yes | Yes | Yes | Yes |

Although “How Cybersmart Are You?” achieves its aim of educating young children about certain online safety aspects, it is very short, with 11 questions in total, and does not educate children about all other

cyberbullying aspects, unlike “Onlinicus – Share Your Story” which is based on real experiences and which Namibian children will be able to relate to.

Digizen, on the other hand, is somewhat similar to “Onlinicus – Share Your Story” as it is also an interactive game, but it is not based on real- life experiences and only deals with school-based scenarios.

Although Webonauts, The Case of the Cyber Criminal, Internet Safety Hangman, and Cyber Security Crossword are all aimed to make the Internet much safer for children, they also only deal with certain aspects such as online theft, teaching Internet-based words and do not cover all other aspects that many children are vulnerable to and they are not based on real- life experiences. Furthermore, these games do not offer a holistic education on cyberbullying and online safety. The games may also not necessarily have been designed based on Namibian children’s perspective which may differ due to cultural differences. CyberAware encourages a self-directed learning process on online safety (Giannakas, Kambourakis, & Gritzalis, 2015).

In conclusion, the comparisons of ‘Onlinicus-Share Your Story’ with other online safety games shows that there are common elements in these games, namely quizzes, engagement, good graphics, interactive, fun, but they are also designed for a specific target and they are not adaptable to the Namibian context. Upon analysis of these games, there is an impact in designing an online safety game that incorporates Namibian culture, as this can serve as a motivation in behavioural and attitude changes (Alsawaier, 2018; Höglund, n.d.) .

#### **6.12 RQ1: How can we design a customised interactive game prototype with Namibian children to sensitise, create awareness and encourage children to report online abuse?**

A co-design was selected whereby we involved children, teachers, parents and students as stakeholders in the design process of ‘Onlinicus-Share Your Story’ as indicated in Chapters Three and Four. The game challenge workshops followed an iterative process in Chapter Four. During the workshops, we found a way to allow the children to team up, overcome their shyness and let them share experiences with the whole team. Our initial focus was less on creating the actual game and more on gathering data on which to base a game. One challenge was the different ages of the members in the team. At first the younger ones were shy to say something "wrong" among computer science students, but we figured out a compromise, thus developing a sense of partnership (McNally et al., 2018). This was achieved in cooperative learning by enabling five elements: positive interdependence, promotive interaction, individual accountability, small-group skills, and group processing (Dodero et al., 2014).

Stories shared about experiences with bad and best practices of combating online abuse against children were insightful to the design process; furthermore, the objectives were met to design and develop games out of the storylines shared by the participants. A limitation that faced the designers was the lack of access to the national online safety curriculum. This was the reason why it was opted to make use of the local (Namibian) children's stories. The children playing would receive enough learning from the stories and the examples in the scenarios in the game.

The first Game Design Challenge workshop approach was similar to hackathons, gameathons and game jams where participants designed games with any design techniques that they knew. The second Game Design Challenge workshop gave an introductory design class as a guide to help participants with their game prototype which enables the participants to produce better designs for the final prototype. The second Game Design Challenge workshop yielded better results because we introduced design concepts as follows personas (Itenge-Wheeler et al., 2018); storyboards which provided context and main scenes (Newman & Landay, 2000); wireframes were designed which involves paper prototyping (screens); we tested the screens for usability using CW, and then developed the interfaces using Unity3D environment.

One user was quoted saying, *"I would say the game-a-thon was definitely a success because all the teams had concrete ideas and designed the game to tackle the given problems and presented them quite well. The only setback was that there was not enough time to fully develop the game designs, but the main ideas and scenes were created and could definitely be seen."*

Another participant expressed: *"It was especially a great learning experience for them as most of them were new to design thinking and they have never used the software before nor the programming languages that were used for game development. Most of them were able to learn very fast from their team members and helped program the game."*

Some of the testers explained that they learned where, how and when to report online abuse. They also learnt the service providers' contact details thanks to the game's storyline and links to the various reporting portals and providers.

### **6.13 RQ2: How do we evaluate the effectiveness and usability of the interactive game prototype?**

The objectives of the game were met because testers reported having learnt or having been reminded about elements of cybersecurity and online safety. This shows that the challenges and quizzes in the game designed to sensitise and teach young children about being cyber secure have been able to communicate that message through. Although, it was also noted that several testers suggested incorporating more challenges, quizzes and puzzles in the game, as well as adding more aspects of personal security and wellbeing, including human trafficking and dangers of depression.

