

Navigating the unbeaten track from digital literacy to digital citizenship: A case of university students in South Africa's Eastern Cape province

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Unlike the millennials from the industrialised world who were raised amidst an increasingly online and socially networked society, their South African counterparts at previously disadvantaged universities have some weaknesses similar to those of digital migrants. These weaknesses are caused by the limited exposure millennials in South Africa have to digital devices and Internet connectivity. In spite of these impediments, their future careers in an increasingly globalised world require them to behave like, transact and engage with full-fledged digital citizens from the global north. Digital citizenship is the ability to use technology safely, responsibly, critically, productively and civically. This raises intellectual curiosity about the extent to which the African millennial is prepared for a world that expects them to be digital citizens. This article, therefore, investigates the challenges faced by the South African millennial as they navigate an unusual route to digital citizenship. We adopted the activity theory for a mixed-methods study that consists of a survey of 148 questionnaires and 15 in-depth interviews. The findings show that while university-going millennials acquire digital literacy, their development of digital citizenship is affected by lack of mentors and access (i.e. connectivity and devices) at home and lack of soft skills training (i.e. online safety, digital etiquette and inadequate information literacy) at the university.

Introduction

Each day the world is becoming increasingly digital/Your students begin to use more and more technology devices at home and in the classroom. But, are they prepared to be good digital citizens? Just as you teach your students the rules of society, it is imperative that you teach them the rules of the digital world, and how to be safe and responsible with technology. (Ribble 2011:14)

The digital competence of young people has been addressed in the literature from different perspectives (Howard 2011; Kritzinger 2016; McMahon 2014; Mossberger, Tolbert & Mamilton 2012; Ribble 2014; Takavarasha, Chinyamurindi & Cilliers 2017; White 2013). White (2013) posits that the 21st century educators need to teach new skills in addition to the traditional ones for them to address the needs of the new era as articulated by Howard (2011).

Drawing from scholars who suggest that technology has changed the mind of people, White (2013) posits that educators must revisit what they teach and how they teach in the information age where students are constantly exposed to technologies. Based on the McLuhan's (1964) dictum which suggests that humans shape their tools and the tools, in turn, shape humans, White (2013) posits that the current state of communication technologies calls for the training of new skills for students to fit in a new paradigm. On this basis, he proposes a new module, 'digital fluency', that must address the continuously evolving needs of the information age students.

This article will argue that what is taught must depend on the needs and background of the learner. The information age student from the global south faces different circumstances and therefore requires peculiar training. In the context of digital exposure, the term 'millennial' is an age-specific term that simplifies and masks the skills and resource gaps between youths from the global north and global south. The assumption that millennials have higher digital competence than their older counterparts has also been debunked by practitioners who found no link between digital nativity and digital skill (IDCL 2014). As will be discussed later, such differences in resources and skills are the ones that shape the millennials' paths to digital citizenship. Farmer (2011:292) defines digital citizenship as 'the ability to use technology safely, responsibly, critically, productively, and civically'.

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As the well-being of people in the information age increasingly depend on the use of information and communication technology (ICT), it is important for educators and parents to promote the acquisition of digital skills. More than mere digital literacy, this paper focuses on digital citizenship as a culmination of both digital fluency and online etiquette (Batista 2003; Jackson 2003). It discusses digital citizenship in the context of developing nations where both digital literacy and access are limited by low income and poor infrastructure. We use Engeström's (2001) activity theory (AT) sensitising an investigation of the importance of social background on the pathway from digital literacy to digital citizenship by South African millennials from disadvantaged backgrounds.

As part of its developmental agenda in an increasingly connected world, the United Nations has set targets for improving ICT skills and access over the next 15 years. For instance, Sustainable Development Goals (SDG) 16.10 aims to ensure public access to information. On the other hand, national governments have also set targets that are aligned with the agenda for 2030 in order to fight poverty and enhance the capabilities of their citizens. In the context of an information-driven economy, it is critical to close the ICT skills and usage capacity gap among their citizens. This calls on educators to focus on the millennials in the underprivileged parts of the developing world who constitute the majority of the young population of the world (United Nations 2015).

In 2013, the government of South Africa launched the National Development Plan 2030 with a view to address livelihoods and capacity gaps among other things (NDP 2030, 2013). The NDP 2030 proposes improvements in school infrastructure including full access to high-speed broadband as well as human capacity. This leaves the ball in the court of educators and parents who are expected to complement each other in developing the millennials into the full digital citizens.

Such an endeavour commences with an in-depth understanding of the unusual road that the young people from previously disadvantaged communities must travel on their way to becoming the information age actor, dubbed the digital citizen. It is only through such an understanding that we the educators can develop digital literacy programmes and bridge the capacity gap between the millennials from previously disadvantaged communities and their counterparts in egalitarian societies.

The route taken by developing countries has been a subject of intellectual debate among digital divides scholars of information systems. That may question our intentions to expect the African digital citizens to be similar to their Western counterparts. Some scholars have problematised the notion of catching up with the West as another doomed attempt to mimic the West at the expense of following our own context development trajectories (Rapley 2004). Whether one views digital citizenship through the lens of context or not, this paper seeks to provide a background for either of the

options by investigating how the African millennials are navigating their way to digital citizenship. The authors contend that human development strategies are strongest when they are informed by a solid understanding of past and present states of a phenomenon against the desired outcomes.

In order to investigate the plight of the millennials from previously disadvantaged communities in developing countries, we conducted this research at a previously disadvantaged university in the Eastern Cape province of South Africa. Most of the students at the university's three campuses come from rural areas that lack electricity and connectivity in the homesteads. There has been a drive by the South African government to improve ICT access as part of its development plan (NDP 2030, 2013). These improvements have not yet reached the wider population and there is a huge cohort of the millennials that will have to acquire digital literacy under difficult conditions. This has been caused by a lack of infrastructure and material and instructional support at both the home and educational institution level.

This article adopts AT for analysing the route that millennials from previously disadvantaged countries navigate on their way to full digital citizenship. The study is meant to unpack the way they develop digital citizenship and then analyses how it differs from the ideal situation that colleagues from privileged communities and developing countries face. It investigates the rules of the community and the tools available to the millennials who are currently enrolled at a previously disadvantaged university in the Eastern Cape province of South Africa. The study assumes that the difference in their development will be because of the rules at home and school, support of community at home and school, and access to tools (ICT access) at home and school. This study uses university students because they are an appropriate unit of analysis for accessing digital citizenship. This is also because they are millennials who have ICT training and constant Internet access at their universities. Because of the aforementioned reasons, it is fair to say that university students have basic qualities of digital citizens as articulated by Mossberger et al. (2012).

The objectives of this research will be met by addressing the following question: what challenges do South African millennials experience in their attempt to become digital citizens and what steps are being taken at the home and educational institutions to develop millennials into digital citizens? To answer this question, mixed-methods research consisting of a survey and in-depth interviews was used at two university campuses in Eastern Cape province. After this introduction, the rest of the study is organised as follows: literature review, theoretical grounding, research methods, findings and discussion.

Literature review

Digital literacy has been a critical issue since the advent of web 2.0 environment when Internet users became potential contributors of information instead of mere recipients.

After web 2.0, the Internet occupies an unprecedented stature as a convivial tool as articulated by Ameripour, Nicholson and Newman (2010). This is because of the continuous convergence of audio, visual and textual technologies, which allows it to surpass Illich's (1973) characterisation of the telephone as a convivial tool. A tool of conviviality is technology, which allows each user to 'enrich the environment with the fruits of his or her own vision' (Illich's 1973:21). It is, however, disturbing to note that the African millennial is yet to fully experience the business, social, and educational benefits of the Internet because of the lack of digital fluency and other constraints (Counted & Arawole 2016). The activity of millennials on social media is an appropriate unit of analysis for assessing the development of digital citizenship by South African millennials. This is because over three-quarters of millennials are on social media (Mackey 2016; Pew Research 2010).

