

https://dspace.org/

Symbolic Narratives and the Role of Meaning: Encountering Technology in South African Primary Education

Van Zyl, Izak; Sabiescu, Amalia

2016-12-15
LINK Centre, University of the Witwatersrand (Wits), Johannesburg
http://hdl.handle.net/10539/21654
Van Zyl, I., & Sabiescu, A. (2016). Symbolic narratives and the role of meaning: Encountering technology in South African primary education. The African Journal of Information and Communication (AJIC), 18, 95-115. https://doi.org/10.23962/10539/21654

Downloaded from a DSpace repository. https://dspace.org/

Symbolic Narratives and the Role of Meaning: Encountering Technology in South African Primary Education

Izak van Zyl
Associate Professor, Transdisciplinary Studies, Research, Innovation and Partnerships, Cape Peninsula University of Technology, Cape Town

Amalia Sabiescu
Research Associate, Institute for Media and Creative Industries, Loughborough University London

Abstract
This article draws on the results of a long-term, design-based research study with South African primary school teachers to discuss the role of subjectively assigned meanings and symbolisms of technology, as key factors affecting the adoption, appropriation and use of educational technology in urban poor and under-resourced environments. The paper examines how teachers' engagements with technology are framed, conditioned, and embedded in multi-levelled "technology encounters". These encounters give rise to meaningful representations of technology that ultimately transform both the teaching and learning process, and culminate in the emergence of "symbolic narratives": complex assemblages of symbolisms, meanings and interpretations that arise through and therefore come to influence further technology engagements. We argue that a closer examination of teachers' symbolic narratives can shed light on the motivations that underpin the appropriation, integration -- or conversely, rejection -- of educational technology in urban poor and under-resourced environments.

Keywords
educational informatics, information and communication technology (ICT), technology encounters, symbolic narrative, meaningful representations of technology

DOI: https://doi.org/10.23962/10539/21654

Recommended citation
Van Zyl, I., & Sabiescu, A. (2016). Symbolic narratives and the role of meaning: Encountering technology in South African primary education. *The African Journal of Information and Communication (AJIC), 18,* 95-115.
https://doi.org/10.23962/10539/21654



This article is licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence: http://creativecommons.org/licenses/by/4.0

1. Introduction: Exploring the meaning of technology in primary education

The long-term, design-based research study with South African primary school teachers, which generated the data on which this article is based, commenced in 2008 with the aim of examining the conditions through which teachers in so-called "disadvantaged" primary schools applied information and communication technologies (ICTs) in practice. The research problem concerned the complex impacts of ICT for education in resource-restricted environments, from the perspective of teachers. The fieldwork experiences in South Africa led to the realisation that ICT is far from a tangible reality in many local schools, especially in terms of the availability of resources and infrastructure; access to information and educational opportunities; and a holistic understanding of the enabling values of technology. However, considering the recognition that ICTs can transform education and the increasing need for ICT-enhanced teacher development (Enigda, 2011; UNESCO, 2011), the drive towards technology in South African primary education has continued. The focus on educators in disadvantaged communities is of academic interest, because of the promise that ICT holds for such environments (Bladergroen et al., 2012). But it is precisely in those environments where stakeholders have the most difficulty in assimilating technologies. In going beyond the "promised" utility that ICTs pose, an exploration of meaningful engagement is where advances are needed in the field.

The research was conducted on the Khanya Project, though not formally affiliated to the project or its members. Khanya was conceived in 2001 by the Western Cape provincial government as a technology access initiative, whose goal was to distribute computer facilities to all primary schools in the Western Cape by the end of 2011. Experiences from the study reported here revealed many opportunities and challenges in terms of the technology-for-education model propagated by Khanya. The findings reveal that the underlying causes for the accomplishments and failures of the Khanya model are best articulated by adopting a perspective that goes beyond an instrumentalist and pragmatic approach to the investigation of technology usage. In the study, we focused on teachers as socio-symbolic beings, and examined how their engagements with technology are framed, conditioned, and embedded in multi-levelled "technology encounters". These encounters represent teachers' daily engagements with digital media as everyday practices. Yet, such encounters also give rise to meaningful representations of technology that influence, in direct ways, further engagements with technology in the classroom and ultimately shape both the teaching and learning process. Our analysis indicates that these encounters are not only of practical value, but are also embedded in broader assemblages of history, symbolism, and culture.

In the next section, we contextualise the introduction and adoption of ICT for education in South African primary schools. Thereafter, we discuss some of the pertinent literature relating to social meaning(s) of technology. This presents a conceptual-theoretical lens through which we can interpret our participants' engagements

with technology for teaching and learning. Next, we present a background to the research project and outline its methodological approach. Finally, we explore the ways in which teachers meaningfully encounter technology in urban poor South African primary schools. From this analysis, we show how "meaning" is assembled and layered through (direct and indirect) encounters with technology at different levels. We argue for the importance of closely and critically scrutinising these encounters when seeking to understand the integration of technology for teaching and learning. Ultimately, we propose that these encounters are interpreted subjectively from the viewpoint of individual teachers, and culminate in the emergence of symbolic narratives: complex assemblages of symbolisms, meanings, understandings and interpretations that arise through and therefore come to influence further technology engagements. We argue that a closer examination of teachers' symbolic narratives can shed light on the reasons underpinning the processes of appropriation, integration -- or, alternatively, rejection -- of ICT in urban poor and under-resourced environments.

2. ICT for education in South African primary schools

Information and communication technology is a broad and sometimes fuzzy term. For the purposes of this study, we regard ICT generally as the electronic means of communicating information. This includes digital devices and services that facilitate the creation and rapid transfer of information. In the study, ICT was mainly encountered in the form of basic computer laboratories, consisting of desktop computers, a local area connection and digital projectors. We recognise that the analysis could therefore be confined to this narrow definition. However, as we will discuss in the following section, ICT is multidimensional and goes beyond mere physical or material means. It extends to matters of access, status, meaning, privilege, social movements, social relations and human development in the context of the global information society (Castells, 2015).