Because the beta phase of the testing was conducted in what was considered a “real environment”, the testers were given minimum briefing before playing the game. This was done to ensure a high degree of freedom to allow the players to explore. This led to deeper insights. One particular insight occurred when the players reached the segment of the game where they interact with the web crawlers. A web crawler, also known as spider or spiderbot allows Google users to search the net. However, most of the testers mistook these spiderbots as actual spiders and considered them as antagonists in the game. This was problematic as the spiderbots would have allowed them to browse the Internet (within the game). It was noted that after the testers received the clarification about the spiderbots from Google, the robot that guides the player in Onlinicus, most of the testers displayed expressions of surprise. This feature was designed purposefully to show that, on the Internet, any information has a risk of being purposefully false and misleading. A seemingly innocent feature or attractive graphics may seem enticing (click bait) but can mean harm. Conversely, the game is also able to show that what may come off as harmful or dangerous may be beneficial and informative to the person browsing. It may seem that the game Onlinicus3D environment is of a confusing and polarising nature.

The methods used to evaluate the reception of the game proved effective. The combination of controlled environment testing, real world environment testing, video, audio and their transcriptions, thematic analysis and quantitative report of the testing sessions provided a comprehensive and inclusive perception into the effectiveness of using an interactive game prototype to raise awareness and educate users on issues pertaining to cybersecurity as well as safe online practices. The insights gathered from the BYOD testing session phase were implemented and then tested during the beta phase. From the beta phase, insights on the characters, playability or fluidity of the game, the graphics and aesthetic of the game were gathered. This is consistent with the expected level of development at this stage, i.e. a prototype is more of a bug ridden, unrefined attempt at the final product. It is recommended that results



of the beta testing and the insights gathered, upon further coding and development, deem the game is feasible.

Despite limitations such as poor audio and video quality, low sample sizes (survey), the method still proved effective as the objectives were met. The developers had to explain the workings of the game thoroughly to the testers. This was due to the fact that no manual exists, and most users required deeper explanation than what was offered by the on- screen, in- game instructions. After this initial explanation, most of the users (especially the experienced users) had little problems figuring out the challenges of the game and they completed it with relative ease.

There were several BrainHex categories that some of the testers managed to fit in. It was found that the testing group was composed of several different categories, but some testers could not be grouped as there was not enough information available to categories them. This was due to the lack of footage of the testers' actual gameplay or inaudible audio. The testing environments, both at the Windhoek Showgrounds and the ICT summit were very noisy and the audio on the videos was inaudible at times. This proved a challenge during the transcription process as non-verbatim transcription style had to be used. Because the think-aloud protocol was used, a lot of data was lost due to the quality of the audio.

It was noted that the nine testers in the Socialiser group were all female. This coincided with findings from the first game workshop game storming session in Chapter Four that boys prefer games with more volatile action and girls prefer those with more intricate story lines, involving deeper interactions amongst the characters. It was also noted that, within the 2D version of the game, the girls displayed more emotions of elation and excitement and tended to read instructions out loud. On the other hand, it was noticed that the boys tended to fall under the "Seeker" and "Daredevil" category because they prefer action and adventure.

