

DIGITAL NATIVE STUDENTS – WHERE IS THE EVIDENCE?

Su-Ting Yong¹, Peter Gates² and Ian Harrison³

¹Department of Foundation, Faculty of Engineering, The University of Nottingham Malaysia Campus, Jalan Broga, 43500 Semenyih, Selangor Darul Ehsan, Malaysia (e-mail: Su-Ting.Yong@nottingham.edu.my).

²School of Education, The University of Nottingham, Jubilee Campus, Nottingham NG8 1BB (email: Peter.Gates@nottingham.ac.uk).

³The University of Nottingham Malaysia Campus, Jalan Broga, 43500 Semenyih, Selangor Darul Ehsan, Malaysia and the Department of Electrical and Electronic Engineering, Faculty of Engineering, University Park Nottingham NG7 2RL.(e-mail: Ian.Harrison@nottingham.edu.my).

1.0 ABSTRACT

The aim of this study was to explore pre-university students' experience in using digital technology and to assess whether they might reasonably be classified as Digital Natives and examine the nature of their classification. Data was collected through an online survey in which 191 pre-university students participated. The sample study consists of 84 males, 107 females; 135 from business/science school and 56 from engineering school. It was found that students are spending more time on-line on entertainment than on academic pursuits. Smartphones and mobile computers are the two most popular electronic devices among the students and they spend more than six hours per day surfing the Internet, calling and messaging. Surprisingly, female and science/business students were characterized to be more digital native compared to male and engineering students. Female and science/business students spent more time on entertainment. This study has found that pre-university students in Malaysia were 'being' digital natives because they were born after 1980 and 'doing' the digital native activities.

Keywords: digital native, gender, multitasking, digital immigrant, per-university, technology usage

2.0 INTRODUCTION

Advances in science and technology have gradually transformed our lives and how our society operates. As a result, today's university students are not the same as those in the past; they have been born into a digital age where technology forms an integral part of their lives. They are surrounded by digital technologies and spend a lot of their time watching television, surfing the internet, playing digital games, using mobile phones, etc. When today's students come into the classroom - instead of copying down notes, they are more likely now to take a snapshot using their smart phone or tablet PC; instead of having face-to-face conversations in the class, they post their updates and messages to Facebook; instead of going to the library to search for information in books, they use Google to search the Internet. Teacher complaints about students using their mobile phones and not paying attention in class now seem strangely ill-informed. The communication and learning approaches of today's young people have radically changed in the past 20-30 years. Whilst a lot of educators are aware of this, many find it easier to ignore, assuming students are the same as they have always been, and that consequently the same teaching methods will continue to work for the current generation of students (Prensky, 2001a, 2001b). In fact, Prensky goes further to claim that today's students (i.e. those born after 1980) are 'digital native speakers' of the digital language of computers, video games and the Internet, and they are no longer the people our educational system was designed to teach (Prensky, 2001a). There is an imperative on the education system to understand these digital native students, and consider how it needs to change as a result (Helsper & Eynon, 2010).

Malaysia is embarking on improving its education system, with a national vision of becoming a developed nation by the year 2020. Malaysian education policies are driving towards digitalization by gradually incorporating information and communication technology (ICT) into teaching and learning. Malaysia's initiatives of digitizing education have been contextualized within several national initiatives over the last 40 years (Cheah & Merican, 2012). In tandem with this, in recent years, there have been an increasing number of studies related to ICT use among Malaysian students (Eow, Wan Ali, Mahmud, & Baki, 2009; Hamat, Embi, & Hassan, 2012; Hashim, Hamid, & Rozali, 2007; Hew & Leong, 2011; Latif, 2007; Yuen & Song, 2009; Zakaria, Watson, & Edwards, 2010; Zulkefly & Baharudin, 2009). These studies explore students' competency and use of the Internet, mobile phones, digital games and social networking. However, the relationship between technology accessibility and characteristics attributed to the digital native generation in Malaysia is yet to be explored. Our search of the literature suggests there is next to no research on the digital native traits of Malaysian students. Helsper and Eynon (2010) did mention that many past research studies focused on young

people's usage of new technologies, but arguments regarding ways of supporting the digital native student tend to be minimal.

“Also not yet explored is the relationship between technology access, use and skill, and the attitudinal characteristics and dispositions commonly ascribed to the digital native generation” (Bennett, Maton, & Kervin, 2008, p. 778).

It is argued (Shariman, Razak, & Noor, 2012) that educators' acceptance of the 'digital native student' is a matter of pure conjecture with the existence of the concept still under some doubt (Bennett et al., 2008). For instance,

“The extent to which a person is a digital native is about date of birth or about a certain amount of exposure, experience or expertise with new technologies, is an important question for policy and practice. If characteristics of a digital native are determined by age then older generations are lost and a solution to a digital disconnect between adults and younger people is out of sight. However, if being tech savvy is determined by exposure and experience then collaboration and learning is possible in environments where younger and older generations interact” (Helsper & Eynon, 2010, p. 506).

The use of age to classify students as digital natives is a risky assumption and we should not presume that all current students are proficient in ICT, being 'technologically savvy'. Likewise, educators drawn from previous generations could be as competent as or even more so than some of the younger generation of students in their use of ICT, though this is likely to be geographically influenced. A study conducted in the United Kingdom (UK) found that there was no substantial difference between digital natives (i.e. born after 1980) compared to the older generation in technology usage (Helsper & Eynon, 2010). Another study conducted in Hong Kong discovered that students were competent in gaming, entertainment, advanced web or mobile and social features such as Facebook, whereas teachers were competent at work-related technologies and simple web functions (Mcnaught, Lam, & Ho, 2009). Consequently it would be dangerous to characterise all Malaysian students as digital natives without any strong empirical evidence. There is a difference between 'being' the digital natives based on their age and 'doing' the digital native in everyday practices (Helsper & Eynon, 2010).

The study we report on here focused on a new wave of Malaysian university students and it contributes to understanding rapidly changing student lifestyles and learning environments driven by fast changing information technology. There is little literature reported in Malaysia with regard to digital native characteristics. Though the term digital native is popular in Malaysia, not much research has been undertaken in this area and most of the data collected on digital natives has been conducted in the United States (Helsper & Eynon, 2010). For Malaysian higher education practice therefore, there is an urgent need to understand how current students react to technologies so that educators are able to assess students' desire and readiness in using technology for learning in the ways that exploit their skills as digital natives (Teo, 2013). This study contributes by giving some preliminary insights, and defines the extent to which Malaysian pre-university students may be characterised as digital natives.