This article presents the ethical, competent, civil and safe user and beneficiary of online facilities as a digital citizen that the African millennial must endeavour to become. As digital citizenship is often confused with many digital competence terms like 'digital nativity', 'digital literacy' and 'digital fluency', it is important to clarify its usage in the context of this study. The terminological confusion emanates from the fact that these terms overlap and they are often associated with a demographic segment that shares age and ICT competence. These are the so called millennials or digital natives as described below. Prensky (2001) refers to digital natives as a generation of technologically savvy people who were born in the digital era. This population segment is also known as the next generation, generation Y and Google generation. They are contrasted with digital immigrants who were born before the widespread use of computers. Unlike the natives, the digital migrants are the Internet users who adopted computing in their adult life.

When Prensky invented the term 'digital natives', he was referring to people born after 1980 (Prensky 2001). His subsequent definition of digital nativity includes 'digital wisdom' to the age component. Digital wisdom goes beyond knowing how to use technologies to include the capacity to critically evaluate and to make pragmatic and ethical decisions in cyberspace. A close reading of Wang, Myres and Sandram (2012) shows that they equate digital fluency with digital nativity. We problematise that definition because we believe that digital fluency can be achieved through training, yet digital nativity is an age-related characteristic that can neither be lost nor acquired.

Another related term is 'digital literacy', which refers to one's capability of, and competence or skill for using ICTs (Gilster 1997). Other scholars use it interchangeably with terms like 'computer literacy', 'information technology (IT) literacy', 'digital competence' and 'ICT competency' as articulated by Wang et al. (2012). Many scholars define digital literacy as a combination of technological expertise and information literacy. In addition, they include the capacity to transform

and communicate digital information in a competent way. This includes critical thinking and evaluation, e-safety, creativity, collaboration, effective communication, functional skills, ability to find and select information, and cultural and social understanding (Binkley et al. 2011; Erstad 2010). Such a definition leaves little difference between digital literacy and digital citizenship and highlights the lack of consensus on the definition of both terms. Ribble (2014) also identifies nine qualities of digital citizenship that are strikingly similar to those of digital literacy. These include etiquette, communication, education, access, commerce, responsibility, rights, safety, and security or self-protection.

The relationship between exposure and digital skills

There is a perception that the people of the industrialised countries are more technologically savvy than those of developing countries. This is based on the fact that ICT access and skills training are better in industrialised countries than they are in developing countries. ECDL (2014) suggests that ICT skills are neither age nor access determined. This questions any idea that the millennials in countries that provide the highest levels of access are any better than those who lack it. They propose that only standardised training can improve superior ICT literacy. While there is an obvious nexus between ICT training and digital literacy, there is no evidence that disconfirms that standardised training is more prevalent in industrialised countries. This calls for an investigation of the effect of access and skills, and hence digital citizenship.

Against this background, the incumbent study endeavours to investigate the digital skill development process of students from previously marginalised universities who also hail from disadvantaged communities. While the literature has shown that they are less exposed than their counterparts from privileged societies, it is important to assess how their underprivileged backgrounds shape their route to digital citizenship (Counted & Arawole 2016). Arguing from a functionalist perspective, Van Dijk and Hacker (2003) identified three Internet inequalities that they related to access. These include psychological access, material access and usage access. Psychological access refers to a lack of basic digital experience because of their lack of interest, computer phobia and the unattractiveness of the new technology. Material access refers to a lack of computing equipment and connectivity. Finally, usage access refers to a lack of digital opportunities by a user who possesses both psychological and material access (Van Dijk & Hacker 2003).

Other studies have related poor digital access to the socio-historical contours of the social exclusionary policies of the apartheid era (Kruger et al. 2006). The long-term effect of these policies contributes to the lack of awareness and low income of the previously disenfranchised communities of South Africa.

Digital training: According to Jochems, van Merriënboer and Koper (2004), optimum implementation of e-learning must combine pedagogical, technological and organisational imperatives. Digital training may be formal or informal; the organisational perspective must include the university and the home environment. The pedagogical perspective is, however, restricted to the formal university and school curriculum. Many computer literate people did not undergo any ICT training. They learned how to use ICTs in school, home or work. This informal training must be viewed as exposure because the prominence of its role suggests that it cannot be downplayed in any assessment of the development of digital citizenship. The other vital perspective of digital training is the tools discussed below.

Access to digital tools: These are the devices, gadgets and various software and hardware artefacts that influence one's ability to learn how to use digital platforms for engaging in social, business and educational activities in a responsible and safe manner.

Relating digital citizenship to development

The focus of information systems (IS) research has been around the potential of IS to improve people's livelihoods using ICTs. Digital divide studies, in particular, have compiled a list of impediments to ICT-enabled development that includes poor access and low ICT literacy among other things. As given as it may seem, it is important to assess the difference between the digital literacy of millennials from the developing world and those from the industrialised world. This will, among other things, show where the gaps are and it is a critical step towards addressing these gaps through the education system.

The Australian Council for Educational Research (2016) identified parameters for measuring digital literacy across different countries. It posits that any global learning assessment of digital and ICT literacy must include aspects of digital and ICT skills that range from basic skill to advanced competent use of ICTs. In view of this, we suggest that the competence of the African millennials must be assessed from diverse levels of digital and ICT skills. The council also suggests that digital learning and ICT literacy should be comparable across industrialised, low-income and developing countries. Finally, it posits that it should permit assessment of all subgroups of people in a population but continue to produce comparable standards across a diverse people.

Research on digital literacy in developing countries like South Africa must follow the Australian Council for Educational Research (2016) model because it captures digital literacy and ICT literacy. This will take the curriculum development approach above the trap of technological determinism, which has been problematised as technological determinism for assuming that social change can take place because

of technological deployment alone (Avgerou 2010). The literature suggests that there is a complex socio-technical interplay where the human actors shape the tools that open possibilities for higher levels of human creativity (Kuutti 1996; Leont'ev 1978). A digital curriculum that acknowledges the dualism between technical competence and information literacy will situate the digital literacy training above the product model of curriculum development which is ideal for artisanal crafts. It will enable the process model, which is amenable to the socio-technical realms of education and information systems (Bednar & Welch 2017).

It must be argued that the information systems domain has been viewed as a craft that requires technical skills development. As a result, some digital literacy educators teach it as another artisanal trade arguably because their graduates are expected to be able to perform certain technical skills in the workplace. Computing or computer science can be a natural science subject which fits the positivist epistemological school. However, its application to different industries has created several new e-world domains that are not amenable to positivism (Klein & Hirschheim 2012). The integration of computing into these disciplines invokes the need to train soft skills, like digital etiquette from the socio-technological lens as articulated by Ciborra (2004).

The research context: The unit of analysis for this study is an institution of higher learning in the Eastern Cape province of South Africa. It is one of the institutions that were underprivileged during the apartheid era. South Africa is a sub-Saharan African country that became a democracy in 1994. The socio-political environment of the apartheid era resulted in social inequalities that still affect South Africans. It has a Gini-coefficient of 0.66–0.7, which makes it one of the most highly unequal countries in the world (Mail & Guadian 2018).

South Africa's apartheid has been widely documented for its impact on the social progress of previously disadvantaged communities of black people. In addition to their educational (Hale 2010; Keswell 2004) and economic endeavours for these communities, through its homeland policy, the apartheid system separated South African education along the lines of the ethnic enclaves that shaped separate economies for black people and white people. It also resulted in the migrant black labour force which left schoolgoing kids under infirm and elderly people. This is said to have created social ills that negatively affected the education of black students (Rakhometsi 2008). The same phenomenon is said to have also affected the post-apartheid reconstruction efforts that were meant to reverse the institutionalised inequalities (Thobejane 2013).

The institution under study is a previously disadvantaged university, which is mainly attended by students from impoverished rural areas in the Eastern Cape. It is situated in the former Ciskei. The Eastern Cape has been reported to have the second lowest Internet access at 37% in South Africa.

At least 11.3% of the population access the Internet through educational institutions and Internet cafes, while in 2014 the majority of the population (80%) accessed the Internet through mobile devices (MyBroadband 2015). While the institution has three campuses, this study was conducted at the two biggest campuses. Most of the students who are enrolled at these two campuses are below the age of 23, unlike the third campus where the student profile tends to lean towards more mature, working adults who are outside the target population of this study.