Since the introduction of computer facilities in South African schools, several complex factors seem to be influencing the capabilities of teachers and learners in adopting ICT. Studies of computer use in under-resourced schools have indicated that ICT adoption and skill levels can vary significantly (Gudmundsdottir, 2010). Teacher competence was identified as a highly impactful factor and was found to affect the abilities of learners to use technology effectively (Fanni, Tardini, Rega, Cantoni, & Van Zyl, 2010). Fieldwork research by Gudmundsdottir (2010) indicated that a great number of teachers struggled with the integration of ICT in the primary school classroom. This was especially true in schools where computer and Internet access were limited. Furthermore, many educators were not adequately prepared to deliver technology-supported lesson plans. They often had diminished interactions with their learners as a result.

In the case of the government-backed Khanya programme, teacher training was often felt to be inadequate or non-existent, thus limiting opportunities for competency

development (Bladergroen et al., 2012). Though Khanya's training programme included the use of educational software in the classroom, there was evidence of mismanagement and ineffective delivery. Globally, proponents of educational informatics strongly emphasise the importance of teacher training for the use of educational technology (Du Toit, 2015). In terms of the broader South African education sector, teacher development in ICT is recognised as an increasingly important skills requirement (DBE & DHET, 2011; Vandeyar, 2015). Several teacher-training campuses across the country have since incorporated ICT literacy components in pre- and in-service training curricula.

In the general pre-service training environment, there has been an over-emphasis on computer literacy and an under-emphasis on teaching with technology (Bladergroen et al., 2014). Past research (Chigona, Bladergroen, Cox, Dumas, & Van Zyl 2011) suggests that the skewed emphasis on technical skills development is only part of a broader problem. The adoption of ICT can be attributed to a combination of ICT skill levels, including content management proficiency and an understanding of pedagogy. Furthermore, the uptake of ICT in schools is also hampered by ineffective management policies. These often constrain the initial enthusiasm associated with computer use for pedagogical purposes. For example, teachers are not incentivised or encouraged to make frequent use of technological facilities (Bladergroen et al., 2012). Computer lab timetables are not properly administered, with computer rooms often being locked and inaccessible (Van Zyl, 2013). These factors are further inflated by the misappropriation of ICT infrastructure and the lack of general resources earmarked for ICT expansion.

Teacher and learner attitudes play an important role in the adoption and integration of digital technologies in primary schools (Cantrell & Visser, 2011). Attitude is a precursor to both behavioural intent and eventual behaviour (Van Zyl, 2013). Therefore, a positive disposition towards computer use is a prerequisite to acquiring higher levels of computer literacy and successful pedagogical adoption (Van Zyl, 2013). In addition to those already mentioned, several inhibiting attitudinal factors constrain positive ICT use. These include a lack of job satisfaction, lack of computer expertise and general computer anxiety. The anxiety relates to an innate suspicion of innovation and change, often hindering technological adoption (Cantrell & Visser, 2011).

Moreover, the learner is an important social component in the adoption of technology. The low skills levels of learners often challenge the introduction and integration of ICT in primary schools. This weakness is further undermined by poorly maintained facilities in resource-limited settings, hindering learner access to computer rooms. At the same time that lower skill levels are an expected part of the classroom environment, learners in resource-poor communities tend not to have computer access at home. They are thus deterred from practicing key concepts obtained in class (Bladergroen et al., 2012). Consequently, educators expend considerable time in

helping learners use the technology, instead of teaching the subject content. In these circumstances, teachers would rather avoid the technology entirely.

Overall, the literature describes a challenging and complex environment for the deployment of digital technologies in South African schools, where effective integration and adoption requires active participation at several levels, including government and policymakers, donors, civil society, school management, educators, and learners. Yet, within and across these levels, differing and even counterproductive attitudes toward technology emerge. These attitudes may instill or deter ICT acceptance and eventual adoption. It becomes important, then, to learn about the many perceptions of, and meaningful engagements with, technology in teaching and learning. Infrastructural and policy challenges aside, the many social meanings and representations that are attached to ICTs can significantly influence the adoption process. A study of social meanings attached to ICTs appears to be critical, therefore, in finding a more comprehensive means to solving the challenge of technological integration in schools (Chigona et al., 2011).

3. Social meaning of technology

This article adopts a social constructionist and sociocultural approach to the study of technology. Drawing jointly on social constructionism and sociocultural theory, this approach seeks to shed light on the importance of meaning attribution and symbolic interpretation in the analysis of technology adoption and appropriation in scholarly environments. Social constructionism highlights that technology, just like any human-made artefact, is a social construct (Pinch & Bijker, 2012). Technology is socially shaped during its development, driven by problem-posing, and reflects the needs and interests of creators and the meanings contained in their sociocultural contexts. Furthermore, the usage of technology is subject to interpretation and negotiation on the part of users and is adapted to a context of implementation (Weick, 1990). Proponents of actor-network theory (Callon, 2012; Latour, 1992) argue that the meanings, norms and values invested in technology design are reinforced by being embedded in compelling ways in technical design features.

Sociocultural theory adds further nuances to the perspective opened by social constructionism, through its close attention to the nexus of technology, human action and the cultural and historical context that embeds the action (Wertsch, 1998, p. 24). Its core principle is that human action is mediated using tools that have been created in a sociocultural system and transmitted to future generations that modify and pass them on (Rogoff, 2003, p. 51). The study of technology is therefore focused on its instrumentality, or its capacity to mediate action. Sociocultural instrumentality is distinguished by two important attributes. Firstly, the instrumental quality dwells on sociocultural and historical factors. The capacity of a tool to mediate certain kinds of activities reflects axiological systems and complex codes of meaning attribution prevalent in a sociocultural system and evolving in time. Secondly,

the study of instrumentality sees the agent, the tool and the action as composing a whole. Mediated action, the core unit of analysis in sociocultural theory, refers to the "agent-acting-with-mediational-means", an expression that suggests there is an almost inseparability between the agent and the tools that mediate action (Wertsch, 1998, pp. 26-27).