3.0 REVIEW OF LITERATURE

3.1 THE DIGITAL NATIVE

The terms, 'digital native' and 'digital immigrant' were initiated by Prensky (2001a). *Digital native* refers to those students who were born after 1980 and are native speakers of the digital language of computers, video games and the Internet (Prensky, 2001a). Students at school and universities have grown up and spent their entire lives surrounded by computers, video games, cell phones and all other digital technologies, which have become almost seamlessly integrated into their daily lives. Interestingly, the rise of Web 2.0 applications has created the second generation of the digital native, children who were born after 1990 (Helsper & Eynon, 2010). Malaysian students have also been exposed to and are comfortable with Web 2.0 applications (Zakaria et al., 2010), and so could be possibly classified as the second generation of the digital native. Furthermore, digital native is also defined as 'someone who comes from a media rich household, who uses the Internet as a first port of call for information, multi-tasks using ICTs and uses the Internet to carry out a range of activities particularly those with a focus on learning' (Helsper & Eynon, 2010, p. 516).

Besides the term digital native, students and young people who are currently studying at school, college and university are also variously claimed to be the 'net generation', the 'Google generation', the 'millennials' (Helsper & Eynon, 2010) or the 'Facebook generation' (Ahuja, 2013).

Conversely, the term *digital immigrant* was used by Prensky to refer to those who were born before 1980, but have adopted and learned new technologies at some later point in their lives (Prensky, 2001a). ‘The single biggest problem facing education today is that our digital immigrant instructors, who speak an outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language’ (Prensky, 2001a, p. 2). Based on this argument, there is a gap or *digital disconnection* between the educators and the students; digital immigrant educators are characterised as left behind in the latest technological developments.

Prensky’s classification of digital native based on age or generational difference has been debated and criticized by some researchers (e.g. Helsper & Eynon, 2010). A study conducted in the UK to explore whether being digitally native was determined by age, experience (i.e. using the Internet for the longest period of time) and breadth of use (i.e. the Internet is integrated into almost every aspect of their everyday lives) revealed that generation (i.e. age) alone does not adequately define whether or not someone is a digital native (Helsper & Eynon, 2010). It is argued that other factors such as gender, education, experience and breath of use, do play a part in explaining how a person is classified (Helsper & Eynon, 2010). On the other hand, other researchers have claimed that the existence of digital natives is based on two assumptions: (1) digital natives *possess sophisticated knowledge* and skills in ICT, (2) *digital natives have different learning preferences* compared to the earlier generations of students (Bennett et al., 2008).

Technologies do play a major role in changing the way young people communicate, socialise and learn (Helsper & Eynon, 2010). According to Prensky (2001b), digital natives received a considerable digital input while growing up, thus arguably some of the functioning of their brains are likely to be modified as they think and process information differently from the previous generation of digital immigrants who tend to shape technological usage around their practices, rather than vice versa. These natives have grown up with a ‘hypertext mind’, they ‘leap around’, and develop parallel cognitive structures (Prensky, 2001b). Digital natives are characterized as (a) used to receiving fast information, (b) like parallel processing, (c) used to multitasking, (d) think of graphics first, (e) are comfortable with random access, (f) function best when networked, (g) thrive on instant gratification and frequent rewards, (h) prefer games to serious work and (i) have a high twitch-speed (Prensky, 2001a, 2001b). Most importantly, ‘today’s kids are always multiprocessing - they do several things simultaneously - listen to music, talk on the cell phone, and use the computer, all at the same time’ (Brown, 2000, p. 13). It is important to highlight that multitasking is not a new phenomenon as many of the parents of today’s generations of students might have done their homework while watching television, or listening to the radio (Bennett et al., 2008). However, the learning behaviour of digital natives is greatly influenced by the digital technologies that have been constantly integrated into every aspect of their lives since an early age.

Digital native students are also claimed to learn so differently from the digital immigrants that the nature of education itself must change to accommodate the interests expectations and practices of these students (Prensky, 2001a). However, it is also contended that this is a controversial assumption because students’ learning approach and preference is not fixed and may change depending on the context of the task given, thus generalizations of particular learning preferences (e.g. receiving fast information, multitasking, etc.) favoured by the digital native is questionable (Bennett et al., 2008). Despite these controversies between researchers (i.e. Bennett et al., 2008; Prensky, 2001a) in regards to learning preferences of digital natives, the preliminary and fundamental interest is to determine whether or not our students can be really characterised as digital natives and if so, what the implications are to learning and teaching.

Teachers have to be aware that today’s students are different from those they might have encountered in the past. It has been contended that digital native students often have short attention spans when exposed to traditional teaching styles, but not for the things that interest them (Prensky, 2001b). Although this has arguably always been the case, it is the pace of change and scale of difference that today is greater than ever before. Students nowadays *think* and *learn* differently and perform many functions in quite distinct ways such that their teachers have a need to understand and communicate in the language of their students and use an adapted teaching approach that best fits into students’ learning strategies. Teachers of course, must know how to grasp students’ attention and interests in the classroom. In fact, understanding of how students react to technology in learning, social and collaborative situations is vitally important to allow teachers to accommodate their students’ learning needs by employing more effective teaching approaches (Teo, 2013).

3.2 THE INTERNET AND FACEBOOK

Today’s digital natives are also regarded as the ‘net generation’ or the ‘Facebook generation’. For this reason, it may be worthwhile to discuss briefly, the Internet and Facebook before proceeding to technology possession of digital natives. According to Internet World Statistics, there are more than 3 billion Internet users worldwide (Stats, 2014). China has the largest group of Internet users (642 million), followed by US (277 million) and

India (243 million) (Stats, 2014). Increasing worldwide use of the Internet has increased in parallel with social media such as Facebook and Twitter. Facebook remains the largest social network in the world to date (BeginGroup, 2013). Since Facebook has been banned in China in 2009, the leading countries based on number Facebook users as of May 2014 were US (151.8 million), India (108.9 million) and Brazil (70.5 million) (Stats, 2014). In September 2014, Facebook reported 864 million daily active users on average and 1.35 billion monthly active users (Facebook, 2014), which means about 45% of the Internet users have a Facebook account. Male Internet users outnumber female Internet users by 7% (Indo-Asian, 2013), but surprisingly females have made up a larger share of Facebook users (58%) compared to males (42%) (Smith, 2014). Men are seemed to have higher accessibility and interest on the Internet, but women tend to prefer connection through Facebook.

In Malaysia, there are 20 million Internet users, which is about 67% of Malaysian population (Stats, 2014). This figure is higher than the 57% of Malaysian Internet users as reported earlier by Department of Statistics Malaysia (2013). Facebook is also the most popular social media in Malaysia, with 13.3 million Facebook users, 45.2% of the total Malaysian population (Stats, 2014). Obviously, the extent of Internet and Facebook penetrations into Malaysia are considered to be good compared to some Asian countries (Socialbakers, 2014).

Today, the popularity of the Internet and social media has changed society overall. The young generation of adults and students are spending a great deal of time on the Internet and social networking, and seem to be attached to their smartphone all the time. Today's digital native students will have spent over 10,000 hours playing videogames, over 20,000 hours watching television and over 210,000 hours communicating through emails, cell phones and instant messaging, but only spend at most 5,000 hours reading books, before leaving a college (Prensky, 2001b).