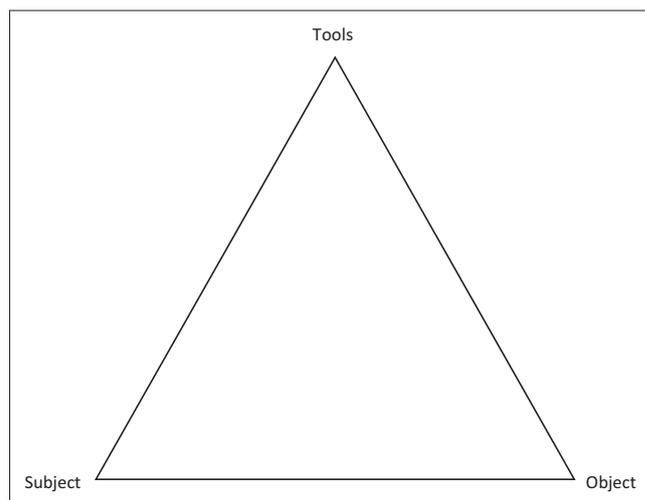
Conceptual framework: Activity theory

The interaction between human actors and technology has been analysed through different socio-technical theoretical lenses by IS scholars. Of particular interest are Latour's (1994) actor-network theory (ANT), which sees no difference between human actors and artefacts, and Vygotsky's (1978) cultural-historical activity theory (CHAT), which draws a distinction between the two. In this study, we adopt AT, as it allows us to analyse the development of digital citizenship in the context of developing countries. Activity theory is ideal for this process because of its ability to conceptualise human actors' use of tools (like ICTs) to act upon objects in order to get a certain outcome in an activity system which is governed by contextual rules and roles or agency of different actors.

We adopt AT for the purpose of analysing the way human subjects (i.e. young people in the developing world) interact with ICT tools as they navigate a particularly unique route to digital citizenship. Activity theory also allows us to assess this interaction in a context-specific manner. Various IS scholars have emphasised the need for contextualism in unlocking the ingredients of appropriate policy and emancipation of its users (Johnson et al. 2009).

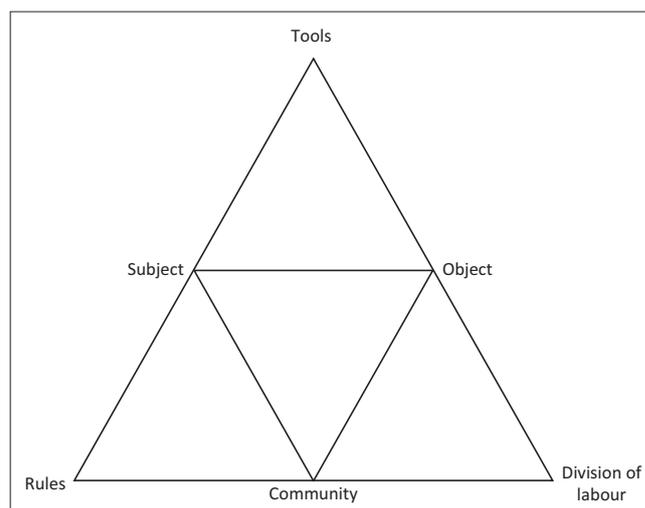
Activity theory suggests that a subject uses tools to act upon an object within the context of an activity system. It was founded in 1920 by Vygotsky, Luria and Leont; entered the Western world in the 1970s; and was popularised in the Western world by Yrjo Engestrom through his work at the Center for Research on Activity, Development and Learning (CRADLE). This theory has evolved from the first generation to the third generation and there is an ongoing effort to develop its fourth generation version. The first-generation AT is presented in Figure 1, while the second-generation AT is presented in Figure 2.

Activity theory provides a rich analytical technique for identifying tensions and contradictions that arise from the interaction of actors in an activity system. It is based on the assumption that knowledge is built through an understanding of the interaction between tools and artefacts. In addition to the transformation that the subject inflicts upon the object, the subject is also influenced by the object, thereby forming an interactionist activity system (Kuutti 1996; Leont'ev 1978). This interaction takes place in an activity system and it



Source: Robertson, I., 2008, 'Sustainable e-learning, activity theory and professional Development. In Hello! Where are you in the landscape of educational technology?', Proceedings ascilite Melbourne 2008, viewed from <http://www.ascilite.org.au/conferences/melbourne08/procs/robertson.pdf>

FIGURE 1: First-generation activity theory.



Source: Robertson, I., 2008, 'Sustainable e-learning, activity theory and professional Development. In Hello! Where are you in the landscape of educational technology?', Proceedings ascilite Melbourne 2008, viewed from <http://www.ascilite.org.au/conferences/melbourne08/procs/robertson.pdf>

FIGURE 2: Second-generation activity theory.

presents the activity as its key unit of analysis. As the activity is key, the analysis must identify the significant activities and their subject and object (Hasan & Kazlauskas 2014).

Activity: An activity is defined as a holistic and high-level construct like conducting a project (Leont'ev 1981). It is a more comprehensive process than the word 'activity' is understood in English. Hasan and Kazlauskas (2014) posit that the activity is situated much higher up the hierarchy of subactivities or goal-oriented actions and operations that are executed in the process of achieving the overriding goal. Kaptelinin (1996) posits that an activity must be understood in the context of the cultural and historical environment in which it is embedded.

The subject is the doer that acts upon the object and it is the central actor in a particular activity. As a result, the

researcher must analyse the activity from the subject's perspective. The object is the deed or the thing being done. It is, therefore, the endeavour that the activity is meant to achieve. It embodies the problem situation or the objective of the activity system (Spinuzzi 2011). The tools are the apparatus that mediates between the subject and the object to bring out the outcome, which is the desired result (see Figure 1).

The rules are the cultural norms and regulations that determine or shape the interaction of players with the activity. These include the government policy, strategic plans of the institution or organisation, and discipline-specific rules that must be complied with by the subject in the process of executing the activity. The division of labour component captures the different roles that are performed by different players towards the execution of the activity. It is, therefore, critical to assess which player performs what role in the activity. Finally, the community represents the environment and the context under which the activity is being carried out.

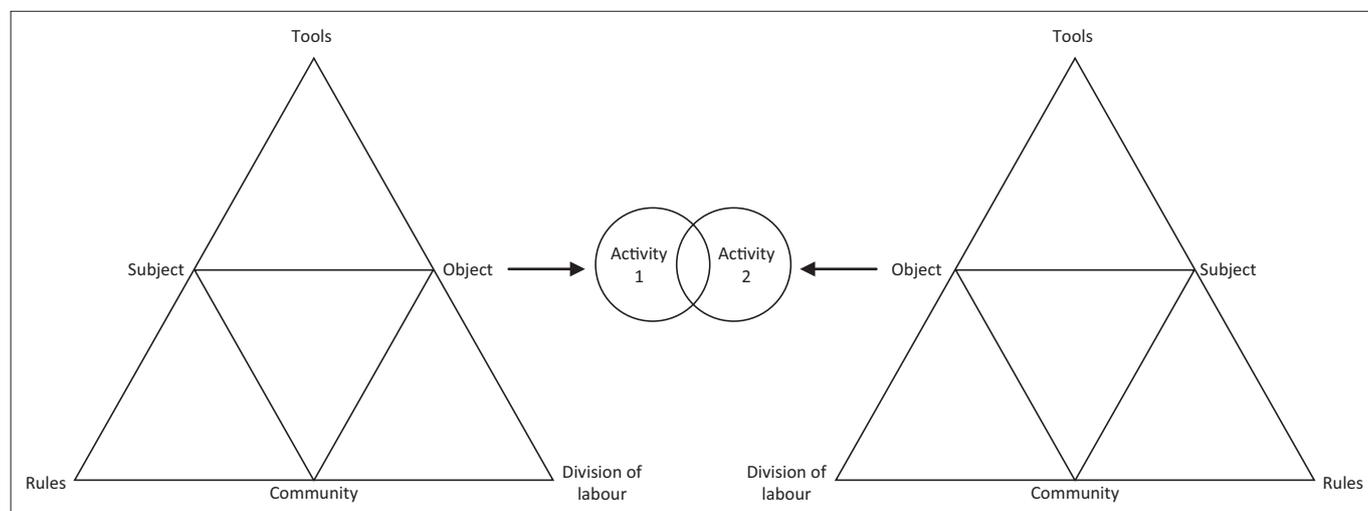
Activity theory is depicted in three distinct generations, namely, the first, second and third generations. The first-generation AT simply consists of a subject and an object that are mediated by tools (Robertson 2008) (see Figure 1). The second-generation AT, however, places the activity at a collective level by including the rules, community and division of labour that affect the undertaking of the activity (Engeström 2001).