Drawing jointly from social constructionism and sociocultural theory, a few aspects pertaining to the social embeddedness of technology can be highlighted. With respect to their definition, ICTs are not only technical tools; they include artefacts, but also the associated practices that they enable and the social arrangements that facilitate their production, distribution and usage (Lievrouw & Livingstone, 2006, pp. 2-3). Technologies are concretisations of social relations instantiated in specific cultural contexts, so that their impacts cannot be anticipated when the same tools are used in different settings (Suchman, 2007). However, the social dimension in both technology design and usage is often invisible. Social practices and social norms become established and unquestioned, so that their social shaping is obscured (Latour, 1992; Lievrouw & Livingstone, 2006).

It is by adopting a social embeddedness perspective that some of the tensions associated with the introduction of educational technology in the Global South can be examined. Technology designed and developed in a specific sociocultural system enters contexts of use that are new and different, where its appropriation is socially shaped on different grounds. When technology is integrated in a new scholarly environment, both teachers and learners re-imagine technology and its uses from a standpoint firmly rooted in their own sociocultural contexts. The functional and the socio-symbolic attributes of technology can clash and spur tensions in this process. Moreover, meanings of technology are intricately connected with teaching and learning attitudes and are important in determining technology use and integration by both teachers and learners. As Van Zyl (2013) and Sabiescu et al. (2013) show, the meanings attributed to technology by pre-service teachers in South Africa are context-bound and display attributes generated by the experience of living in a resource-limited context. In this article, we go one step further and discuss how meanings attributed to technology are formed and how they are articulated in close relation with technology encounters.

4. Background to the project: Participants and methodology

The multilateral study, reported in this article, officially commenced in late 2008 and involved two Western Cape universities, the Western Cape Education Department and a university in Switzerland. The research was originally designed as a quasi-experimental (mixed method) study to determine the impact of digital technology on teaching and learning in resource-restricted (urban poor) primary schools. As a mixed methods study, the research made use of controlled experiments, questionnaires, as well as in-depth qualitative approaches, namely ethnographic fieldwork.

For reference, we give some background to the context and participants in the overall study. However, we primarily discuss the ethnographic component and some of the primary insights generated by it.

Between the years 2010 and 2013, 120 participants from six primary schools in the Metro Central Education District of Cape Town were engaged as part of the study. Participants were comprised mainly of teachers, principals and managerial staff of the schools' computer laboratories. Schools were originally grouped in two categories, to allow for a quasi-experiment (Fanni et al., 2010). However, concerning the ethnographic component, all six schools were involved at the same time.

The six participating schools were generally under-resourced and under-equipped. At the time of the fieldwork, all schools were understaffed, with little access to technology resources. Learner: PC ratios were relatively high (between 16:1 and 20:1), a criterion for participation in the Khanya programme. On the surface, then, the six schools were comparable. However, this veils the true heterogeneity across the schools. The population of Cape Town is deeply polarised along race, class, and language divisions. Communities present diverse histories, experiences and sociocultural norms and values. In this way, schools are at once heterogeneous and embedded in larger political and educational structures.

In this article, we report on those ethnographic activities that manifested as in-depth discussions, participant observations, and critical reflections with participants at the six schools. These have long been the principal methods in anthropological research (Bernard, 1998). In addition, participants were regularly engaged through weekly computer literacy workshops, in which the ethnographers acted as facilitators and mentors. In this way, the research became action-oriented, wherein the researchers had some influence on participants' daily environments and work life.

The ethnographic inquiry was generally informal in nature, and was responsive to the time constraints and agendas of the participants. In this sense, the research approach was dictated by the empirical field. Semi-formal interviewing (110 interviews, following a general interview protocol) was complemented by informal discussions that were open, flexible and iterative. The researchers also focused on the contexts of discussion, that is those cultural, interpersonal and political dynamics that appeared to govern the social interaction. In this sense, the ethnographic process was strongly informed through the practice of self-reflection (Scholte, 1972).

5. Towards an understanding of meaningful representations of digital technology

In what follows, we document some of the leading insights gathered during our ethnographic journey. Specifically, we unpack the "realm" of the primary school teacher in a critical and contextual manner. This will be done in respect of the various social interactions and technology encounters that take place in teachers' daily lives. This

discussion forms the starting point of a broader symbolic narrative. In describing this narrative, we intend to depict teachers as socio-symbolic beings who encounter digital technology in diverse, meaningful and contrasting ways. Such encounters are complex and multifaceted, and form part of deep symbolic assemblages of meaning, culture, history and technology.

The social function of the teacher

Teachers are not reducible to instructors, proverbially bound to classrooms and chalkboards. Rather, their duties range from being facilitators of knowledge, to being social workers and counsellors. This multifaceted role is particularly important in volatile contexts where students have experienced poverty, abuse and trauma. When queried on his daily activities, one senior teacher listed his primary functions:

> Educate; Inform students about the technicalities of growing up; Upskilling the students to help them to be productive; Social work counselling [for] both parents and students; Moulding the students and help them see opportunities; Help them deal with the results of the social circumstances and [the] political climate, and [help them] rise above all that.

The complexity of the teacher's role quickly becomes apparent. The same respondent spoke of his responsibility to learners:

> At Grade R, they come in as "clean slates" that have different languages, cultures, beliefs and have only been exposed to their families. So we then help them not [to] operate from ignorance and fear about each other, and help them transition to accommodating each other.