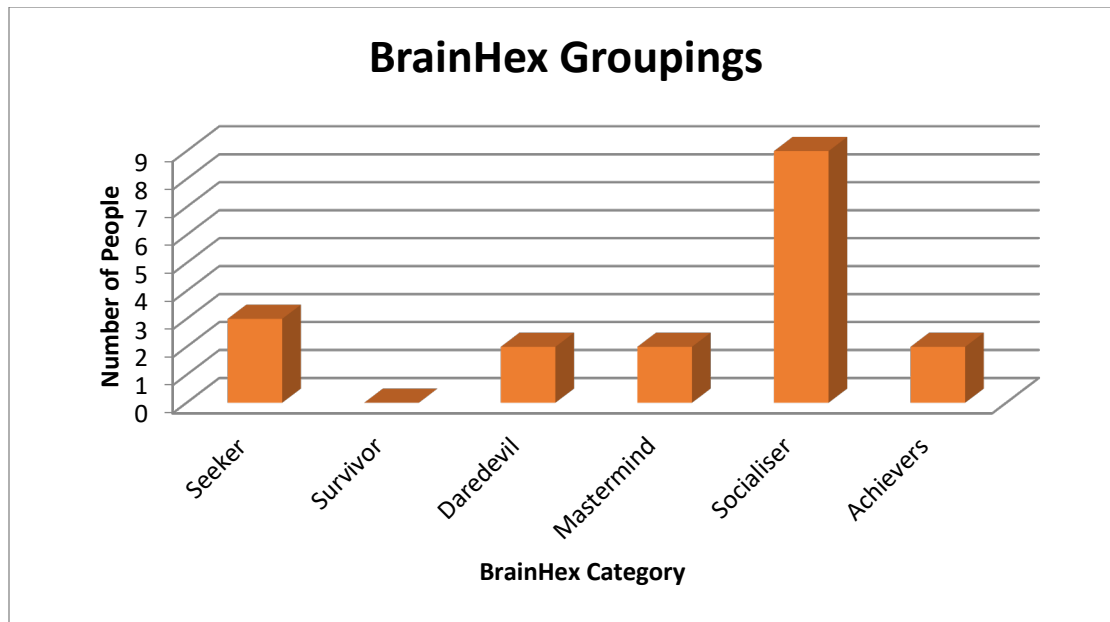


Figure 35: Players BrainHex categories

The design was received well because the only criticism received on the design was on the size of the main character's head and the zoom of the camera view. Testers enjoyed the graphics and several showed signs of being captivated. The game's aesthetics also seem to be attention grabbing as several onlookers were drawn to it while passing by the testing stations. Testers also reported back having learnt lessons, or at least reminded about online security, cyberbullying, etc.

#### 6.14 Conclusion

The thesis focuses on co-designing online safety games for Namibian children. This resulted in the birth of 'Onlinicus-Share Your Story'. Onlinicus is an interactive game designed to create awareness and teach young children and inexperienced users about the potential harm and negative effects of using the Internet. The game was endemically designed and developed with Namibians children ranging between the age 6-18.

Using game design challenge workshops to design the games, Onlinicus was developed using the Unity3D game engine and coded in C# programming language. The game was designed with many defining features such as characters having lives similar to the stereotypical Namibian teenager. Another feature that stood out was a science fiction environment where online platforms are anthropomorphised and interact with the players. The game features diverse content focused on improving the decision-making

processes as opposed to using multiple-choice questions. The game is described as fun and eye-catching while being educational and very informative.

The highlights of the game (which were identified during the various testing phases) include that the game is an effective medium for teaching young and inexperienced Internet users about the potential dangers that could be encountered on the Internet. Another highlight is that the game contains links to real websites of organisations such as Childline and IWF that aim to protect and help users against the dangers found online. Additionally, the game has intricate stories with scenarios that accurately simulate real-life scenarios that users might come across. Videos are used as a tool to better elaborate on some of the concepts that the game aims to teach. More highlights include how the game mimics real, Namibian Internet user experiences. The game also works on both PC and mobile platforms or consoles. It does not require any Internet connection. The game incorporates certain aspects that make it attention grabbing. The most prominent facets of the game are competitions to win awards while keeping the moral bar of the player high and the ability to engage the player. The study contribution is in the application of a game-based approach to sensitise and prevent children from becoming victims of online abuse and to report such incidents, and finally to add to Namibian games, co-designed with stakeholders.

#### **6.15 Future Work and Recommendations**

Although the study's main objectives were met and the game developed successfully manages to teach children about the dangers of surfing the Internet, the recommendations made through the testing need to be coded and usability testing needs to be carried out in the rural areas of Namibia. As one tester suggested, the game may include segments which educate the user about the dangers of depression and how organisations like Childline can be contacted to help. While the game includes links to websites such as Childline, other organisations can be approached with the intentions of collaborating on content creation.

A similar approach may be used to address the issue of human trafficking. Researchers may work together with organisations that deal with such issues. It was also suggested that parents be encouraged to monitor their children's online usage. While the game made a fair attempt at communicating this aspect, there is so much more that parents can do to get involved. The game needs an addition of more playable scenarios with more characters to represent more real-world scenarios that children may face.