Finally, the third-generation AT expands on the second-generation AT by including connected activities (see Figure 3). The dual-activity system depicts the outcome of the interaction of two activities when they come into contact with each other to produce an outcome (Engeström 2001). This study, therefore, adopts the third-generation AT because of the two digital exposure activity systems (school system and home system) that we analyse in the development of the emerging African digital citizen.

Applying activity theory to the development of digital citizenship in South Africa

Mwanza and Engestrom (2003) present eight parameters that can be used for identifying and analysing the contradictions and tensions that can arise from the interaction of actors in an activity system. In the following section, we discuss each of them as they apply to the development of digital citizenship in South Africa:

- **Activity:** when analysing an activity system, Mwanza and Engestrom (2003) propose that we ask what sort of activity we are interested in. Our application of AT to the development of digital citizenship in South Africa is interested in analysing the learning process that young South Africans undergo in their endeavour to become digital citizens. This must open the challenges and opportunities they experience as they endeavour to become full digital citizens.
- **Object(ive):** in answer to the objective component of AT, Mwanza and Engestrom (2003) admonish the researcher to ask 'Why is the activity taking place?' The activity (development of digital citizenship) is taking place because the brick and mortar world is now shifting into the e-world where social, business and educational activities are now taking place in cyberspace. Digital citizenship will enable young South Africans to fully participate in the digital era with the right 'norms of behaviour for the use of technology' (Ribble 2014:2) and to have 'a sensible and reasonable approach to online interaction' (Miles 2011:1).
- **Subjects:** this refers to who is involved in carrying out the activity. The young South African university student is the one from whose perspective the activity will be analysed. We contend that this must not be taken literally because when viewing the activity through the lens of the subject like a student, the subjects may not have an all-round view of the entire system. As a result, our analysis



Source: Robertson, I., 2008, 'Sustainable e-learning, activity theory and professional Development. In Hello! Where are you in the landscape of educational technology?', Proceedings ascilite Melbourne 2008, viewed from <http://www.ascilite.org.au/conferences/melbourne08/procs/robertson.pdf>

FIGURE 3: Third-generation activity theory.

of critical elements that the subjects are not exposed to will lack verbatim evidence but rather the reviewers' analysis.

- **Tools:** this refers to by what means the subjects are performing the activity. The tools in this activity are ICTs and online platforms such as social media and commercial as well as educational sites. Our application also includes the technological gadgets like mobile phones, personal computers and Internet connectivity. This is because we view connectivity as an enabler without which communication modes like social media will be impossible.
- **Rules and regulations:** these indicate any cultural norms, rules or regulations governing the performance of the activity. The rules and regulations include the rules that govern access to and use of ICT tools and the platforms like social media and commercial as well as educational sites. These constitute a key aspect of context as they define what is possible in the current environment.
- **Division of labour:** this component indicates who is responsible for what when carrying out an activity and how those roles are organised. This refers to the various roles that are being played by teachers and parents and/or guardians in helping the development of digital citizenship. We also include the students on the list of the specialist actors that perform the above roles.
- **Community:** it refers to the environment in which the activity is being carried out. The community and the environment in which the activity is unfolding are the university community and the home community. The university includes the halls of residence because they are part of the university system. The home environment is the area where the student comes from, whether village or urban, and its community, like public libraries, shopping centres and community amenities. This includes the parents, guardians, teachers, neighbours and friends of the young people.
- **Outcomes:** It refers to what is the desired outcome of carrying out the activity. The desired outcome is for the emerging South African digital citizen to develop the full qualities of a digital citizen that are described in the next section, that is, to identify and strategise the execution of what is necessary to develop a millennial who can participate in the digital engagement safely, responsibly, productively and civically (Mwanza & Engstrom 2003).

Methods and approach

This study used Engeström's (2001) AT as a conceptual lens for identifying and analysing the challenges that are faced by South African millennials in their attempt to become digital citizens. We used the third-generation AT for assessing any tensions and contradictions (Engestrom & Sannino 2011) that may exist between the university and the home communities that are grooming the African millennials into digital citizens. The study operationalised the components of third-generation AT on the home and university activity systems. We adopted an interpretivist paradigm as articulated by Klein and Myres

(1999). As a result, this led to our writing style in the first person to declare the internal realism perspective from which we (the authors) interpret the research findings. While AT is often viewed as an epistemological stance, we complemented it with two key principles of interpretive case studies to enhance the conceptualisation of both contradictions and contextualisation (Klein & Myres 1999). These are the principle of dialogical reasoning, which requires 'sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings', and the principle of contextualisation, which calls for 'critical reflection of the social and historical background of the research setting' (Klein & Myres 1999:72).

In addition to the challenges faced, we investigated the capacity gap by assessing the African millennials' situation against the ideal expectations of the digital citizen as articulated by Al-Zahrani (2015). A sequential mixed-methods research approach consisting of a low-resource survey and interviews (Creswell 2009) was used for collecting data on the capacity gap of the upcoming South African digital citizen. A sequential mixed-methods design was chosen to enable the researchers to analyse and reflect on the findings from the first phase before proceeding to the second phase. This was done through a research design that combines exploratory and confirmatory research phases.

A total of 148 questionnaires were administered to students at two campuses of a university in the Eastern Cape province, followed by 15 interviews. The interview guide for the qualitative research phase was, therefore, designed for getting an in-depth understanding of the reasons behind the survey findings. While the interview phase was mainly confirmatory, it was also used for exploring the gaps emanating from the methodological limitations of the quantitative phase. This, therefore, employed the in-depth interview for conducting both exploratory and confirmatory investigations on the themes which could not be investigated using closed questions that were employed in the survey phase.

The quantitative phase uses a survey for investigating quantifiable aspects of digital citizenship through a self-assessment of digital competence on a Likert scale. It focuses on Facebook since it was found to be the main driver of Internet uptake in Africa (RIA 2012; Stork et al. 2013). It is the most highly used Internet site by the millennials who constitute 42% of South Africa's Facebook users (Kemp 2016; Mackey 2016). This probes digital citizenship themes like personal security, digital skills and frequency of usage, while digital etiquette and information literacy are assessed through semi-structured interviews. The questionnaire was designed as closed questions in the form of a Likert scale with four options, which include disagree = 1, disagree strongly = 2, agree = 3 and agree strongly = 4. Based on our previous experience, the neutral option was excluded in order to discourage students from using it to avoid answering survey questions.

We attempted to design simple and easy questions to ensure that the respondents would get the same message without misunderstanding them. A pilot study was conducted in order to validate the questionnaire for user-friendliness. A few snags were identified through user feedback and these were documented and used for refining the final version of the questionnaire. The ethical approval to conduct the study was granted by the University of Fort Hare Research and Ethics Committee.

Data analysis

Quantitative data were analysed using SPSS, while qualitative data used a drawing from selective use of grounded theory analysis approach. The data were cleaned and imported into SPSSV24 where descriptive and test statistics were conducted using frequencies. The qualitative phase used selective coding (Glaser 1992) by drawing from the selective use of grounded theory methodology for analysis only as articulated by Matavire and Brown (2011). After the first two interviews, a preliminary coding of the

TABLE 1: Demographics and frequencies.