3.3 TECHNOLOGY USAGE OF DIGITAL NATIVES

Some studies have revealed that digital native students are spending more time on entertainment and less time on academic and health purposes. Research found that 63,600 university students spent 41 hours per week (i.e. a sharp increase from 25 hours in 2003) on social and leisure activities, but only allocated 28 hours on academic activities including studying outside of class and attending lecture (Shragge, 2010). Data obtained in the USA from the Kaiser Family Foundation in 2010 showed that between 8 and 18 years, children now spend more than 7.5 hours daily watching television, listening to music, surfing the web, communicating in social network and playing computer game (Ahuja, 2013). Conversely, according to the 2011 Bureau of Labor Statistics' American Time User, the high school students only spent on average less than an hour per weekday on sport, exercise and recreation (Ahuja, 2013). In fact, this is a global phenomenon, seen in many developing and developed countries. In Malaysia, a study (Yuen & Song, 2009) revealed that students were spending most of their time using digital technologies for communication or entertainment, and less for academic or collaboration. The researchers (Yuen & Song, 2009) claimed that Malaysian digital natives have similar traits as the USA and Australian digital natives. No matter where they are, students nowadays are more connected to the world than ever before and thank to the Internet, a global network linking people around the world by giving an illusion of a borderless world.

3.3.1 ACCESSING FACEBOOK

Today, the Internet has played a significant role in the life of many people around the world. Based on Brint's study, the largest amount of time spent on the Internet is on Facebook, with an average of 10.5 hours per week (Shragge, 2010). Another study conducted in the USA discovered a similar result, where students spent an average of 1 hour 41 minutes per day (11.78 hours per week) on Facebook and checked Facebook 5.57 times per day (Junco, 2011). In Malaysia, a study revealed that 80.8% of students had a social networking account and were spending more time on social networking than on learning (Hamat et al., 2012). Though Facebook is popular in Malaysia, the top four main activities of Malaysian Internet users were reported as posting information or instant messages (69.1%), using email (65.4%), searching for information about goods/ services (65.3%) and downloading multimedia or listening to music (64.6%) (Department of Statistics, 2013). According to Facebook, most of the Facebook users are mobile users, in which there are 703 million mobile daily active users on average and 1.12 billion mobile monthly active users (Facebook, 2014). Apparently, mobile devices such as smartphones or tablet computers have become an integral part of life for many of us.

3.3.2 CALLING AND MESSAGING WITH MOBILE PHONE

Past studies (Ahuja, 2013; Kennedy, Dalgarno, & Bennett, 2008; Madden, Lenhart, Duggan, Cortesi, & Gasser, 2013; Margaryan, Littlejohn, & Vojt, 2011; Mcnaught et al., 2009; Thinyane, 2010; Yuen & Song, 2009) also revealed that more than 80% of the digital native students owned a mobile phone. However, students' experiences in developed and developing countries tend to be different, for instance, in South African students tend to use more functionalities of mobile phones and about 84% of them used mobile phone to call and to send

SMS to people daily (Thinyane, 2010). In Malaysia, a study revealed that students spent 353.36 minutes on the mobile phone daily (Zulkefly & Baharudin, 2009). Students prefer messaging to calling, especially among the female students (Zulkefly & Baharudin, 2009). This may be due to cheaper charges for sending messages compared to making a phone call. Furthermore, sending messages resembles an asynchronous communication that does not require activities to be taken place in real time.

3.3.3 PLAYING DIGITAL GAME

Video games have become a popular form of entertainment since the appearance of Super Mario in the 1980s. In the USA, university students spent 11.04 hours per week playing video game, whereby males played 16.87 hours per week and females played 6.34 hours per week (Sherry, Lucas, Greenberg, & Lachlan, 2006). Another study on massively multiplayer online role-playing games (MMORPGs), with a sample study from 45 countries, mainly the gamers from USA, UK and Canada between 11 and 63 years found that the mean time spent playing per week was 22.85 hours (males - 23.3 hours and females - 21.7 hours) (Cole & Griffiths, 2007). In Malaysia, about 47.9% of Malaysians reported playing computer games on the Internet (Department of Statistics, 2013). A study conducted in one Malaysian secondary school showed that 75.8% (91.3% boys; 54.1% girls) of the students played computer games and spent an average of 8.47 hours per week playing (Eow et al., 2009). Another study conducted in a public university in Malaysia showed that 54 % of those students were playing games on mobile phones (Hashim et al., 2007). A study in Malaysia also found that no evidence to support students' poor academic performance in school was due to playing computer games (Eow et al., 2009).

3.4 DIGITAL NATIVES AND DIGITAL IMMIGRANTS

Many studies investigate on the digital native students' accessibility and use of digital technologies, assuming that digital natives are technology savvy, 'think and learn' differently from digital immigrants. A few studies have defied this assumption however. In Australia, a study has revealed that the technological skills of digital native students were overestimated, because they were not familiar with several new evolving digital technologies (Kennedy et al., 2008). A similar finding was observed in a study conducted in Malaysia, in which majority of the students had moderate levels of ICT competencies in office applications (e.g. words, presentation, spreadsheet, database), the Internet, email, social networking, utility and computer maintenance (Hew & Leong, 2011). The impact and technology skills of digital natives could be overestimated; conversely, the impact and technology skills of digital immigrants could be underestimated. It was contended that the digital divide between the digital natives and digital immigrants was not as large as expected (Kennedy et al., 2008). This could be justified on the grounds that digital natives and digital immigrants are deemed to be proficient in different technological skills. A study in Hong Kong revealed that digital native students were better at advanced web activity, diverse use of mobile phones, social networking and entertainment, whereas the digital immigrant educators were better at digital technologies related to work and simple web functions (Mcnaught et al., 2009). In the UK, a study revealed that digital native students did use more digital technologies compared to digital immigrants, however, there was no evidence to support different learning preferences adopted by the digital natives (Margaryan et al., 2011). It was contended that digital natives' attitudes to learning were in fact influenced by the educators' teaching approaches (Margaryan et al., 2011). Returning to the preliminary idea, teachers' pedagogical approach plays a major role in exposing students to a range of learning experiences.

4.0 AIM OF THE STUDY

The purpose of the study reported here is to explore Malaysian university students' use of digital technologies and to determine the level at which students might be characterized as digital natives. A practical contribution of this study is to understand university foundation students' need to use technologies for learning in ways that characterize them as digital natives. The findings would inform the educators of the need of speaking the 'same language' as their students and to understand how the young generation could be educated more effectively. The objectives of the study were:

- (1) To explore students' accessibility to digital technologies.
- (2) To explore students' technology usage.
- (3) To investigate the level at which students can be characterized as digital native.

This is a casual-comparative study that compares quantitative data in two or more groups (i.e. gender, nationality and course of study) of subjects from two different disciplinary schools. 'In casual-comparative research, investigators attempt to determine the cause or consequences of differences that already exist between or among groups of individuals' (Fraenkel & Wallen, 2006). In this study, students' technology usage and digital natives attributes were compared against different groups of gender, nationality and course of study.