The game should be able to inform children about the tactics that fraudsters use on social media, for example using photos to create fake passports. The game would benefit from being made into an online, multi-player game. This would encourage social interaction between players. This can also allow for children from different schools to play and compete against each other with the aim of the winner being identified as an 'Online Guru'. Players can be rewarded with cumulative points when achieving tasks and completing quizzes and puzzles. The winner and their respective school could then be rewarded and crowned. This would also compound the learning as users would be able to share experiences with each other.

The game should also be used to teach good offline practices such as high moral standards and good attitudes. Furthermore, it should teach users to practice the same levels of caution that they do in everyday life while online. For instance, not giving personal information to strangers. The game teaches users to be aware of their digital footprint. It should give the user the awareness to better minimise and manage their digital footprints. It teaches the user to navigate the World Wide Web safely without endangering themselves or their families.

One suggestion that was noted was making the game available in schools. This would be ideal as that would give the game's target audience access to it. It is also reported that there are no aspects of online safety in the Namibian curriculum. Involving the Ministry of Education, Arts and Culture in future development may be advantageous as the game can be incorporated and integrated into the curriculum and vice versa. The children are only taught basics of computer use. The game is an effective tool to aid with the teaching of young, schoolgoing children about safe surfing practices. The Ministry benefits by having access to the results of the research and testing conducted, which might be useful when revising the curriculum or designing a game of a similar nature.

The content of the game, sound and graphics, aesthetics, layout and design, would benefit from inputs from qualified experts in different fields, including education and psychologists to design more effective teaching aids. The storylines could be made more intricate by using experienced scriptwriters. The game requires minimum computing power to operate so it can be used on most home computers found in Namibia. The game can be made available to children through schools, providing take-home copies to install copies on their home computers. The mobile version is easy to install and will allow the children to play using their mobile devices. Future versions of the game should be available in more local languages.

It was identified that the players wished to customise the characters to be more representative of who they are. Aside from choosing names, the language will play a crucial factor in creating a more relatable gaming experience.

In summary, the final game prototype developed during the study needs to be further coded to incorporate the suggestions from beta testing. The issue of kids dealing with depression and how organisations like ChildLine be contacted to help was one of the most pertinent addition needed. The game must include scenarios where the issue of human trafficking is addressed. Educating parents on how to monitor children's online activity must also be incorporated. Another important addition is the integration with social media, such as Facebook, should automatically block any inappropriate images. Information on how to contact different authorities to report online abuse must be added to the content of the game, as well as more characters, particularly villains. Further studies need to be conducted with the aim of investigating the way to incorporate more issues such as depression and human trafficking.

The study was hampered by limited resources and hence workshops could not be conducted countrywide. Results are not generalisable to other areas as the study was based on an urban sample, namely Windhoek. Further testing in other areas of the country is required. Results will be more accurate as this will provide a wide sample size. The game's target audience is limited since games are generally only played by those with direct interest in them. Due to the educational nature of Onlinicus, the lessons and messages that it aims to convey may not reach those who are not appealed enough by an initial interest to play the game. Future studies need to develop a game which can accommodate various types of users and allow for multi-player gaming experience.

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## APPENDICES

### Appendix A: Request for Permission and Permission from Ministry



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**  
**Faculty of Computing and Informatics**

Office of the Dean

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Private Bag 13388  
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NAMIBIA

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20 June 2017

Mr Gerard Vries  
Director  
Ministry of Education, Arts and Culture  
Private Bag 13186  
Windhoek

Dear Mr Vries

#### **Research on Online Risks Among Teenagers in Namibia**

I am conducting research on online risks among teenagers in Namibia. This work builds on two previous research projects on the use of Facebook and cultural appropriation, and in particular, inappropriate behaviour on Facebook. The previous research projects were multinational and targeted university students.

However, during the course of previous research, Namibian participants frequently mentioned inappropriate behavior such as posting or circulating graphic materials on Facebook. Given that teenagers have smartphones, affordable airtime and are active on Social Media, they may become more at risk when engaging in such behaviors online. Earlier in 2017, we also became aware of an international network who are targeting school girls to become involved in risky online activities via Facebook, Instagram and WhatsApp. The network is operational in many countries, including Namibia.