Item	Category	Frequency	%
Gender	Male	65	43.9
	Female	83	56.1
	Total	148	100
Current year of study	1st year	3	2.1
	2nd year	64	43.2
	3rd year	61	41.2
	4th year	20	13.5
	Total	148	100.0
How often do you use social media?	Several times a day	104	70.3
	Daily	13	8.8
	Several times a week	25	16.8
	Once a week	4	2.7
	Less than once a week	2	1.4
Total	148	100.0	
Please indicate your level of experience with social media	Excellent	47	31.8
	Good	73	49.3
	Average	26	17.4
	Poor	2	1.4
	Total	148	100.0

TABLE 2: Frequencies.

Description	Strongly agree		Agree		Strongly disagree		Disagree	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
I am not concerned about the privacy of the information about me that is posted on Facebook.	18	12.2	24	16.2	49	33.1	53	35.8
I feel confident that I have the skills to protect my privacy on Internet sites.	17	11.9	42	29.4	34	23.8	50	35.0
It is very important to me that I am aware and knowledgeable about how my personal information will be used when I post it on Facebook.	58	39.2	67	45.3	9	6.1	8	5.4
I am not aware of how my social network may use information that I post on my profile.	25	16.9	69	46.6	41	27.7	11	7.4
I know the extent to which my information will be accessible to other people.	22	15.2	57	39.3	18	12.4	47	32.4
Advertisers use my social network profile information to send me ads targeted to me.	29	19.6	55	37.2	44	29.7	17	11.5
I would not mind if an employer saw what I posted on my profile.	33	22.3	51	34.5	33	22.3	29	19.6
I am careful about the pictures I post of myself on my profile.	99	66.9	37	25.0	7	4.7	5	3.4
I read the privacy statement provided by the site before I enter personal information.	22	15.7	58	41.4	19	13.6	41	29.3

data was conducted. The coding process was repeated after each interview to assess the emergence of new codes. The process seemed to have reached saturation after the researchers conducted 15 interviews.

Research findings

This section presents the results of both the survey and interviews. In Table 1, the demographic distribution of the participants shows that more female students (56%) participated than male students (44%). It also shows that more second- and third-year students (84%) participated than fourth- and first-year (16%) students. About 81% had a good and excellent experience with social media, while over 70% used social media several times a day.

The descriptive statistics show that most of the student (55%) were aware of how the personal information posted on the Internet will be accessible to other people. Only 51% knew that the junk mail they received was related to the information they posted on Internet sites. The descriptive statistics for the rest of the questionnaire is provided in Table 2.

Phase 2 result

This section presents a summary of the results of the qualitative research phase in Table 3. The findings on each of the components of the AT are categorised according to both home and the university activity systems. This is meant to make it easier for the reader to compare and contrast the findings from the two activity systems.

The interaction between the university and the home systems

Activity outcomes: The university and the home systems are complementing each other to produce an incomplete digital citizen who has more technical skills than digital etiquette. This is because of inadequacies on both university and home communities (see Figure 4).

TABLE 3: Quotes from interviews divided per variable

Variable	University	Home
Subject	<ul style="list-style-type: none"> 'I am from a very small town called Flagstaff. I grew up in rural areas and I came here when I was 19 years and there was a course for computers in my first year and that was the first time I learned to use a computer'. (A1, Female, 19) 'I was 19 years in 2012 and I learned for the first time in university. There was an orientation day and we were supposed to write a test during our first-year registration. I wrote the test and failed but then it was just a test to check if I am able to use the Internet and computer and then I learned by myself'. (Ti4, Male, 20) 'I haven't been formally trained but just from my general knowledge I am able to identify valuable information just by looking at the source of the information and the content of the information'. (Si8, Female, 20) 'No I have never been taught on how to buy online or how to treat others; I have bought something online and I wouldn't really say I have been taught. On how to protect myself or my own privacy because I think for me it comes with what you want to be exposed to on the Internet and I just limit the information I put on the Internet especially about myself, so I would say for me it has always been a self-taught skill'. (Si5, Male, 19) 	<ul style="list-style-type: none"> '... No, I got my first smartphone this year and at home I had my first phone when I was doing grade-10 called V360 for calls and text messages'. (A1, Female, 19) 'There is a huge gap and need for training. If I can give you an example of my Dj career, some other things that DJs write are too offensive... because those guys are illiterate.' They just know how to play music and they can't really deal with criticisms from social media and other people. It's like you are running a business and so some people will always complain that they don't like this and that...and these guys would take it negatively but me I would always take it differently because I have got those skills'. (Mi3, Male, 21) 'I have never used the Internet to buy anything, you know when you are not used to these digital things and you hear people saying there are scams in buying things online, then you become scared even when you want to buy ...'. (Si8, Female, 20) 'Yes, she did teach me and even at school we were taught that we must not just use the Internet anyhow because one day you are going to get a job and they will check your character on the Internet and even Facebook. Then it will be difficult for you if they find something negative to be hired for certain job position or even at all because of what you once posted on the Internet'. (Mi3, Male, 21)
Subject conclusions	<ul style="list-style-type: none"> Learned Internet at university No e-commerce exposure No information literacy training 	<ul style="list-style-type: none"> Late smartphone adopter No digital etiquette training No e-commerce exposure Warned to be modest on social media
Rules	<ul style="list-style-type: none"> '... they restricted us to not download movies or listening to music online. Well it's good for the institution but for us, it's not because sometimes when studying we need to take a break and listen to music or watch something to refresh'. (Ki14, Female, 20) '... there are rules which one has to agree to when logging in to the university networks and these rules govern what you can do here. The rules state that you can't do things like visit porn sites, downloading movies and other stuff'. (Pi15, Male, 22) 'We are allowed to use our devices in class as long they don't disturb lectures'. (Mi3, Male, 21) '... we are only allowed to do things that are regarded as part of school work and doing things like watching movies online is forbidden'. (Si9, Female, 19) 'I think the Wi-Fi needs to be improved, the software needs to be updated to the current versions, and also they should allow us to use some services like torrents. We should be allowed to enter the labs with our own laptops as currently, they won't allow us because they don't want people stealing the laptops in the labs.' (Si9, Female, 19) 	<ul style="list-style-type: none"> 'No there are no rules and that is because they have no much knowledge about the Internet and the only thing that they would say is that I am old enough to know not to do something that would be offensive to other people or too private. Also that you can stay on the phone while you have something you should be doing or you can't be on the phone while eating, so the rules are such things only'. (Si8, Female, 20) 'Yes, I think there are rules [home] because you can't really do those things, you have to ask for permission to use the internet for academic purposes only and maybe you can then when they are not around do your other stuff but you can't access the internet for anything other than academic [purpose]'. (Mi3, Male, 21) 'It depends because we are not allowed to be on our phone while dining as a family or during the sleeping time but our parents don't really have much control on that so there are no rules I can say'. (Ti3, Male, 22) '... not rules but WhatsApp is always an issue with parents when you always on it but then when they refuse me WhatsApp I can always go out and be with my friends and do my WhatsApp, as long as I have done all my duties and back in the house at right time'. (A1, Female, 19)
Rules conclusions	<ul style="list-style-type: none"> Access to bad sites is blocked Not allowed to download drama series Allowed to use own devices 	<ul style="list-style-type: none"> No parental rules about Internet use Excessive use and use during dinner
Community	<ul style="list-style-type: none"> 'No, I don't have friends who know better than me in using the internet ... Yes, they [Lecturers] do give me enough information I need because most of the things I know is because of them'. (Ti3, Male, 22) 'I learned here a lot from my friends, I didn't learn anything from ICT and lecturers because even though there is a computer lab in my department we were told to do books when we want to access it'. (A1, Female, 19) 'Yes, I had two friends: one doing a B.Comm General and the other Economics. We used to do CLT practical together and since I was struggling with computers a lot they helped me a lot'. (Ki14, Female, 20) '... but I have friends who still post their nude pictures online or share derogatory statement online which are things that may cost them in the future because I heard employers look at your online activities. I think they need to be taught more about avoiding things like that'. (Pi15, Male, 22) 'Yes, I remember very well the lecture was by Dr N. She spoke about cyberbullying and that we should respect others. She also spoke about restricting the amount of information you give out online and on social media to avoid cyber bullies'. (Ki14, Female, 20) 	<ul style="list-style-type: none"> 'In the rural areas there is really nothing much you can learn there; there's not much support they can give you like in my rural community most people are illiterate and even my own parents are not educated, so they don't really know much about those things to be able to offer any support'. (Mi3, Male, 21) 'Specifically using the internet I was never taught at home, using Microsoft I was taught that at a community centre but unfortunately they didn't have internet; they were just teaching basic Microsoft Word and Excel. Accessing internet there was no one to teach, you would go to the internet café and get someone to assist you by connection, how you do it is your struggle, no one teaches you'. (Mi2, Male, 22) 'In rural areas one thing is that people who have already acquired skills should be able to teach those who don't have the skills, but; they move out of the village to the city and we are left alone to hustle the skills on our own; when they come back, we have already got the skills on our own and some of them become very interested to assist there and there in improving what we already have'. (Mi2, Male, 22) 'In my township community some of my friends have access to these things and I can go to their homes and be able to access the internet as much as I want unlike at my home where it is limited and restricted by rules and I can get also skills and knowledge from them by asking of what I don't know and they tell me because they are much informed'. (Mi3, Male, 21)
Community conclusions	<ul style="list-style-type: none"> Educators Friends and/or fellow students 	<ul style="list-style-type: none"> Parents, siblings; friends Internet cafes, libraries
Division of labour	<ul style="list-style-type: none"> 'They [ICT support] give me support like ICT when I have a problem with my laptop I do go to them and they fix it for me so that I can be able to use it and also access the internet ...'. (Ni6, Female, 20) '[ICT support] they do not assist us with the learning but they help with setting up our login profiles, our emails and printing our student cards'. (Si9, Female, 19) 'Lecturers also do support like they give us support on how to access information especially about certain projects that they give us'. (Ni6, Female, 20) 'The tutors move around helping the struggling students but often we are taught as a group and some people can't understand things quickly and the class may even end and they still do not understand what we were learning'. (Si9, Female, 19) 	<ul style="list-style-type: none"> '[Siblings] my sister who is 5 years older than me taught me most of the things about technology, how to use a phone and most of the things I know now I learned from her'. (Si8, Female, 20) '[Friend] I can't say I learned something (from friends) because the community I come from is a bit behind; in fact, I had to be the one teaching them when I went home'. (Si15, Female, 22) '[Neighbours] I had a neighbour who was studying engineering at Ibika. He was advanced in technology so I used to follow him. He owned a computer and a smartphone and I was always with him. However, I was young then and all I knew about technology was watching movies on his laptop. He was the person who motivated me to get an interest in the computer world'. (Si10, Male, 22) '[Parents] at my home there is no one to help me with the money to buy bundles because no one has it'. (Oi6, Male, 19)
Division of labour conclusions	<ul style="list-style-type: none"> Technical support from ICT Helpdesk Academic content from lecturers Practical assistance from fellow students 	<ul style="list-style-type: none"> Parents provide funding Siblings and friends give assistance Internet cafes and libraries provide access