5.0 SAMPLE

The participants were pre-university students from a private university in Malaysia. There were 405 pre-university students aged between 16 to 18 years old and the majority of them have just completed their high school education (e.g. Malaysian Certificate of Education, O-level, etc.). The sample was selected based on convenience sampling. Convenience sampling is 'people who are available, volunteer, or can be easily recruited are included in the sample... individuals who can be conveniently selected' (Johnson & Christensen, 2008, p. 238) and readily available (Mertens, 2010). In fact, the most commonly used sampling method for quantitative give research is convenience sampling (Johnson & Christensen, 2008; Mertens, 2010) because most of the time, it is extremely difficult to select either a random or a systematic non-random sample (Fraenkel & Wallen, 2006).

6.0 DATA COLLECTION

Data was collected from pre-university students during their first semester of study between July and September 2013. An online survey questionnaire was posted in Google docs and all the 405 pre-university students were informed of the survey questionnaire during the first week of the semester. Due to low response rate from the students, they were reminded once again at the end of the semester. Finally, 191 students responded to the survey. The survey was completely anonymous and voluntary. In order to understand why some students were reluctant to participate in the study we had an informal chat with a few students. To our astonishment, they claimed that every week, they were invited to participate in one or more survey and they had become so irritated by those surveys. Some of the studies undertaken in the university rewarded participants with a small token of appreciation from MYR 5 to MYR 20, but the response rate enduring low. Though no reward or incentive was given to the research participants in this study, we explained to the students regarding the importance of the study for future teaching and learning in the university. Though not all students responded, the response rate was 47%, in which 191 out of 405 students. There are 84 males and 107 females with 164 local and 27 international students. In total there are 135 business/science students and 56 engineering students.

7.0 RESEARCH INSTRUMENT

In this study, survey questions on technology accessibility were adapted from (Kennedy et al., 2008), and the Digital Natives Assessment Scale (DNAS) developed by (Teo, 2013) was used to measure attributes of digital natives. Although, the DNAS was newly developed, it is statistically valid and reliable, and easy to administer. Furthermore, all the factors measured in DNAS are strongly related to the characteristics of the digital native defined by Prensky (2001a, 2001b). DNAS is a self-reported instrument designed to measure students' perceptions of the degree to which they see themselves as digital natives. The DNAS consists of 21 items with four subscales: grow up with technology [TEC], comfortable with multitasking [MUL], reliant on graphics for communication [GRA] and thrive on instant gratifications and rewards [INS]. A Likert scale is used to indicate the extent of students' agreement with each statement. A seven-point scale from strongly disagree to strongly agree (scored from 1 to 7) is used for all the subscales. The scores from these items can be summed (ranging from 21 to 147) and a higher score indicating a level closer to be a digital native. DNAS is cost effective and it is available to be used by educators to enable them to understand how their students react to technology in learning, social and collaborative situations (Teo, 2013).

8.0 DATA ANALYSIS AND DISCUSSION

Data is analysed and discussed in three sections, students' access to technology, students' technology usage and digital native assessments. Demographic characteristics of students who responded are shown in Table 1. In casual-comparative study, the recommended sample size is based on one of the following rules of thumb: (1) 64 individual per group (Mertens, 2010; Onwuegbuzie, Jiao, & Bostick, 2004), (2) minimum of 30 individuals per group (Fraenkel & Wallen, 2006), (3) minimum of 30 cases for statistical analysis (Cohen, Manion, & Morrison, 2007).

Table 1: Demographic of Students

Gender		Nationality		Course of Study	
Male	Female	Malaysian	International	Engineering	Science/Business
84	107	164	27	56	135

Based on Table 1, only International students could not meet the minimum requirement. Since statistical analysis requires minimum cases of 30 (Cohen et al., 2007), comparison between Malaysian and International students was excluded from the data analysis. Raw data from the questionnaires was entered into SPSS. Frequency tables were generated and differences between variables (e.g. gender and course of study) were analysed using non-parametric tests, Mann-Whitney U test, as the dataset including all subsamples are not normally distributed.

8.1 STUDENTS' ACCESS TO TECHNOLOGY

Students were asked about their access to a range of technology (desktop computers, smart phones, tablet PC, mobile computer, etc.) and their access to the Internet.

Table 2: Technologies accessibility in percentage

Technologies	Unrestricted Access	Limited Access	No Access	Not sure/missing
Desktop computer	51%	31%	15%	3%
Video game console	16%	29%	48%	6%
Mobile computer	84%	13%	3%	1%
Tablet PC	37%	24%	36%	3%
MP3 Player	42%	18%	38%	3%
Portable DVD player	19%	26%	51%	4%
Digital/video camera	37%	30%	29%	4%
Cell phone	37%	16%	41%	6%
Smartphone	87%	5%	8%	0%
Home broadband	60%	22%	16%	3%
Mobile broadband	61%	23%	16%	1%

Table 2 reports on students' accessibility to different kinds of digital technologies: computers, mobile phones, electronic gadgets and the Internet access. The most common kind of computers in use is mobile computers such as laptop or notebook, with 84% of ownership, followed by desktop computer (51%) and tablet computer (37%). As expected, a very high proportion of students have unrestricted access to mobile computers (84%) as compared to desktop computers (51%). The result contradicts findings from other countries by (Kennedy et al., 2008; Margaryan et al., 2011; Mcnaught et al., 2009; Thinyane, 2010), in which students' accessibility to desktop computers were higher than mobile computers. In this study, about 51% of the students owned a desktop computer, which is lower than reported for students from Hong Kong, 98.7% (Mcnaught et al., 2009), Australia, 90% (Kennedy et al., 2008), U.K., 79.4% (Margaryan et al., 2011) and South Africa, 61.1% (Thinyane, 2010). Nevertheless, ownership of mobile computer (84%) by students in this study is reported to be higher than the students from Hong Kong, 63.9% (Mcnaught et al., 2009), U.K., 66.3% (Margaryan et al., 2011), Australia, 63% (Kennedy et al., 2008) and South Africa, 49.6% (Thinyane, 2010). Moreover, students' possession of desktop and mobile computers in this study is higher than what was reported in an earlier study in Malaysia, desktop computer (46.3%) and mobile computer (25.2%) in (Yuen & Song, 2009). This study shows a huge increase (58.8%) in the number of students who possess a mobile computer compared to the earlier result in (Yuen & Song, 2009). This is an indication that possibly mobile computing has gained in popularity very recently due to its affordable price and is now the device of choice of many students. This would be consistent with the statistics reported by Malaysia Communications and Multimedia Commission, in which most of the families in Malaysia owned a laptop (46.3%) compared to desktop computer (21%) or tablet computer (15.3%) (MCMC, 2014). According to the Department of Statistics Malaysia, majority 94.2% of individual Malaysians used a mobile phone (Department of Statistics, 2013). In an earlier study in Malaysia (Yuen & Song, 2009), all students were reported to own a mobile phone. In this study, however, mobile phone was classified into either cell phone or smartphone. Based on Table 2, students have the highest possession of smartphone (87%), but only 37% of the students owned a cell phone. Conversely, in a study conducted in the USA, 41% of the teenagers possessed a cell phone but only 37% of them possessed a smartphone (Ahuja, 2013; Madden et al., 2013). In our study, a higher percentage of students owning a smartphone may due to the cheaper price of smartphones in Malaysia in the recent years, and the cultural popularity amongst the youth.