We now wish to conduct more research on this phenomenon with the main aim of developing risk profiles to identify teenagers who are at risk and also develop an educational campaign to teach online safety to our Namibian youngsters.

We would like to approach a few schools to allow us to conduct focus groups and semi-structured questionnaires with learners to understand their online behaviours and safety awareness. Attached hereto is a standardised instrument that lists questions that will be asked in an online questionnaire and during interviews.

We kindly request permission from the Ministry to approach schools.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Anicia Peters'.

Dr Anicia Peters  
Executive Dean: Faculty of Computing and Informatics  
Tel: +264-61-2072722  
Email: [apeters@nust.na](mailto:apeters@nust.na)



**REPUBLIC OF NAMIBIA  
KHOMAS REGIONAL COUNCIL  
DIRECTORATE OF EDUCATION, ARTS AND CULTURE  
SECTION: RACE**

Enquiries: Ms. E. Haipinge  
Tel.: (+264) 61 293-4509/0812561584  
Fax: (+264) 61 25-0135  
E-mail: [emiliehaipinge@yahoo.com](mailto:emiliehaipinge@yahoo.com)

Private Bag 13236  
Windhoek



13 July 2017

Dr Anicia Peters  
Executive Dean: Faculty of Computing and Informatics  
Namibia University of Science and Technology  
Te: +264 61 207 2722  
Email: [apeters@nust.na](mailto:apeters@nust.na)

Dear Dr Peters

**REQUEST TO CONDUCT RESEARCH ON ONLINE RISKS AMONGST TEENAGERS  
IN NAMIBIA AT VARIOUS SCHOOLS IN THE KHOMAS REGION**

Your request on the above subject refers.

Permission is hereby granted to you to conduct a research on Online Risks Amongst Teenagers in Namibia at various schools in the Khomas Region with the following conditions.

- ❖ The Principal of the school to be visited must be contacted before the visit and agreement should be reached between you and the Principal.
- ❖ The school programme should not be interrupted.
- ❖ Learners who will take part in this research will do so voluntarily and confidentiality should be maintained.
- ❖ The Directorate of Education, Arts and Culture should be provided with a copy of your research findings

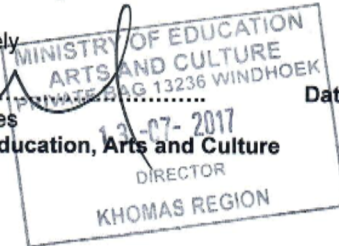
The Schools that will take part in the research are as follows:

1. Academia Secondary School
2. Delta Secondary School
3. Concordia College
4. Dawid Bezuidenhout Secondary School
5. Immanuel Shifidi Secondary School

6. Eldorado Secondary School
7. Ella Du Plessis Secondary School
8. Hage Geingob High School
9. C. J. Brandt High School
10. Mount View High School
11. Highline High School

Yours Sincerely

Gerard N. Vries  
Director of Education, Arts and Culture



Date: .....

13/07/2017

## Appendix B: Ethical Clearance



This informed consent form is for students/ youth and Life Skill teachers who we are inviting to participate in Child Online Protection Awareness Design Workshop for Master Research Project titled "Designing an Interactive Game for Preventing Child Online Abuse in Namibia".

Name of Principle Investigator : Josephina Muntuumo -215043367  
Name of Organization : Namibia University of Science and Technology  
Name of Project and Version : Master's Degree in Computer Science: Designing an Interactive Game for Preventing Child Online Abuse in Namibia.

This Informed Consent Form has two parts:

- Information Sheet (to share information about the study with you)
- Certificate of Consent (for signatures if you choose to participate)

You will be given a copy of the full Informed Consent Form

## **Part I: Information Sheet**

### **Introduction**

I am Josephina Muntuumo, a Computer Science Master's student at the Namibia University of Science and Technology. I am doing research on addressing child online victimisation through a game-based approach that is intended to prevent child online victimisation by sensitising, create awareness, encouraging children to open up and report child online abuse. Child online crimes are very common in Namibia. I am going to give you information and invite you to be part of this research. You do not have to decide today whether or not you will participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research. This consent form may contain words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them.