Table 3 continues on the next page →

TABLE 3 (Continues...): Quotes form interviews divided per variable

Variable	University	Home
Tools	<ul style="list-style-type: none"> '... here at school, I have free Wi-Fi all the time... So on a daily basis, I would say I get about 9–10 h of internet access'. (Si8, Female, 20) '... almost 90% of my classmates have laptops and 99.5% have smartphones'. (Ai1, Female, 19) 	<ul style="list-style-type: none"> 'At home [access] is a struggle with expensive data as you know... I can't even use my laptop because connecting it to the internet is very expensive at home, so I use my phone'. (Ai1, Female, 19) 'Flexibility is serious caution and the fact that you can't compare desktop with the phone then you can't really be flexible on the phone as you would do on a desktop'. (Mi2, Male, 22) 'We have limited resources when it comes to technology in the Eastern Cape and the teachers seem to not take technology serious and they do not dedicate time to teach students how to use computers. There is also a lack of internet connectivity. I started to hear about Wi-Fi when I got to university'. (Ki14, Female, 21)
Tools conclusions	<ul style="list-style-type: none"> Computers Smartphones Free Wi-Fi 	<ul style="list-style-type: none"> Smartphones Data Bundles

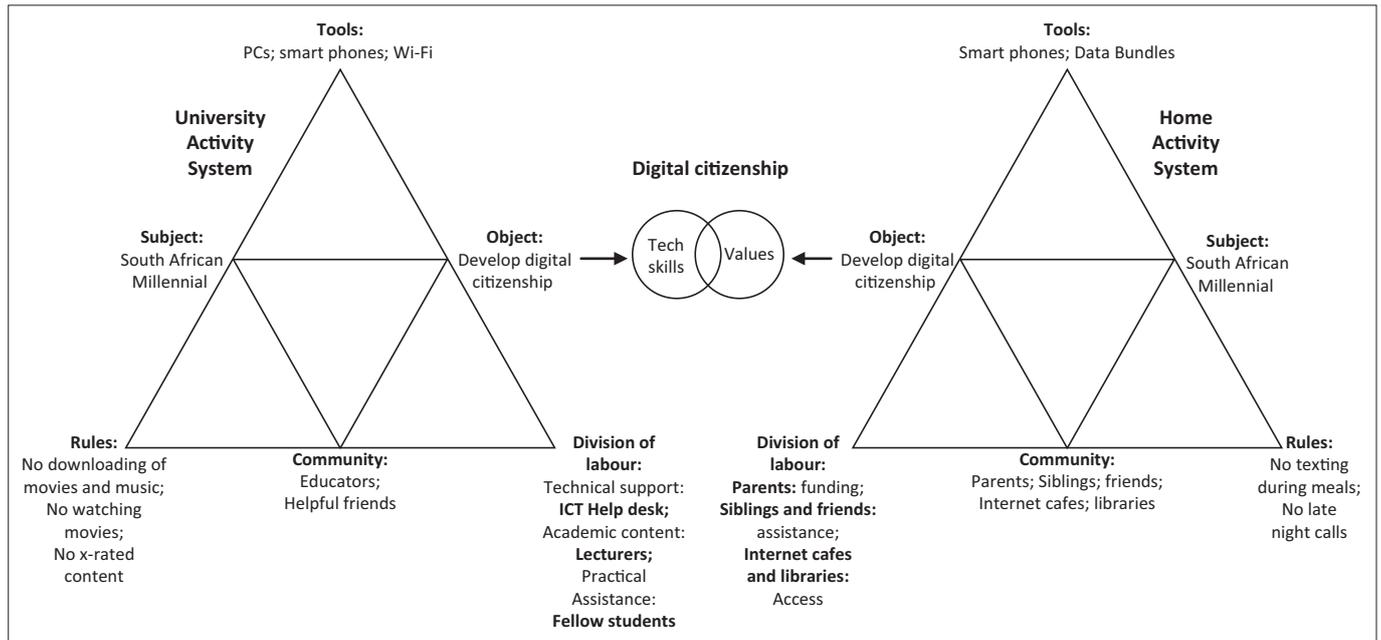


FIGURE 4: University and home activity systems.

The university activity system: It is teaching technical skills for students to be productive during their university education and future work.

The home activity system: This system is funding the student's education and giving no further assistance than the values and the mores that are inculcated during the student's upbringing. It is failing, however, to complement the skills developed at university because of inadequate connectivity, mentorship and lack of devices in some cases.

Tools: The ICT tools that are available to the students at home are fewer than what they have in the university activity system. In addition to the personal devices like laptops and smartphones that some of them also have at home, they also have university Wi-Fi and computer labs at their disposal.

One participant puts it:

'At home [access] is a struggle with expensive data as you know... I can't even use my laptop because connecting it to the internet is very expensive at home, so I use my phone.' (Ai1, Female, 19)

There is, therefore, no continuity of access which is essential for continuous digital exposure.