In the USA, smartphones have quickly embedded themselves into the lives of many people (eMarketer, 2013) and they come with many new special functions and improved features that imitate many electronic gadgets. For instance, a popular social network such as Facebook has 82% of mobile users (Facebook, 2014). Though some earlier studies did not categorise mobile phones into cell phone or smartphone, students' possession of a mobile phone were also reported to be very high 89% to 99% in (Kennedy et al., 2008; Margaryan et al., 2011; Mcnaught et al., 2009; Thinyane, 2010; Yuen & Song, 2009).

With respect to the Internet access, 60% and 61% of students reported having unrestricted access to broadband Internet and wireless mobile Internet respectively. These results are slightly higher than the national statistics, in which 57% of individual Malaysians have access to the Internet (Department of Statistics, 2013). Students' accessibility to broadband Internet in this study is lower than Hong Kong, 92.6% (Mcnaught et al., 2009) and

Australia, 73% (Kennedy et al., 2008), but higher than South Africa, 46.3% (Thinyane, 2010). However, students' accessibility to wireless mobile Internet is higher than Hong Kong, 54.6% (Mcnaught et al., 2009) and South Africa, 43.3% (Thinyane, 2010), but lower than US, 74% (Madden et al., 2013). Obviously, students' accessibility to wireless mobile Internet is comparable to broadband Internet, as the smartphones and mobile computers enable Internet access at anywhere and anytime. Heavy internet usage among students is reflected in Table 3.

Other electronic gadgets possessed by students are a video game console, DVD player, MP3 player and digital/video camera. About 42% of students have unrestricted access to an MP3 player and 37% of students have unrestricted access to a dedicated digital/video camera. Surprisingly, this result is lower compared to that reported by (Kennedy et al., 2008; Margaryan et al., 2011; Mcnaught et al., 2009; Thinyane, 2010), whereby the possession of MP3 player was 49.6% to 76.2% and digital camera was 40.7% to 91%. However, this result is similar to an earlier study reported in Malaysia, 44.4% possession of MP3 in Malaysia (Yuen & Song, 2009). However, with the increasing functionality of smartphones, it is possible young people no longer need digital cameras or MP3 players.

Lastly, 19% and 16% of students reported having unrestricted access to portable DVD player and video game console respectively. Students' accessibility to a video game console is much lower compared to that reported by (Kennedy et al., 2008; Margaryan et al., 2011; Mcnaught et al., 2009; Thinyane, 2010), whereby the possession of video game console was 28.1% to 53.1%. A decline in the accessibility of electronic gadgets (i.e. MP3 player, digital camera) is not surprising with the recent mobile market penetration by smartphones. Possibly a majority of the students have no access to a dedicated DVD player (51%) and video game console (48%) because they download or watch films online, or play on-line games or because they own a desktop or mobile computer that can play DVDs and allow game playing. Interestingly, new laptop computers are now being produced without a DVD player because the DVD is being replaced by a USB flash drive.

8.2 STUDENTS' TECHNOLOGY USAGE

In our survey, students were asked about their daily technology usage (surfing Internet, making phone call/messaging, accessing Facebook, etc.) and academic activities. The results are shown in Table 3.

Table 3: Average of hours spent per day

	Male	Female	Sc/B	Eng	Total
ENTMT					
Internet	3.02**	3.93**	3.77**	2.96**	3.53
Phone call/msg	1.77**	3.76**	3.44**	1.54**	2.88
Facebook	2.12	2.60	2.58	1.92	2.39
Digital game	1.93	1.64	1.98	1.24	1.76
Watch TV	1.91**	2.53**	2.72**	1.14**	2.26
Listen to Music	2.12**	3.30**	3.00**	2.26**	2.78
Academic					
Homework	1.93**	3.05**	2.76**	2.08**	2.56
Revision	1.96**	2.72**	2.49	2.14	2.39

** Difference is significant at the 0.05 level (2-tailed).

Among all the non-academic activities, surfing the internet (3.53 hours per day) is the most popular activity among the students, followed by chatting on the phone or sending messages (2.88 hours per day), listening to music (2.78 hours per day), using Facebook (2.39 hours per day), watching TV (2.26 hours per day) and lastly playing digital games (1.76 hours per day). The number of hours (3.53 hours) spent on the Internet reported in this study is so much lower than what was reported in (Wearesocial, 2014) that reported Malaysian Internet users use an average of 8.7 hours per day on the Internet. Furthermore, number of hours (2.88 hours) spent on the mobile phone reported in this study is also so much lower than what was reported in an earlier study in Malaysia (Zulkefly & Baharudin, 2009), which was 5.9 hours daily use of mobile phone. While social networking has recently grabbed headlines in the media (BeginGroup, 2013; Protalinski, 2013), the number of hours (2.39 hours) spent on Facebook reported in this study is so much higher than the worldwide average which is 21 minutes per day (Smith, 2014) and also higher than previous findings in the USA of 1.5 hours (Shrage, 2010) and 1.68 hours (Junco & Cotten, 2012). Malaysians were reported to spend 3.3 hours daily on social media (Wearesocial, 2014) and based on the time spent (2.39 hours daily) on Facebook in this study, we can recognise Facebook as the most popular social media among the students. Television is also popular and common in Malaysia, whereby 97.7% (MCMC, 2014) or 98.2% (Department of Statistics, 2013) of Malaysians have access

to television. Nevertheless, students in this study only spent 2.26 hours per day watching TV compared to 5 hours in US (Shrage, 2010) and 3.5 hours in Greece (Economides & Grousopoulou, 2008). Students in this study spent as little as 1.76 hours daily playing digital games, but it is higher than that reported in the USA, at 1.58 hours (Sherry et al., 2006), Maltese students 0.88 hours (Bonanno & Kommers, 2005), Swedish students 0.79 hours (Bonanno & Kommers, 2005) and an earlier study in Malaysia, 1.21 hours (Eow et al., 2009). Nevertheless, time spent on playing digital games (1.76 hours) in this study is lower than what was reported in 45 countries mainly USA, UK and Canada, 3.26 hours (Cole & Griffiths, 2007). Conversely, hours spent on academic purposes was merely 2.56 hour per day on homework and 2.39 hours per day on revision. The result of this study coincides with findings of an earlier study reported in US (Shrage, 2010) and Malaysia (Yuen & Song, 2009), that students were spending more time on social and leisure activities, rather than for academic purpose.