### **Purpose of the research**

Namibian children are now exposed to damaging material and consequently become vulnerable to predators online. Research shows that Namibia does not have an interactive platform that can sensitise, create awareness, encourage children to open-up and report cyberbullying, harassment and repeated requests for explicit sexual images and many more pertaining to child online abuses. This has resulted in children becoming vulnerable to predators online. We want to explore ways on how adopting a game-based approach to sensitise and prevent children from becoming victims of online abuse and hopefully empower children to protect themselves from being victimised. We believe that you can help us by telling us what you know both about what things bother you the most about the Internet and to solve and prevent online abuse in general. We would like to know what you are learning at school about online security and safety.

### **Type of research intervention**

This research will involve your participation in completing a questionnaire and being part of a group discussion and/or interview that will take about two hours.

### **Participant selection**

You are being invited to take part in this research because we feel that your experience as a student / school learner/educator/psychologist/social worker/responsible citizen can contribute to our understanding and knowledge of online behaviour and experiences of minors.

## **Voluntary participation**

Your participation in this research is entirely voluntary. It is your choice whether or not to participate.

## **Procedures**

A.

We are asking you to help us learn more about online behaviour and experiences in your community. We are inviting you to take part in this research project. If you accept, you will be asked to fill in the questionnaire, participate in the focus group discussions and/or participate in the interview.

B.

### **For focus group discussions**

You will take part in a discussion with 4-5 other persons with similar experiences. This discussion will be guided by the researcher/moderator. The group discussion will start with the researcher/moderator making sure that you are comfortable. Feel free to ask any questions about the research that you might have. Then we will ask you questions about the online behaviour and experiences and give you time to share your knowledge. The questions will be about online behaviour and experiences of minors in your school, how you deal with it and what you think could be improved to make online experiences safe to you and others. You will be required to document a storyline based on your shared online behaviour and experiences; the storyline/plot will be converted to a game that you will create using cartoon characters of your choice. We will not ask you to share personal beliefs, practices or stories and you do not have to share any knowledge that you are not comfortable sharing.

### **For interviews**

You will participate in an interview with the researcher. During the interview, the researcher will sit down with you at any place where you will feel comfortable. If you do not wish to answer any of the questions during the interview, you may say so and the interviewer will move on to the next question. No one else but the interviewer will be present unless you would like someone else to be there.

### **For questionnaire surveys**

Fill out a survey which will be provided by the researcher. If you do not wish to answer any of the questions included in the survey, you may skip them and move on to the next question. The information recorded is confidential, your name is not being included on the forms, only a number will identify you, and no one else except the researcher with access to the information documented during your survey.

### **Duration**

The group discussion and/or interviews will take about one and a half hour.

### **Risks**

There is a risk that you may share some personal or confidential information by chance, or that you may feel uncomfortable talking about some of the topics. However, we do not wish for this to happen. You do not have to answer any question or take part in the discussion/interview/survey if you feel the question(s) are too personal or if talking about them makes you uncomfortable.

### **Benefits**

The obvious benefit is to enhance your storyline/essay writing skills and showcase your creativity and design skills by co-designing a game with your peers. Your participation is likely to help us find out more about online behaviour and experiences of Namibian children.

### **Reimbursements**

You will not be provided any incentive to take part in the research.

### **Confidentiality**

The research being done in the community may draw attention and if you participate you may be asked questions by other people in focus groups. We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research project will be kept private. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is.

### **Sharing the results**

Nothing that you tell us today will be shared with anybody outside the research team, and nothing will be



attributed to you by name. Each participant will receive a summary of the results.

**Right to refuse or withdraw**

You do not have to take part in this research if you do not wish to do so and choosing to participate will not affect your job or job-related evaluations in any way. You may stop participating in the discussion/interview at any time that you wish without your job being affected. I will give you an opportunity at the end of the interview/discussion to review your remarks, and you can ask to modify or remove portions of those if you do not agree with my notes or if I did not understand you correctly.

**Who to Contact?**

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact me at the following email address: [Josephina Muntuumo, jossey13@gmail.com]

**The research proposal has been reviewed and approved by the NUST Higher Degrees Committee. The Faculty Research Ethics Committee has reviewed the ethical concerns around this study. If you wish to find out more about the F-REC, contact Josephina Muntuumo, Poly Heights 405, 061-2072741.**

You can ask me any more questions about any part of the research study, if you wish to. Do you have any questions?