Rules: The home activity system has no rules that control the online activity of the millennials. The rules at home tend to regulate when not to use ICTs rather than the student's online behaviour, as one participant advised:

'No, there are no rules, and that is because they have no much knowledge about the internet and the only thing that they would say is that I am old enough to know not to do something that would be offensive to other people or too private. Also that you cannot stay on the phone while you have something you should be doing or you can't be on the phone while eating, so the rules are such things only.' (Mi3, Male, 21)

Division of labour

The findings show less enabling actors in the home compared to the university activity system. For instance, very few participants had any influence from friends, neighbours and institutions like libraries while they are at home. This is because of the lack of capacity, as well as rural to urban migration, as respondent Mi2 put it:

'In rural areas one thing is that people who have already acquired skills they would be able to teach those who don't have; they move out of the village to better city and we are left alone to hustle the skills on our own.' (Mi2, Male, 22)

Participant Si10 who comes from an urban community had a different experience:

‘I had a neighbour who was studying engineering at Ibika. He was advanced in technology, so I used to follow him. He owned a computer and a smartphone, and I was always with him. However, I was young then, and all I knew about technology was watching movies on his laptop. He was the person who motivated me to get an interest in the computer world.’ (Si10, Male, 22)

As discussed later, the university system had technical training, helpdesk backup and peer assistance.

Community

Unlike the university, which had an ICT helpdesk, lecturers and peers that can help, the home activity system had some parental guidance and little technical help from a few libraries and Internet cafes.

Participant Mi2:

‘Specifically using the internet I was never taught at home, using Microsoft I was taught that at a community centre but unfortunately they didn’t have internet; they were just teaching basic Microsoft Word and Excel. Accessing internet there was no one to teach, you would go to the internet café and get someone to assist you with connection; how you do it is your struggle, no one teaches you.’ (Mi2, Male, 22)

Discussion

In this section, we discuss the findings presented in the previous section in line with the objectives of this study. Our analysis shows that the challenges that are being faced by the South African millennials in their endeavour to become digital citizens emanate from university curriculum, as well as their historical background and socio-economic situation. While our research findings show that they must make do with inadequate Internet access at home, their digital skills are acceptable. This is because they are compelled to acquire digital literacy at university and also because they are active on social media. They, however, lack digital citizenship qualities, for example, the ability to protect their personal privacy on Internet sites. About 81% rated their social media experience as excellent or good, while only 41% of them were

confident in their ability to protect themselves on Internet sites. They also need to teach themselves the soft skills (like digital etiquette) and e-commerce that they are not being taught at university. Our research revealed that while the university system has scope for incubating good digital citizenship, the current syllabus, unenforced rules and poor access on the home front make it difficult for millennials to develop digital citizenship. Figure 5 presents a high-level summary of the main barriers that inhibit the development of digital citizenship both at home and university activity systems.

Third-generation AT enabled a comparative investigation of the home and university systems that are expected to complement each other in the process of developing South Africa’s millennials into digital citizens. The research findings show tensions and shortcomings between the two systems. These tensions and some constraints – socio-economic and historical contextual factors – have a negative impact on the development of digital citizenship. The university system was technocentric and the home system had an indirect impact on ethics. Instead of collaborating in both training and provision of technology, that is, connectivity and ICT devices, we found that the home community did not allow the students to perpetuate the technical training acquired at university. On the other hand, the university was not enhancing the ethical values from home. This is because of the lack of mentors and digital tool (i.e. devices and connectivity) at home, as well as the technical focus of the university curriculum.

As a result, the combination of both systems failed to produce digital etiquette. This leaves it all to chance as interviewee Mi3 put it:

‘I think it is a state of mind because, on my Facebook, some people would post things that I feel they are offensive to others. To me, I think it is a different story which goes with who you are and whether or not you care about other people. So I wasn’t really taught how to behave on the internet, I think I do my best and maybe I am not doing right according to other people.’ (Mi3, Male, 21)

The contradiction within the home activity system is that the student has morally unfettered access without any cyber

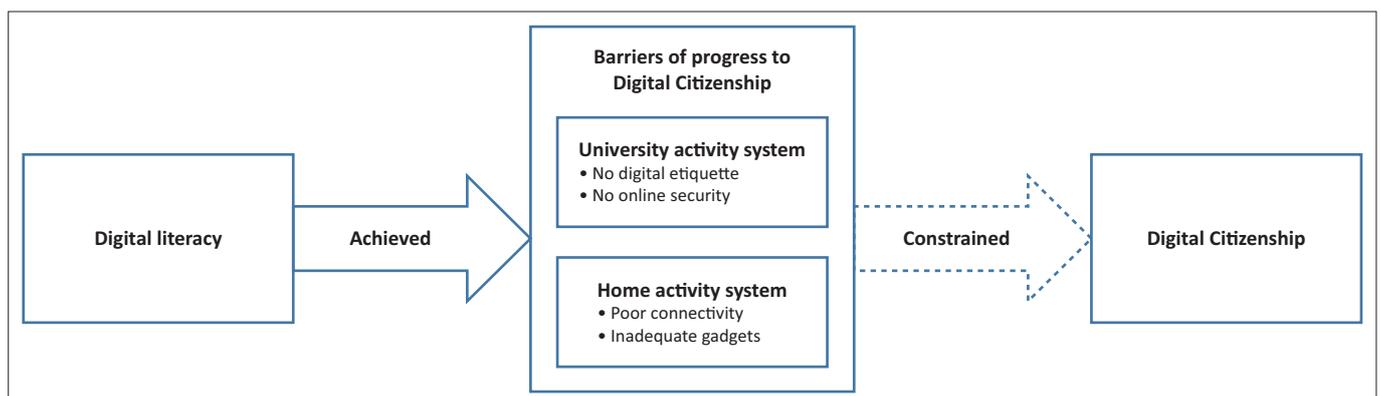


FIGURE 5: The barriers that inhibit the development of digital citizenship.

ethics rules at home where their ubuntu (humanness) is expected to come from. Olinger, Britz and Olivier (2005) describe 'ubuntu' as an African ideology whose ethical values are capable of solving Africa's political strife and ethnic conflict. We found that some ubuntu cultural values from one's upbringing (i.e. from the home system) were said to contribute towards responsible online behaviour. This is, however, affected by the knowledge gap that develops between parents and students. It is also exacerbated by the concomitant change in the students' status when they return from university to their underprivileged community. The students acquire respect as the educated digital expert; yet they still need the community's moral guidance in their ongoing transition from digital literacy to digital citizenship.

As the interviewee Ki14 put it:

'at home, there are no rules they don't mind if I'm using my laptop.' (Ki14, Female, 20)

We found that this is because the parents have no capacity to monitor the student's online behaviour as they do on offline platforms. The irony is that where connectivity allows, the students are freer at home to do what they cannot do at university; yet the home is supposedly the bastion of ubuntu. These contradictions in the activity system (Engestrom & Sannino 2011) must be viewed from the causal effects of their historical context as articulated by Moulder (2016). South Africa's apartheid legacy is responsible for the illiterate parentage, access gap and resource gap identified in the underprivileged communities where the majority of millennials came from.

The university activity system was found to be playing a significant role in providing basic skills, exposure to mentors and unlimited access. The university was, however, lacking in the development of millennials who can use technologies responsibly, safely, critically, productively and civically as expected from digital citizens (Ribble 2014). This is arguably because the university operates in silos and therefore no department has a specific endeavour to train the virtues of digital citizenship to every student. The students, therefore, need to develop these virtues on their own.