Such responses convey the miscellany of social actions in the primary school environment. Teachers fulfil the role of secondary parents and guide students in dealing with their surroundings. They harness and mould those crucial skills learners will require in becoming productive members of society. In environments marred by poverty, marginalisation and inequality, educators also act as counsellors, helping students transition from positions of "ignorance and fear" to positions of accommodating diversity. Such roles seem to represent some of the main educational functions of teachers, as voiced by the respondents:

> I try by all means to give whatever I've got to put it through to the learners as much as I can. Most of the students have been traumatised. I majored in Psychology and Linguistics, so I am comfortable counselling students. I also talk to them because I want to see them achieve their goals.

Teachers regard their roles as being holistic. They are not only central to the pedagogical process, but also to the socialisation of young persons. They are required, in this way, to possess skills and capabilities that far exceed conventional teacher train-

ing. Such types of social relations seem to dominate much of teacher group life. It is then important to acknowledge that the introduction and use of technology would always be contained within the idiosyncrasies of everyday teacher relations. Considering this, the research opened up to a new analytical perspective with respect to ICT integration in schools, asking the following: How can ICTs, as artefacts initially alien to teachers, be integrated so that they are not merely instructional devices in a simplistic teaching-as-information-delivery paradigm, but that they enable teachers to both express their multifaceted roles and enact meaningful teaching-learning interactions?

Encountering digital technology in meaningful ways

During the ethnographic study, we observed how teachers approached, appropriated and negotiated their understandings of ICT. In concrete terms, we refer to this as "technology encounters". Importantly, the encounter cannot be defined in its lay sense alone, which refers to a casual interaction or meeting. Rather, we argue that the encounter is an interpretive and symbolic act. The encounter is not independent or isolated, but entwined in a complex web of interactions. The encounter generally takes place spontaneously and intuitively, and includes interactions with both material and intangible objects (Michalski, 2013). We do not separate ourselves as ethnographers from those encounters exhibited by teachers. Rather, we recognise our own role in shaping some of the technology encounters in the primary schools partaking in our study.

In the following passages, we present technology encounters in terms of how they take place across three intersecting levels. First, we describe macro- and meso-level encounters. These are perhaps intangible at a personal level, but represent the higher order understandings of, and experiences with, technology. These aspects shape the micro-level encounter and inform the local technology experience. After describing some micro encounters, we contextualise the spectrum of encounters within a holistic symbolic narrative.

Macro- and meso-level encounters

Encounters at macro and meso levels are mostly discernible as formal, high-level movements, discussions and policies. At a macro level, referring to worldwide movements and discourses, we identify three critical components: (1) an emerging global state of hyper-connectivity, which propels the development of infrastructure and new techno-capabilities; (2) the purported transformative capacities of digital technology, offering improved functionality and efficiency, among many others; and (3) the many perils of hyper-connectivity that instil the "expectation to change" and can breed anxiety, fear and resistance (Thierer, 2013). Jointly, these aspects are visible at a macro level, but have real implications for meso- (national, regional) and micro- (local, personal) levels.

Following the ending of apartheid in 1994, the South African government gradually pursued the adoption of technology in its policies of regional and local development. Below, we list some of the influential factors at this meso-level:

- The ongoing challenge of addressing systemic poverty, ill health, violent crime, and unemployment.
- The roots of an oppressive past, which contributed to the unequal distribution of resources in the country (Oyedemi, 2009).
- The strong belief that technology can address many of the region's development challenges, notably poverty (May, Waema, & Bjåstad, 2014).
- The local materialisation of the "digital divide" as a state of technological inequality between the many South African groups and communities. Individual and regional differences are polarised along the lines of social class, geography (urban and rural) and access to opportunity (information "haves" and "have-nots") (Pick & Sarkar, 2015).
- Policies to address the digital and development imbalance nationwide: Strategic imperatives include the Ten-Year Innovation Plan (2008-2018), the White Paper on e-Education (2004), and the mandate of the Presidential National Commission on Information Society and Development (PNC on ISAD) (Averweg & Erwin, 2010).
- The implementation of technology-for-development initiatives country- and region-wide (James, 2004). In the domain of education, these have included technology access programmes, digital content development initiatives and user-driven projects. In the Western Cape, the Khanya Project is one such example.
- At both macro- and meso-levels, there is a clear sense of techno-optimism: Local institutions purposefully leverage digital technology in the belief that it can support development, not least in the educational sphere. At a micro level, however, this plays out in diverse ways.

Micro-level encounters

> For me, ICT is how you link with the global world in terms of sharing knowledge, information, and resources with people that are not here with you. For me, it also ties up with skills, sharing skills. It has to do with skills development. It also makes you aware of the changes that are out there by using ICT. And it opens up your eyes and it gives news. It brings the other world here. It makes things easier for me.

The passage above, expressed by a female teacher at a participating school, represents one of the many local understandings of ICT. When asked to reflect on what she meant by technology and the kinds of functions it could offer society and her as an educator, this teacher alluded to the connectedness of ICT, of the possibility it provides to share information, knowledge and resources. Interestingly, the respon-

dent referenced skills sharing and development as advantages of ICT. Perhaps most significantly, she described the ability of ICT to "bring the other world here". This echoes the opinions of other teachers interviewed:

> Especially our learners, who don't really experience outdoor life, outdoor activities, they don't venture out there, they don't see things. Some of them have never been close to Table Mountain, although they see it from our school. They need to be shown these things. You don't want to accuse them of ignorance, but their lack of experience, it's alarming. They don't experience your lifestyle. Showing them opens their eyes up to what is around them.

> Their experiences revolve around what happens in the townships, because that is where they live. You try to broaden their horizons, to show them. For them, this is the best thing and that is why they enjoy these computers. They don't usually have access to it. And showing them clips about what Cape Town looks like. You think, wow, here you are driving around Cape Town every day, and they've got to see it. So that's part of the value, the exposure.

Such expressions are only specific examples of some of the social representations of ICT in under-resourced school settings. These teachers assume a characteristic "universal" view, suggestive of what Brown and Hart (2012) term a globalisation discourse. Teachers also say that ICT makes their lives easier, what Brown and Hart term a productivity discourse:

> It helps us a lot, the ICT. Before I didn't know about email and now I know a lot. And as a result, now I am going to Langa. So now I'm using the computer. It is very, very useful.