A comparison between male and female students shows that females are significantly ($p < 0.01$) spending more time on the following activities: chatting on phone or sending messages ($r = 0.40$), doing homework ($r = 0.36$), listen to music ($r = 0.28$), revision ($r = 0.26$), surfing internet ($r = 0.21$) and watching TV ($r = 0.17$). Effect size, r is 'some specific nonzero value in the population. The larger this value, the greater the degree to which the phenomenon under study is manifested' (J. Cohen, 1977, p. 10). These results show that females are moderately (r between 0.3 and 0.5) spending more time chatting on the phone/ messaging (3.8 hours) and doing homework (3 hours) compared to males (i.e. 1.8 hours on the phone and 2 hours doing homework). In Malaysia, more males (51.1%) than females (48.9%) own a mobile phone (Department of Statistics, 2013), but surprisingly, this study reveals that females are more likely than males to use the mobile phone. The finding coincides with an earlier study in Greece that female students (4 hours daily) made more phone calls and sent more messages than males did (3 hours daily) (Economides & Grousopoulou, 2008). In this study, females also reported to spend a slightly (r between 0.1 and 0.3) more time listening to music (3.30 hours), doing revision (2.7 hours), surfing internet (3.9 hours) and watching TV (2.5 hours) compared to males (i.e. 2.1 hours listening to music, 2 hours doing revision, 3 hours surfing internet and 2 hours watching TV). The finding aligned with Economides & Grousopoulou (2008) that females (4 hours) spent more time listening to music than males (3 hours), but contradicts with Economides & Grousopoulou (2008) that more males (2 hours) spent more time accessing the Internet than females (1 hour). Male Internet users outnumber female Internet users in the world as well as in Malaysia (Department of Statistics, 2013; Indo-Asian, 2013; Stats, 2014), but females in this study are reported to spend a little more time surfing the Internet. Initially our assumption was that females may spend more time on Facebook since females (58%) have made up a larger share of the Facebook users worldwide, compared to males (42%) (Smith, 2014) and women are more likely to use Facebook than the men in US (Guimarães, 2014). However, comparison between males and females in this study shows no significant difference in Facebook usage time. Lastly, for digital games that tend to be male dominant in Malaysia (Eow et al., 2009), this study found that males (1.93 hours) are spending more time playing digital games compared to females (1.64 hours), but the difference is not significant and this finding is coincide with (Cole & Griffiths, 2007). Though the result is not significant, males were reported play more digital games compared to females (Bonanno & Kommers, 2005; Phan, Jardina, Hoyle, & Chaparro, 2012; Sherry et al., 2006).

Further course comparison shows that science/business students are significantly ($p < 0.01$) spending more time on the following activities compared to engineering students: chatting on phone or sending messages ($r = 0.36$), watching TV ($r = 0.36$), doing homework ($r = 0.17$), surfing internet ($r = 0.16$) and listen to music ($r = 0.15$). These results show that science/business students are moderately (r between 0.3 and 0.5) spending more time chatting on the phone/ messaging (3.4 hours) and watching TV (2.7 hours) compared to engineering students (i.e. 1.54 hours on the phone and 1.1 hours watching TV). In this study, science/business students also reported to spend a slightly (r between 0.1 and 0.3) more time doing homework (2.8 hours), surfing the Internet (3.8 hours) and listening to music (3 hours) compared to engineering students (i.e. 2 hours doing homework, 3 hours surfing the Internet and 2.3 hours listening to music). However, there is no significant difference between science/business and engineering students in time spent on Facebook, digital game and revision. Generally, science/business students in this study tend to spend more time using the mobile phone, surfing the Internet, watching TV, listening to music and doing homework compared to engineering students. This finding contradicts a study in UK which discovered that engineering students are using more technology tools compared to non-technical students (Margaryan et al., 2011). In our study, science/business students were found to be more technology savvy. However, this requires further confirmation with DNAS whether science/business students are characterized to be more digital native.

In general, the students tend to spend more time on entertainment than for academic purposes. However, it has to be stressed that nowadays students tend to do multitasking or as mentioned in (Brown, 2000), kids nowadays are multiprocessing. For example, research done by Lorch (cited in Prensky, 2001b) shows that children do not

watch television continuously but in fact they can distribute their attention between other activities and viewing what was informative for them in the television program. Multitasking is one of the characteristics of digital native shown in Table 4.

8.3 DIGITAL NATIVES ASSESSMENT

Students were asked about their individual perceptions of the four factors used to measure students' perception of the degree to which they are digital natives: TEC - grow up with technology, MUL - comfortable with multitasking, GRA – reliant on graphics for communication, INS– thrive on instant gratifications and rewards. Cronbach's alpha of 0.92 shows that the instrument used has high internal consistency reliability.

Table 4: Digital Natives Assessment Scale

	Male	Female	ScB	Eng	Total
TEC	5.86**	6.15**	6.05	5.96	6.02
MUL	5.37**	5.95**	5.84**	5.36**	5.70
GRA	4.30**	5.00**	4.81	4.40	4.69
INS	5.35**	5.81**	5.74**	5.27**	5.60
DN:	109.75**	120.48**	118.03**	110.29**	115.76

** . Difference is significant at the 0.05 level (2-tailed).

Based on data shown in Table 4, surprisingly, female students are characterized to be more digitally native ($p < 0.01$, $r = 0.32$) compared to male students in all aspects measured but the differences are small (r between 0.1 and 0.3): TEC (female=6.15, male=5.86, $p < 0.01$, $r = 0.20$), MUL (female=5.95, male=5.37, $p < 0.01$, $r = 0.26$), GRA (female=5, male=4.3, $p < 0.01$, $r = 0.28$), INS (female=5.81, male=5.35, $p < 0.01$, $r = 0.22$). One of the reasons to explain this phenomenon could be because male students prefer more outdoor activities such as sports, travelling, etc. These results suggest that female students were more likely to agree that they grew up with technology, comfortable with multitasking, reliant on graphics for communication (e.g. using emoticons, smiley faces in messages) as well as to thrive for instant gratification and rewards.

Course comparison shows that science/business students are significantly characterized to be more digital native compared to engineering students but the difference between these two groups is small ($p < 0.01$, $r = 0.23$). Further investigation of the data shows that science/business students are significantly more comfortable with multitasking (mean score for science/business=5.84, mean score for engineering=5.36, $p < 0.01$, $r = 0.21$) and thrive for instant gratification and rewards (science/business=5.74, engineering=5.27, $p < 0.01$, $r = 0.22$) but the differences are small too ($0.1 < r < 0.3$). Engineering students were less likely to feel comfortable with multitasking and less likely to thrive for instant gratification and rewards. This may due to the nature of engineering courses that have trained the students for concentration and patience in doing their lab experiments and solving engineering or mathematical problems.

In general, students have the highest agreement in terms of growing up with technology [TEC], followed by being comfortable with multitasking [MUL], expressing a thrive for instant gratifications and rewards [INS], and finally being reliant on graphics for communication [GRA]. Overall, students obtained a mean score of 115.76 in this instrument (ranging from 21 to 147), whereby they generally agree that they are digital natives at a moderate level.