**Part II: Certificate of Consent I have been invited to participate in research about gamified online safety.**

**(This section is mandatory)**

**I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study**

**Print Name of Participant**\_\_\_\_\_

**Signature of Participant** \_\_\_\_\_

**Date** \_\_\_\_\_

Day/month/year

*If illiterate*<sup>1</sup>

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness \_\_\_\_\_

Thumb print of participant



Signature of witness \_\_\_\_\_

Date \_\_\_\_\_

Day/month/year

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

1. Participate in group discussions.
2. Design an Online Safety Game and document your game with your group.
3. Present and share all documents/scripts/drawings with the researcher at the end of the workshop

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.

Print Name of Researcher/person taking the consent \_\_\_\_\_

Signature of Researcher /person taking the consent \_\_\_\_\_

Date \_\_\_\_\_

Day/month/year

<sup>1</sup> A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

## Appendix C: Informed Consent Form

### Informed Consent Form for Research on Online Safety Game called CyberBullet- Share Your Story

I am Josephina Muntuumo, a Master of Computer Science student in the Faculty of Computing and Informatics at the Namibia University of Science and Technology. My research is about the Co-designing Interactive Games for Teaching Online Safety in Namibia.

I am requesting your informed consent for the following:

1. That you agree to participate willingly in the interview about Co-designing Interactive Games for Teaching Online Safety. You do not need to be a gamer for you to test the game. You will not be compensated for participation in this interview.
2. There are no wrong or right answers as we are asking for your opinion.
3. We will not make reference to you as an individual or by name in our reports and research publications as we will assign a pseudonym or a number to you. We will also not report on individual results but on aggregate results.
4. Should you feel uncomfortable with any question, you may skip the question.
5. We would like to record the interview for transcription purposes. These recordings will not be released or seen by one other than the research team members. Please indicate whether we can video record you ☐ or audio record ☐ you.
6. We would also like to take photos. Any participant faces appearing on the photos will be blurred prior to use in reports or research publications. Do you agree ☐ or ☐ not agree that we can take photos during the interview?

.....

**Name (print)**

.....

**Signature**

.....

**Date**

Contact details of researchers:

Student: Josephina Muntuumo, Cell: 081-4244747, Email: [jossey13@gmail.com](mailto:jossey13@gmail.com)

Supervisor: Dr Anicia Peters, Tel: 061-2072722, Email: [apeters@nust.na](mailto:apeters@nust.na)

## Appendix D: Discussion Questions

| Discussion Questions   | Assessment   |
|--|--|
| Part 1: Online Experiences and Behaviour   |  |
| <p>1. What things on the Internet would bother people of your age?</p> <ul style="list-style-type: none"> <li>• Why are you interested in social media sites?</li> <li>• What did you do/share on social media today?</li> </ul>   | <p>Intimidation/Annoyance/Upset/Upset/Anger/ Embarrassed/ Afraid</p>   |
| <p>2. Share any bad online/Internet experiences that you hear/read about. Can you describe what happened?</p> <ul style="list-style-type: none"> <li>• How would you respond if a stranger tried to contact you through an online site?</li> <li>• What would you do if you found out that one of your friends was talking to strangers online?</li> </ul> | <p>Pornography/ Cyberbullying/ Phishing/Sexting/Fraud and identity theft / / <u>Copyright Infringement/ Unwarranted mass-surveillance/ Child pornography/ Child grooming</u></p> |
| Part 2: Knowledge  |  |
| <p>3. What do you think could be improved to make the online experiences safe to you and others?</p> <ul style="list-style-type: none"> <li>• How can you solve and prevent online abuse?</li> </ul>   | <p>Knowledge of asking for help/Channel of reporting</p>   |