As participant Pi15 advised, they were never taught to post positive content. He does it because his sister was once raped:

'I can't say I have been taught but I would like to believe some of the content I post on my twitter is productive. For example, when I post about things like rape because it is a subject I care about sharing since my sister was once raped.' (Pi15, Male, 22)

Another respondent Ti4 expected students to learn digital etiquette on their own. She suggested that those who suffer cyberbullying are unaware of the tools provided by social media platforms. In her words, she said:

'... it's just that people are ignorant, for example, if you are using Facebook, it tells you that this is how you should conduct yourself, like if someone posts something that I don't like then I

have a right to report it so it can be removed. So everyone who is using the internet knows, it is just that they are reluctant to learn about how to conduct themselves.' (Ti4, Male, 20)

An analysis of the university's rules shows the contradiction of willingness to tackle cyber mischief, as well as an unwillingness to teach their students to confront it and overcome it when they get exposed on unrestricted platforms like their own devices. In other words, they impose rules that address the symptoms without developing the student's capacity to withstand the online vices that they will face outside the university network. By blocking access to unacceptable sites without teaching civility and responsibility, they are missing the opportunity to prepare their students for the unbridled access that they have on the home system. This may arrest some contagion at the university, but it forfeits the opportunity to teach digital citizenship, more so because there is no university curriculum that teaches digital etiquette.

Our research reveals that the ethics and etiquette that the participants purport to possess emanate from their upbringing and less from formal training. There are, however, some isolated degree programmes that were found to be instilling values that may foster digital civility in the students. This includes a course in nursing and another in information systems.

A nursing student Mi3 said:

'We are also taught in our courses in nursing departments how to interact with other people and not harm them'. (Mi3, Male, 21)

An information systems student also advised that they had learnt about personal security and cyberbullying:

'... yes I remember very well the lecture was by Dr Ni. She spoke about cyberbullying and that we should respect others. She also spoke about restricting the amount of information you give out online and on social media to avoid cyber bullies.' (Mi3, Male, 21)

As can be seen in Figure 2, the tools that facilitate access and training and usage do not facilitate continuous learning. The access limitations of the home system do not complement unlimited access at the university. When the student leaves university for semester break or after-hours as well as on completion of studies, they access changes from unlimited (Wi-Fi) to intermittent if not non-existent (data bundles). Continuous learning is necessary in a fast-changing domain like ICT literacy where new technologies must be matched with further studies. Our concern is that the inhibitors (like access cost and lack of devices and electricity) that millennials face at home, that is, when they are not at the university, are capable of negating the progress made at university.

The university system provides basic aspects of literacy through two courses, namely CLT and Basic Computer Literacy. At the university of (name withheld), CLT is a compulsory module that contributes credits to the university degree, whereas Basic Computer Literacy is an optional

course that one can skip by simply writing the exemption test. However, if one skips BCL there are no repercussions as it has no credits. Both courses prepare the student for the technical skills that enable the students to do their assignments on computer irrespective of the fact that they had no prior knowledge of computing. While it may give room for computer literate students to avoid the BCL module, there is no clearly defined route to exemption, just as there is no enforcement for those who need to take both CLT and BCL.

The students were found to have different levels of computer skills. For instance, one student, Si5, advised that she was far behind colleagues from better off backgrounds. In her own words, she said:

'There was a huge gap ... they had that privilege of knowing how to use a computer, for example, typing and me I still had to first familiarise myself with the keyboard. ... they knew how to use the internet which I did not know, so there was a lot of catching up on my side even though we were of same age I was way behind with knowledge of computer use and internet.' (Si5, Male, 19)

The university community was also found to have a vast capacity to develop digital citizenship if its resources were coordinated to do so. It has educators, ICT helpdesk technicians and fellow students who can foster the development of the millennials' digital fluency. These aspects of the university activity system need to be harnessed for developing digital citizenship. For instance, we found that students help each other informally. Respondent Mi2 said:

'Actually, some of them (friends) learned a lot of things from me because I am curious by nature and so that's how I know things then I shared the skills I got, I would say I have learnt some things from them and gave them some things. We teach each other.' (Mi2, Male, 22)

This opportunity for the cross-pollination of skills in the university could be formalised through the teaching and learning centre where students work as tutors.

The ICT helpdesk also had the underutilised capacity to help develop digital skills. According to respondent Ni6, they were helpful:

'They [*ICT support*] give me support like ICT when I have a problem with my laptop I do go to them and they fix it for me so that I can be able to use it and also access the internet.' (Si5, Male, 19)

This potential was not being utilised by all who could benefit from it. For instance, respondent Mi2 a fourth-year student, had never benefited from the ICT helpdesk:

'... the ICT staff I have never been engaged with them for help with internet or computer use, I just know they work with these digital staff around campus and I don't know anything about them having to do with students.' (Mi2, Male, 22)

The university activity system would realise its full capacity by advising all students about the role of the ICT helpdesk.

We also found that the students lacked the skill to conduct e-commerce, which is an important aspect of digital citizenship. This was, however, a rare exception of some IS students. The rest of the participants had not received any training to buy and sell on the Internet. Most of the respondents had not bought anything online. One student confirmed that he had taught himself how to buy online. About 59% suggested that they feared financial loss on the Internet.

This was confirmed by an interviewee, Si8:

'not yet but I am looking to buy something right now, but I am still sceptical because I don't trust it that much'. (Si8, Female, 20)

This suggests that the key aspects of digital citizenship could only be developed by chance rather than through formal training.

Our comparison of the home and the university activity systems showed that the home activity system suffers from the lack of access and low exposure to other Internet users that students can learn from. Unlike the university where they have friends and lecturers to help with skills training, at home most have no computer literate friends who can mentor them. Their parents are not computer literate and they lack Internet access. As stated by one participant:

'... [*in*] my hometown Bizana most people know nothing about using mobile devices or the internet. As a result, even when I asked for money to go to the library they would not understand why I need to go to the library. Most of them advised that they use mobile data bundles for accessing the internet.' (Mi2, Male, 22)

In terms of rules of Internet access and usage, we found that there were no rules on the home activity systems, basically because the parents are totally uninvolved in the children's online activity. There were some rules on the university system which forbade them to access illegal sites and to watch television (TV) series. The rest of the forbidden sites are blocked by the system.

Conclusion and implications

This article makes its contribution by highlighting the challenges that the African millennials face on their way to digital citizenship. While the home activity system has socio-historical challenges, the university has an opportunity to refocus and help reduce the challenges that their students face. By focusing on digital skills while marginalising information literacy and digital etiquette, the educators are upholding temporary tools above their permanent purpose. Such technological determinism is downplaying the ephemeral nature of technologies and the need to inculcate transferable skills that will help the student to safely and civically process information in a continuously evolving information age with new cyberspace vices and new technological devices. Teaching the millennials about how to use technology without teaching

them online safety, information literacy and civility will make them victims and perpetrators of cybercrime. Their productivity in the information age jobs will be lower than expected as they suffer from the effect of cybercrime. This calls for a revision of ICT literacy training modules to include the digital fluency that is required for good digital citizens. It also calls for the need to change teaching strategies by using learners to support other millennials in the communities of both the university and the home activity systems.

Research limitations and future research

This research was conducted among university students. While they have the age and access which are expected of digital citizens, their situation cannot be uncritically inferred to the rest of South African millennials. The findings of this research, therefore, need to be read with due cognisance that university students have better training and better access than other millennials who come from the same backgrounds.

Future research must investigate how the ubuntu cultural virtues can be transferred to the digital front. It must also use practical testing exercises for assessing both the information literacy and digital wisdom (Prensky 2001) of African millennials. This will show the inadequacy of the current university training that marginalises soft skills like information literacy and digital etiquette.

This article has operationalised the use of Engeström's (2001) activity system by presenting the South African millennial as the subject or human doer, the digital training process as the 'object' or the thing being done, while the development of digital citizenship as the outcome. We have found that the millennials are walking a tightrope to digital citizenship because of inadequacies on both the home and the university systems. The home system lacks access (i.e. mentors, connectivity and devices), while the university system lacks soft skills training (i.e. information literacy, safety and etiquette). The two activity systems under consideration have the capacity to produce digital citizens if the home community improves digital tool and rules, while the university must include digital etiquette in its compulsory digital literacy curriculum.

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Competing interests

The authors declare that they have no financial or personal relationships which may have inappropriately influenced them in writing this article.

Authors' contributions

W.C. conceptualised the study and collected the data. L.C. conceptualised the study, did the data analysis and assisted

with the final editing of the manuscript. S.T. conducted the literature review, wrote the manuscript and assisted with the editing of the manuscript.

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