> It makes our life easy. It is easy to get. We don't struggle like before. Like setting papers, using that old typewriter. Now it is just "click, click" and everything we got. It is very, very easy.

> It is easy now to get a lot of information, especially when there is the Internet here. So, most of the time we just go there and we will get the information. At least everything is easier to find. If it is easier to get, of course we have access to it.

These are some of many instances of globalisation and productivity themes to have emerged from our discussions with teachers. The general sentiment is that technology makes life easier, makes information accessible, and increases productivity at work. The functional value of technology is also closely linked to its educational benefits:

> To me computers are like a supporting material. I like to use computers,

> because the learners find it much more interesting to learn with computers.

Teachers are aware of the educational benefits of ICTs. For some, ICTs offer interactive engagement with the unknown or external world. Learners can be exposed to previously unfamiliar lifestyles, activities, and events. Their horizons are broadened as the access to information is increased. For teachers, ICTs are particularly useful as "supporting material" in the classroom. Learners are engaged, excitedly, in the educational process. These types of responses indicate the sense of optimism found among most teachers interviewed.

> Because we've got learners who, when they come to the computer room, they are so excited they can't wait. I think this has a lot of impact, because when I take my kids they are so excited... because there's a lot of information that they are getting from the computers.

Yet the implications of digital technology in these schools extend beyond its clear functional and educational value. Some teachers alluded to the "transformative capacities" of technology:

> It sharpens their minds and [they] become critical thinkers, because they are viewing the information. ICT enlightens.

> So the teacher feels that they [are] imparting far more than just the basic lessons. So the technology opens up so many more avenues, so many more horizons for them. They can see so many more things, do so many more things. So it is a very empowering tool.

The transformative benefits of technology are evident in its ability to "expose", to "enlighten" and to "empower". Beyond its immediate functional and educational properties, then, ICTs reveal other affordances. Despite this, several conflicting opinions surfaced as well, somewhat negating the techno-enthusiasm of the majority. Not all teachers were confident in using digital technology for educational (or other) purposes:

> I do not know how to use the Internet, which tends to limit me.

> Well from my experience of using the computers, sometimes you get stuck and you don't know what to do and this is really frustrating.

> But they've got a negative attitude. They said, "you want to take part of our time now for this training, but we don't want that nonsense. We can teach without computers. We can manage."

These excerpts reveal many challenges and frustrations related to ICT use. Because

of the nature of the participating schools, the teachers have limited access to digital technology. This is worsened by technical illiteracy, time constraints and negative attitudes. In this regard, participants alluded to a divide between "natives and immigrants" within the primary school. This refers to the commonly accepted trope within ICT-for-education: Young people (natives) have grown up with computers and the Internet, and are naturally proficient with new digital technologies and spaces (Rapetti & Cantoni, 2012). Conversely, older people (immigrants) will always be a step behind in their dealings with the digital (Bayne & Ross, 2007). This belief affects teachers' professional experience with technology:

> We got [have] the problem because us as teachers, we are not coming from this generation, so we are not equipped enough for this. Because we only started to be computer literate only now while we [are] already teachers.
>
> Yes because, like I said, I had never had any experience with computers, I could only switch it on and off. But we are old with [for] this!

These experiences indicate a sense of computer anxiety. Some teachers are not proficient in using digital technology and do not have confidence in their own abilities. Generally, these teachers have had minimal exposure to digital technologies. Some refer to a generational gap: teachers versus students, natives versus immigrants, digital versus analogue. This belief may itself reinforce any perceived disconnect between groups, because teachers may fear the changes that are expected of them (Bayne & Ross, 2007).

Encountering technology symbolically

In a seminal work, Prasad (1993) discusses the symbolic processes involved in the computerisation of work in an organisation. Citing Turkle (1984), she examines the "computer" as an extraordinarily meaningful technology, holding different meanings for different people. Prasad (1993) describes the "magical symbolism" of the computer in the workplace, and identifies those "ritualistic assurances" inherent in an automated organisation. Again, citing Turkle (1984), she lambasts studies that exclusively focus on the "instrumental computer", while ignoring what she calls the "subjective computer". While the former holds only practical significance, the latter is a symbolic object, conveying multiple personal meanings.

More than two decades on, the notion of the subjective computer is very much relevant in the study of ICT in educational settings. As we gathered from the field study, the subjective computer can take the form of "multiple symbolisms", encounters, or experiences, and is located within the realm of human meaning and related meaningful action (Prasad, 1993). In this regard, every organisational situation is likely to be filled with multiple and contested interpretations and meanings. Therefore, in the primary school environment, one should expect a diversity of perspectives and

meanings that do not necessarily accord with any universal imperative.

Our emphasis remains on micro meanings, those held in multiple everyday contexts, such as particular areas, functions and enclaves within an organisation (Prasad, 1993). Within these domains, individuals symbolically interact with material and intangible objects. The outcome of this interaction is a series of multiple symbolisms, or representations. Such symbolisms vary within and between different organisational levels, individuals, and communities. They should not be reduced to stand-alone or isolated encounters; rather, they are embedded in a complex assemblage of symbolisms, an ecology of meaning.

Our observations at the various primary schools revealed contradictory technology encounters at the micro level. Teachers were generally positive as to the functional role that technology can play in teaching and learning. In general, we observed an overwhelming sense of technology enthusiasm at all the participating schools. In some cases, this enthusiasm took the form of "gizmo idolatry" (Leff & Finucane, 2008), the conviction that a technological approach is intrinsically better than one that is less technological. In contrast, the teachers had also had many frustrating and negative experiences with technology. They were fearful of the expectation to change their behaviour, to learn new approaches, or to embrace technology. In many cases, this was due to self-induced fear and not actual negative encounters. Teachers could perceive technology to be monstrous, generationally confined, or challenging to understand. For instance:

> I can be very honest with you, when I started, came back into teaching, I was very afraid of the computer. It was like a monster to me, you know. I was afraid even to touch my children's computer, because I didn't know the computer.