|  |   |
|--|---|
| <ul style="list-style-type: none"> <li>Who can help you if something makes you uncomfortable online?</li> </ul>  |   |
| Part 3: Cyber Education  |   |
| <p>4. Tell me what it means to use the Internet in a safe way?</p> <ul style="list-style-type: none"> <li>How do you do it?</li> <li>What would you advise people about your age when using the Internet.</li> </ul>   | <p>Effectiveness of current cyber safety education platforms.</p> <p>Future work?</p>   |
| <p>5. What do you learn about online safety at school?</p> <ul style="list-style-type: none"> <li>In which course is it covered?</li> <li>Are you satisfied with the course content?</li> </ul>  | <p>Effectiveness of current online safety education platforms.</p> <p>Future work?</p>  |
| Part 4: Game Design Questions  |   |
| <p>Do you like to play video and/or computer games?</p> <ul style="list-style-type: none"> <li>How much time did you spend last week playing video and/or computer games?</li> <li>What game do you like the most?</li> <li>What types of games do you play?</li> <li>List the name of games that you play?</li> <li>Why do you play the games you mentioned above?</li> </ul> | <p>Assess children's game behaviour and preferences to assist the researcher with the game genre ( Action, Adventure, Simulation, Sports, Strategy/Puzzle )</p> |

|  |  |
|--|--|
| <ul style="list-style-type: none"><li>• Where do you usually play video/computer games?</li><li>• How often do you play?<br/>Daily   Weekly   Monthly<br/>Semesterly</li><li>• What don't you like about computer game playing?</li><li>• What do you use to play games?</li></ul> |  |
|--|--|

2/3/2019

ONLINE SAFETY GAME: EVALUATION FORM

## ONLINE SAFETY GAME: EVALUATION FORM

Your feedback will be used by the developers to improve the quality of the game prototype. Please answer all the questions truthfully.

\* Required

1. **1. Gender \***

Mark only one oval.

- ☐ Male  
☐ Female  
☐ Prefer not to say

2. **1. Gender \***

Mark only one oval.

- ☐ Male  
☐ Prefer not to say  
☐ Female

3. **2. What is your age group? \***

Mark only one oval.

- ☐ 5-7  
☐ 8-13  
☐ 14-17  
☐ 18+

4. **3. In your opinion, how does the game appear overall? Check all that apply: \***

Check all that apply.

- ☐ Well designed and organized  
☐ Easy to read and play  
☐ Help screens are available  
☐ Instructions are available  
☐ Instructions were clear  
☐ Poorly designed and organized  
☐ Difficult to read and play

5. **4. What is your overall assessment of the Game? \***

Mark only one oval.

- ☐ Excellent  
☐ Very Good  
☐ Adequate  
☐ Needs improvement  
☐ Poor

**6. 5. Does the content meet your expectations? \****Mark only one oval.*

- ☐ Yes, most definitely
- ☐ Mostly
- ☐ Not sure
- ☐ Somehow
- ☐ Not at all

**7. 6. Does the Game teaches you about online safety? \****Mark only one oval.*

- ☐ Yes, definitely
- ☐ Mostly
- ☐ Not sure
- ☐ Somehow
- ☐ Not at all

**8. 6. What can be improved with regard to the Design ? \***

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**9. 7. What can be improved with regard to the colours ? \***

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**10. 8. What can be improved with regard to the Content, Formatting and Texts ? \***

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11. 9. What can be improved with regard to the Visuals? \*

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12. 10. What can be improved with regard to the Characters ? \*

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13. 11. In your own words, briefly describe the purpose of the Game ? \*

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14. 12. What did you learn from the game ? \*

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15. 13. Please make some comments and suggestions (including activities or initiatives) that you think would be useful, for the improvement of this game.

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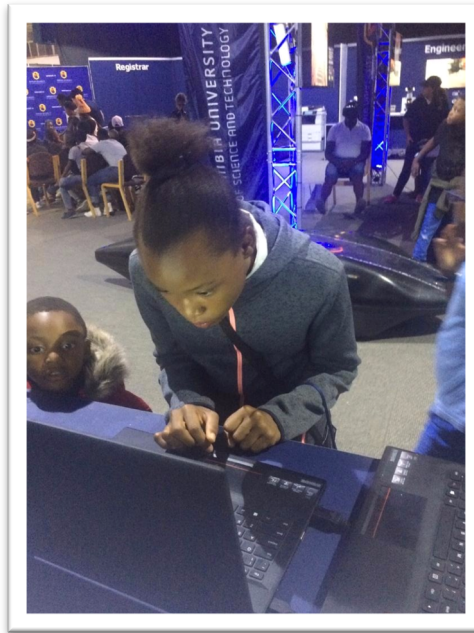
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#### Appendix F: Windhoek Show Grounds Beta Testing Photo



#### Appendix G: ICT Summit Beta Testing Photo