9.0 CONCLUSION

Being digital natives, pre-university students are spending approximately fifteen hours per day surfing the internet, making phone calls, text messaging, engaging in online social network, such as Facebook, playing digital games, watching TV and listening to music. Despite spending more time on entertainment purposes, students do spend about five hours per day on academic purposes. This phenomenon is not surprising and it supports the previous findings in (Ahuja, 2013; Shragge, 2010; Yuen & Song, 2009). The pre-university students are spending a total of 20 hours daily on entertainment and academic, and obviously they extensively do multitasking. Smartphones and mobile computers are in the top two of the most popular devices that enable them to communicate and access to computer and Internet at anytime, anywhere. Rapid advancement in technology diminishes the popularity of non-portable devices such as desktop computers and video games consoles. Portable DVD players, digital/video cameras, tablet PCs and MP3 players are widespread electronic gadgets but students' accessibility to these devices are minimal as all those features are available in laptops and smartphones. On the other hand, traditional cell phones are seen to be obsolete and old-fashioned without Internet access and without many smartphone applications. In general, multi-functionality of smartphones and

portability of mobile computers fulfil the needs of undergraduate students who spend most of their time on entertainment and academic pursuits. The top three activities favoured by the students are surfing the Internet, using the mobile phone and listening to music. This study also found that girls are characterised to be more digitally native than boys and female students are also spending more time on the computer for entertainment purpose. On the other hand, course comparison shows that science/business students are characterised to be more digital native compared than engineering students and science/business students are spending more time on entertainment. Further investigation using DNAS confirmed that the result substantial, the students are digital native at a moderate level. Moreover, the students could also be considered as the second generation of digital native as instigated by (Helsper & Eynon, 2010) because they were born after 1990 and they were familiar with Web 2.0 technology such as Facebook. The majority of the pre-university students surveyed who came to university are relatively familiar with and possess the latest emerging technologies such as the smartphone and mobile computers. This study has shown that the pre-university students surveyed are 'being' the digital natives and 'doing' the digital native activities.

These indications from our students are an important factor to inform us on how we should consider the future use of technological tools to design rich and engaging learning experiences for all students and as educators, we should adapt to the ever changing characteristics of our students (Kennedy et al., 2008). For instance, still our anecdotal experience is that some lecturers complain that students always come to class without bringing any lecture notes, books or tutorial papers. Knowing that the students would never forget to bring their smartphone, the lecturers could ask the students to access to the Universities virtual learning environment using their smartphone to download the lecture notes and tutorial questions. Alternatively, the students might just use their smartphone to take a snapshot of tutorial question from their friends. Furthermore, in a large classroom (e.g. 100 to 200 students during a lecture and lab), students who sit at the back are at a disadvantage because it is difficult to see the whiteboard. In this case, some lecturers could encourage the students to go in front, and use their smartphone or tablet computer to take a snapshot of the whiteboard. Lecturers may also face a problem whereby some students are very reluctant to access to the Moodle by giving a justification that the server or the Internet connection is slow. To overcome this problem, some lecturers could create a Facebook account for the module taught because they know that students would access to Facebook every day and night. Facebook used in proper way is beneficial for the students (Junco, 2011). Though students have a limited understanding of how technology may support learning (Margaryan et al., 2011), educators should learn to adapt to different students' learning behaviour influenced by the ever changing environment. Educators may be presumed as the digital immigrants that are being left behind by technology, and students may seem as the digital natives that are technology savvy. The differences, however, are not straightforward and the so-called digital natives are not always more digitally-oriented than the so-called immigrants (Mcnaught et al., 2009). Teaching is a life-long learning and understanding the students' learning behaviour is vital important for continuous long term personal development as educators. Future research could be improved by an increase of sample size and broadening the sample to include more diverse groups of students as technologies evolve over time.

10.0 REFERENCES

- Ahuja, M. (2013, March 14). Teens are spending more time consuming media on mobile devices. Retrieved from http://articles.washingtonpost.com/2013-03-13/news/37675597_1_teens-cellphones-video-games
- BeginGroup. (2013). In 2013 Facebook will have 1 billion users. Retrieved from http://begingroup.com/en/top/news/market_news/1353
- Bennett, S., Maton, K., & Kervin, L. (2008). The "digital natives" debate: A critical review of the evidence. *British Journal of Educational Technology*, 39(5), 775–786. doi:10.1111/j.1467-8535.2007.00793.x
- Bonanno, P., & Kommers, P. A. M. (2005). Gender differences and styles in the use of digital games. *Educational Psychology: An International Journal of Experimental Educational Psychology*, 25(1), 13–41. doi:10.1080/0144341042000294877
- Brown, J. S. (2000). Growing Up: Digital: How the Web Changes Work, Education, and the Ways People Learn. *Change: The Magazine of Higher Learning*, 32(2), 11–20. doi:10.1080/00091380009601719
- Cheah, P. K., & Merican, A. M. (2012). Education Policy: A Case Study of Digitizing Education in Malaysia. *Procedia - Social and Behavioral Sciences*, 69(1), 1714–1718. doi:10.1016/j.sbspro.2012.12.119
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th ed.). New York: Routledge.
- Cole, H., & Griffiths, M. D. (2007). Social interactions in massively multiplayer online role-playing gamers. *Cyberpsychology & Behavior: The Impact of the Internet, Multimedia and Virtual Reality on Behavior and Society*, 10(4), 575–83. doi:10.1089/cpb.2007.9988
- Department of Statistics, M. (2013). ICT use and access by individual and households survey 2013. Retrieved from http://www.statistics.gov.my/portal/images/stories/files/LatestReleases/ICT_Use/2013/ICT_HS2013BI.pdf