6. Analytical discussion: A complex assemblage of meaning

The analysis of these contradictions reveals an inherent tension between the functional and socio-symbolic roles of technology, fuelled by direct and indirect technology encounters. While they are expressed at the micro-level, influences from the macro- and meso- levels have an important bearing. A powerful stimulus towards technology adoption appears to have been provided by South African national discourses emphasising the importance of adopting ICT. These discourses give prominence to the functional attributes of ICTs. At the same time, through the depictions of the many advantages associated with their educational integration, ICTs quickly acquire a dimension associated with progress, change and modernity. This dimension informs the socio-symbolic role of ICT in teachers' realms.

At the outset of the study, several utilitarian themes, including *pragmatism* and *necessity*, were observed as the foremost technology experiences:

Pragmatism emerged as a dominant encounter in our exploration. ICT is symbolised as being practical and functional. It is generally useful and necessary for administrative purposes and classroom management. In some cases, this extends to teaching and learning; it becomes valuable as an educational technology.

Necessity emerged as another dominant symbolic encounter in our study. Digital technologies are critical to the progress of the school and to the advancement of the teaching profession. This is promulgated at a national level, in which the need for ICT gains momentum in policy, regional programmes and public discourse. In this vein, the embrace of digital technologies is embedded within an educational directive; it is pertinent in developing the capacities of the teacher. This symbol is also tied to the "expectation to change". As with other symbols, organisational necessity is often implicit or inherent, that is, technology becomes unquestionably necessary.

In additionl to these pragmatic approaches, two additonal, contradictory themes emerged, broadly characterised by elements of either *pessimism* or *optimism*:

Pessimist narratives convey mistrust and cynicism towards technology integration. Many educators doubt the transformative benefits of ICT, or are sceptical of its purported value to the classroom environment. Although this a common perception, it is often overshadowed by enthusiasm or pragmatism. One reason for this is the fear of being ostracised, of being labelled as backward or incompetent (Sabiescu et al., 2013; Van Zyl, 2013). Negative or sceptical attitudes are associated with other strong themes, namely *frustration* and *fear*.

- *Frustration* represents actual negative encounters with technology. Frustrations are tied to a series of negatives, including lack of bandwidth or electricity, mismanaged timetables, lack of know-how, overpopulated classrooms, time pressures, and the like. Such encounters are frequent, but are often suppressed by dominant positive interactions.
- *Fear* can result from frustrating or negative encounters, but can also precede an actual encounter, manifested as a sense of distance and associated with a lack of capacity to handle what are perceived as complex technical systems. Fear also manifests through strong beliefs of generational differences. Older respondents tended to resort to such perceptions and were seemingly afraid of technological interaction. This affected their confidence and overall willingness to engage with ICT, to the point of complete avoidance.

Optimism, conversely, relates to the potential transformative capacities of ICT and to its "promises" of change. Optimism is associated with some nuanced symbolic narratives, ranging from a view of technology as entertaining and engaging, to a pronounced *romantic vision* of technology, to a belief in its *capacity to enlighten* and transform. At an initial level, the engagement with digital technology is recurrently associated with expression of enjoyment, fun, excitement and interest. We found this

related especially to the learner community, who tended to be uncontrollably eager to visit computer laboratories each week. Many teachers were equally enthusiastic, particularly in terms of the interactive features offered by technology in the classroom.

- *Enlightenment narratives* allude to a state of technology utopia, in which ICTs instil a sense of transformation and uplifted human capacities. Here, teachers perceive ICTs as inherently good or desired and stress their transformative capacities in education and professional practice.
- With a more pronounced imaginative dimension, the theme of *romanticism* represents instances where respondents romanticise the use of technologies. It also pertains to cases in which teachers idolise technology, for example, as seen in the overt security measures for computer labs. This symbol also alludes to instances in which digital technologies are attributed with human and animal characteristics (anthropomorphism). In such cases, digital objects are thought of as lifelike, with attributes that remind of humans or creatures, for example the "monster" earlier described.

The idea of anthropomorphism underpinning some of these symbolic narratives is of particular interest, given its allusion to human qualities. This links closely to the socialisation and cerebrality of technology, in which computers are associated with the human presence, modelled on the principles of behaviour and intelligence (Case, 2007; Haraway, 1991; Prasad, 1993). This notion of "human-like" technology was not fully explored during the fieldwork. Rather, we observed it as a casual occurrence in the context of everyday use, especially during formal training sessions at each of the schools. We generally perceived anthropomorphist symbols, such as loyalty, unreliability, interactivity or sociability, temperamentality and indifference (unresponsiveness, "death"). In these instances, the computer system and associated technologies seemed to acquire human characteristics (Prasad, 1993). In some cases, teachers appeared to be demonstrative toward computer machines and laboratories. This resulted in the exaggerated safekeeping of labs, rendering them inaccessible for long periods. Such sentiments are broadly associated with technology idolatry, as earlier discussed (Nickel, 2010).

These symbolisms, among many others, converge within an assemblage of meaning. Specifically, we term this as a "symbolic narrative", one that contains the multiple, interpreted realities that arise in the engagement with technology. This narrative offers a broadened and complex view of those micro-encounters presented earlier. Ultimately, we found that the symbolic narrative that characterises the technology-in-education experience is, paradoxically, both perceptible and elusive. Many of the foremost symbols we identified emerged ambiguously or obscurely. Teachers, for instance, desired to use technology, but also insulated themselves against it. In public (e.g., interviews), they were passionate and optimistic about educational technologies. In practice, they were often passive and indifferent to acquiring digital literacy skills (Bladergroen et al., 2012; Chigona et al., 2011). Many of the teachers, more-

over, had not encountered ICTs as a real educational tool; hence there existed no benchmark by which to gauge successful adoption.

The diversity of themes described above could be interpreted in different ways at various interactional levels. Considering this case, ICTs may simultaneously represent elements of chaos or turmoil and, at the same time, elements of professionalism and educational enlightenment. The images and meanings of these objects are not homogeneous and need to be understood in terms of their contextual manifestations (Prasad, 1993). It would not be accurate to claim that, for all respondents, digital technology symbolises pragmatism or organisational efficiency. Consideration also needs to be given to personal or individual meaning. A complex assemblage of meaning transpires through a collective or individual sense-making.

7. Concluding thoughts

In this article, we have discussed how teachers in South African primary schools encounter digital technology in a meaningful and symbolic manner. The encounter is an interpretive social capacity that forms the basis of interaction. It is impractical to seek to canvass all of the many differing encounters that take place in such a complex environment. Rather, it is the systematic recognition of individual and collective sense-making that remains of concern. The very nature of meaning creation, then, should form the basis of future investigations regarding the use of technology in education.

Furthermore, we discussed how encounters are located and enacted across macro-, meso- and micro-levels. At the macro-level, the globalisation of digital technology has strongly affected the teaching profession. This resonates both nationally and regionally in South Africa. Leading actors in government, industry and civil society have pursued technological progress by means of ICT access and integration programmes in teaching and learning. This has permeated the micro-level, at which primary schools are introduced to local ICT-for-education initiatives such as the Khanya project.

At this more nuanced micro-level, we observe the institutionalisation of the "technology imperative": the use of technology out of the (deterministic) belief that it is good or beneficial. Examined more closely, we notice this imperative to be enacted as a symbolic reality. This represents an alluring state of new technology, in which it is viewed as an instrumental symbol of modernity. Our exploration deepens to discover related symbolisms: meaningful encounters espoused by teachers, to which they ascribe value. Some of the multiple symbolisms of ICTs include pragmatism, organisational necessity, cynicism, digital immigration, fear, romanticism, utopianism and enlightenment. These are just some of the descriptors that we can assign to technology encounters.

Notably, macro-meso contextual issues, and specifically organisational and work-related dynamics, may affect teachers' attitudes towards technology. It is therefore likely that encounters and meanings that arise in environments where the use of technology is voluntary may be different. The symbolisms thus far described may therefore not be typical of disadvantaged primary schools or of teachers in general. In this vein, symbolic encounters are highly situational and may vary across institutional, personal and cultural modalities.

Overall, the multiple experiences of individual teachers converge within a fluid symbolic narrative. This narrative is a collection (assemblage) of meaning, history, culture, and technology. This aspect should be recognised and deepened in future studies of technology in education. Specifically, researchers should ask how encounters come to be, how meaning is assembled, and how the notion of a symbolic narrative can help us understand the integration of technology in teaching and learning.

References

Averweg, U. R., & Erwin, G. J. (2010). Context for ICT's role in South African development. In E. E. Adomi (Ed.), *Frameworks for ICT policy: Government, social and legal issues* (pp. 89-97). Hershey, PA: IGI Global.

Bayne, S., & Ross, J. (2007). The 'digital native' and 'digital immigrant': A dangerous opposition. Paper presented to the Annual Conference of the Society for Research into Higher Education (SRHE), Brighton, UK, 11-13 December.

Bernard, H. R. (1998). *Handbook of methods in cultural anthropology*. Walnut Creek, CA: Altamira Press.

Bijker, W. E., Hughes T. P., & Pinch, T. (Eds.) (2012). *The social construction of technological systems: New directions in the sociology and history of technology*. Cambridge, MA: MIT Press.

Bladergroen, M., Chigona, W., Bytheway, A., Cox, S., Dumas, C., & Van Zyl, I. (2012). Educator discourses on ICT in education: A critical analysis. *International Journal of Education and Development using Information and Communication Technology*, *8*(2), 107-119. Retrieved from http://files.eric.ed.gov/fulltext/EJ1084168.pdf

Bladergroen, M., Bytheway, A., Cantoni, L., Chigona, W., Pucciarelli, M., & Sabiescu, A. (2014). "I can't fall behind!" Aspirations, technology and becoming a teacher in South Africa. *South African Computer Journal, 54*, 1-9. http://dx.doi.org/10.18489/sacj.v54i0.235

Brown, C., & Hart, M. (2012). Exploring higher education students' technological identities using critical discourse analysis. *Information Systems Research and Exploring Social Artefacts: Approaches and Methodologies*, *181*. doi: 10.4018/978-1-4666-2491-7.ch010

Callon, M. (2012). Society in the making: The study of technology as a tool for sociological analysis. In W. E. Bijker, T. P. Hughes, & T. Pinch (Eds.), *The social construction of technological systems: New directions in the sociology and history of technology* (pp. 77-98). Cambridge, MA: MIT Press.

Cantrell, S., & Visser, L. (2011). Factors influencing the integration of technology to facilitate transfer of learning processes in South African, Western Cape Province schools.

Quarterly Review of Distance Education, *12*(4), 275-285.

Case, A. (2007). *The cell phone and its technosocial sites of engagement*. Master's thesis, Lewis & Clark College, Portland, OR.

Castells, M. (2015). *Networks of outrage and hope: Social movements in the Internet age (*2nd ed.). Cambridge, UK: Polity Press.

Chigona, W., Bladergroen, M., Cox, S., Dumas, C., & Van Zyl, I. (2011). Educator discourses on ICT in education. Paper presented to E-Skilling for Equitable Prosperity and Global Competitiveness, East London, South Africa.