- Economides, A. A., & Grousopoulou, A. (2008). Use of mobile phones by male and female Greek students. *International Journal of Mobile Communications*, 6(6), 729–749. doi:10.1504/IJMC.2008.019822
- eMarketer. (2013). Smartphones Help Drive Users to Facebook. Retrieved from <http://www.emarketer.com/Article/Smartphones-Help-Drive-Users-Facebook/1009816>
- Eow, Y. L., Wan Ali, W. Z., Mahmud, R., & Baki, R. (2009). Form one students' engagement with computer games and its effect on their academic achievement in a Malaysian secondary school. *Computers & Education*, 53(1), 1082–1091. doi:10.1016/j.compedu.2009.05.013
- Facebook. (2014). Company Information. Retrieved from <http://newsroom.fb.com/company-info/>
- Fraenkel, J. R., & Wallen, N. E. (2006). *How to Design and Evaluate Research in Education* (6th ed.). Boston: Mc Graw Hill.
- Guimarães, T. (2014, December 3). 7 New Statistics About Facebook Users That Reveal Why It's Such A Powerful Marketing Platform. Retrieved from <http://www.businessinsider.com/a-primer-on-facebook-user-statistics-2014-9#ixzz3N7TpNstP>
- Hamat, A., Embi, M. A., & Hassan, H. A. (2012). The Use of Social Networking Sites among Malaysian University Students. *International Education Studies*, 5(3), 56–66.
- Hashim, H. A., Hamid, S. H. A., & Rozali, W. A. W. (2007). A Survey on Mobile Games Usage among the Institute of Higher Learning (IHL) Students in Malaysia. In *2007 First IEEE International Symposium on Information Technologies and Applications in Education* (pp. 40–44). IEEE. doi:10.1109/ISITAE.2007.4409233
- Helsper, E. J., & Eynon, R. (2010). Digital natives: where is the evidence? *British Educational Research Journal*, 36(3), 503–520. doi:10.1080/01411920902989227
- Hew, T. S., & Leong, L. Y. (2011). An Empirical Analysis of Malaysian Pre-university Students' ICT Competency Gender Differences. *International Journal of Network and Mobile Technologies*, 2(1), 15–29.
- Indo-Asian, N. S. (2013). Male Internet users outnumber female: United Nations report. Retrieved from <http://gadgets.ndtv.com/internet/news/male-internet-users-outnumber-female-united-nations-report-422381>
- Johnson, B., & Christensen, L. (2008). *Educational Research Quantitative, Qualitative and Mixed Approaches*. Thousand Oaks, CA: Sage Publications.
- Junco, R. (2011). The relationship between frequency of Facebook use, participation in Facebook activities, and student engagement. *Computers & Education*, 58(1), 162–171. doi:10.1016/j.compedu.2011.08.004
- Junco, R., & Cotten, S. R. (2012). No A 4 U: The relationship between multitasking and academic performance. *Computers & Education*, 59(2012), 505–514. doi:10.1016/j.compedu.2011.12.023
- Kennedy, G., Dalgarno, B., & Bennett, S. (2008). Immigrants and natives: Investigating differences between staff and students' use of technology. In *In Hello! Where are you in the landscape of educational technology? Proceedings of the Ascilite Conference* (pp. 484–492). Melbourne: ascilite.
- Latif, R. A. (2007). Understanding Malaysian students as gamers. In *Proceedings of the 2nd international conference on Digital interactive media in entertainment and arts - DIMEA '07* (pp. 137–141). New York, USA: ACM Press. doi:10.1145/1306813.1306843
- Madden, M., Lenhart, A., Duggan, M., Cortesi, S., & Gasser, U. (2013). Teens and Technology 2013. Retrieved from <http://www.pewinternet.org/Reports/2013/Teens-and-Tech.aspx>
- Margaryan, A., Littlejohn, A., & Vojt, G. (2011). Are digital natives a myth or reality? University students' use of digital technologies. *Computers & Education*, 56(2), 429–440. doi:10.1016/j.compedu.2010.09.004
- MCMC. (2014). Communications & Multimedia Pocket Book of Statistics Q2 2014. Retrieved from http://www.skmm.gov.my/skmmgovmy/media/General/pdf/Q2_2014C-MPocket.pdf
- Mcnaught, C., Lam, P., & Ho, A. (2009). The digital divide between university students and teachers in Hong Kong. In R. Atkinson & C. McBeath (Eds.), *Same places, different spaces. Proceedings ascilite Auckland 2009*. Auckland.
- Mertens, D. M. (2010). *Research and Evaluation in Education and Psychology. Research and Evaluation in Education and Psychology* (3rd ed.). United States: Sage Publications, Inc.
- Onwuegbuzie, A. J., Jiao, Q. G., & Bostick, S. L. (2004). *Library Anxiety: Theory, Research and Application*. United States: Scarecrow Press Inc.
- Phan, M. H., Jardina, J. R., Hoyle, S., & Chaparro, B. S. (2012). Examining the Role of Gender in Video Game Usage, Preference, and Behavior. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 56(1), 1496–1500. doi:10.1177/1071181312561297
- Prensky, M. (2001a). Digital Natives, Digital Immigrants. *On the Horizon (MCB University Press)*, 9(5), 1–6.
- Prensky, M. (2001b). Digital Natives, Digital Immigrants, Part II: Do They Really Think Differently? *On the Horizon (NCB University Press)*, 9(6), 1–9.
- Protalinski, E. (2013). Facebook passes 1.06 billion monthly active users, 680 million mobile users and 618 million daily users. Retrieved from <http://thenextweb.com/facebook/2013/01/30/facebook-passes-1-06-billion-monthly-active-users-680-million-mobile-users-and-618-million-daily-users/>

- Shariman, T. P. N. T., Razak, N. A., & Noor, N. F. M. (2012). Digital Literacy Competence for Academic Needs: An Analysis of Malaysian Students in Three Universities. *Procedia - Social and Behavioral Sciences*, 69(1), 1489–1496. doi:10.1016/j.sbspro.2012.12.090
- Sherry, J. L., Lucas, K., Greenberg, B. S., & Lachlan, K. (2006). Video Game Uses and Gratifications as Predictors of Use and Game Preference. In P. Vorderer & J. Bryant (Eds.), *Playing video games: Motives, responses, and consequences* (Vol. 24, pp. 213–224). Mahwah, NJ: Lawrence Erlbaum. doi:10.4324/9780203873700
- Shrage, R. (2010). Students spend more time in leisure activities than studying. Retrieved from <http://www.theaggie.org/2010/02/18/students-spend-more-time-in-leisure-activities-than-studying/>
- Smith, C. (2014). By the Numbers: 200+ Amazing Facebook User and Demographic Statistics. Retrieved from <http://expandedramblings.com/index.php/by-the-numbers-17-amazing-facebook-stats/>
- Socialbakers. (2014). Facebook statistics directory. Retrieved from <http://www.socialbakers.com/statistics/facebook/>
- Stats, I. W. (2014). Usage & Population Statistics. Retrieved from <http://www.internetworldstats.com/usage.htm>
- Teo, T. (2013). An initial development and validation of a Digital Natives Assessment Scale (DNAS). *Computers & Education*, 67, 51–57. doi:10.1016/j.compedu.2013.02.012
- Thiniane, H. (2010). Are digital natives a world-wide phenomenon? An investigation into South African first year students' use and experience with technology. *Computers & Education*, 55(1), 406–414. doi:10.1016/j.compedu.2010.02.005
- Wearesocial. (2014). 2014 Asia-pacific digital overview we are social's snapshot of key digital data & statistics. Retrieved from <http://gapit.com.vn/UploadFile/wearesocialsguidetosocialdigitalandmobileinapac2014v01-140115192146-phpapp02-141124215123-conversion-gate02.pdf>
- Yuen, M. C., & Song, S. Y. (2009). Classroom conduct for digital natives learning in higher education settings. In *2nd International Conference of Teaching and Learning*. Kuching, Sarawak: Inti University College.
- Zakaria, M. H., Watson, J., & Edwards, S. L. (2010). Investigating the use of Web 2.0 technology by Malaysian students. *Multicultural Education & Technology Journal*, 4(1), 17–29. doi:10.1108/17504971011034700
- Zulkefly, S. N., & Baharudin, R. (2009). Mobile Phone use Amongst Students in a University in Malaysia : Its Correlates and Relationship to Psychological Health. *European Journal of Scientific Research*, 37(6), 206–218.