Department of Basic Education (DBE) & Department of Higher Education and Training (DHET), South Africa. (2011). *Integrated strategic planning framework for teacher education and development 2011-2015: Technical report.* Retrieved from http://bit.ly/Y3uiFy

Du Toit, J. (2015). *Teacher training and usage of ICT in education. New directions for the UIS global data collection in the post-2015 context.* Background paper for ICT in Education Statistics. UNESCO Institute for Statistics. Retrieved from http://bit.ly/212eRfi

Engida, T. (2011). *ICT-enhanced teacher development model*. Addis Ababa: UNESCO-ICBA. Retrieved from http://www.iicba.unesco.org/sites/default/files/ICT-enhanced%20Teacher%20Development.pdf

Fanni, F., Tardini, S., Rega, I., Cantoni, L., & Van Zyl, I. (2010). Investigating perception changes in teachers attending ICT curricula through self-efficacy. In *Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development*. https://doi.org/10.1145/2369220.2369229

Gudmundsdottir, G. B. (2010). When does ICT support education in South Africa? The importance of teachers' capabilities and the relevance of language. *Information Technology for Development*, *16*(3), 174-190. http://dx.doi.org/10.1080/02681102.2010.498409

Haraway, D. (1991). A cyborg manifesto: Science, technology, and socialist-feminism in the late twentieth century. In *Simians, cyborgs and women: The reinvention of nature* (pp. 149-181). New York: Routledge.

James, T. (Ed.). (2004). *Networking institutions of learning – SchoolNet* (Vol. 3). Ottawa: International Development Research Centre (IDRC).

Latour, B. (1992). Where are the missing masses? The sociology of a few mundane artifacts. In W. E Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change* (225-258). Cambridge, MA: MIT Press. Retrieved from http://www.bruno-latour.fr/node/258. Updated chapter retrieved from http://www.bruno-latour.fr/sites/default/files/50-MISSING-MASSES-GB.pdf

Leff, B., & Finucane, T. E. (2008). Gizmo idolatry. *Journal of the American Medical Association (JAMA)*, *299*(15), 1830-1832. doi: 10.1001/jama.299.15.1830

Lievrouw, L. A., & Livingstone, S. (2006). *Handbook of new media: Social shaping and social consequences of ICTs*. London: Sage. Updated student edition (2010). http://dx.doi.org/10.4135/9781446211304

May, J., Waema, T. M., & Bjåstad, E. (2014). Introduction: The ICT/poverty nexus in Africa. In E. O. Adera, T. M. Waema & J. May (Eds.), *ICT pathways to poverty reduction: Empirical evidence from East and Southern Africa* (pp. 1-32). Ottawa: International Development Research Centre (IDRC). Retrieved from https://idl-bnc.idrc.ca/dspace/bitstream/10625/52420/1/IDL-52420.pdf

Michalski, M. P. (2014). Symbolic meanings and e-learning in the workplace: The case

of an intranet-based training tool. *Management Learning*, *45*(2), 145-166. doi: 10.1177/1350507612468419

Nickel, J. C. (2010). Seduced by a robot. *BJU International*, *105*(5), 581-582. doi: 10.1111/j.1464-410X.2010.09219_1.x.

Pick, J. B., & Sarkar, A. (2015). Digital divide in Africa. In *The global digital divides* (pp. 275-310). Berlin & Heidelberg: Springer. Retrieved from https://www.springerprofessional.de/en/digital-divide-in-africa/4406256

Pinch, T. J., & Bijker, W. E. (2012). *The social construction of facts and artefacts: Or how the sociology of science and the sociology of technology might benefit each other*. In W. E. Bijker, T. P. Hughes, & T. Pinch (Eds.), *The social construction of technological systems: New directions in the sociology and history of technology* (pp. 11-44). Cambridge, MA: MIT Press.

Prasad, P. (1993). Symbolic processes in the implementation of technological change: A symbolic interactionist study of work computerization. *Academy of Management Journal, 36*(6), 1400-1429. doi: 10.2307/256817

Rapetti E., & Cantoni L. (2012). Reconsidering "Gen Y" & co: From minding the gap to overcoming it. In M. Paulsen & A. Szucs (Eds.), *Open learning generations: Closing the gap from "Generation Y" to the mature lifelong learners*. 2012 Eden Annual Conference, Porto, 6-9 June. Retrieved from http://www.eurodl.org/materials/special/2013/Rapetti_Cantoni.htm

Rogoff, B. (2003). *The cultural nature of human development.* New York: Oxford University Press.

Sabiescu, A., Van Zyl, I., Pucciarelli, M., Cantoni, L., Bytheway, A., Chigona, W., & Tardini, S. (2013). Changing mindsets: The attitude of pre-service teachers on technology for teaching. In *Proceedings of the 6th International Conference on Information and Communications Technologies and Development (ICTD '13): Notes – Volume 2* (pp. 136-139), Cape Town, 7-10 December. New York: ACM. doi: 10.1145/2517899.2517927

Scholte, B. (1972). Toward a reflexive and critical anthropology. In D. H. Hymes (Ed.), *Reinventing anthropology* (pp. 430-457). Ann Arbor, MI: Michigan University Press.

Suchman, L. (2007). *Human-machine reconfigurations: Plans and situated actions*. 2nd ed. Cambridge, UK: Cambridge University Press.

Thierer, A.D. (2013). Technopanics, threat inflation, and the danger of an information technology precautionary principle. *Minnesota Journal of Law, Science & Technology*, *14*(1), 12-19. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2012494

UN Educational, Scientific and Cultural Organisation (UNESCO). (2011). *UNESCO ICT competency framework for teachers.* Paris. Retrieved from http://unesdoc.unesco.org/images/0021/002134/213475e.pdf

Vandeyar, T. (2015). Policy intermediaries and the reform of e-education in South Africa. *British Journal of Educational Technology*, *46*(2), 344-359. Retrieved from http://repository.up.ac.za/bitstream/handle/2263/45369/Vandeyar_Policy_2015.pdf?sequence=1&isAllowed=y

Van Zyl, I. (2013). *Technology encounters and the symbolic narrative: Localising the 'technology for development' experience in South African education settings*. Doctoral dissertation, Università della Svizzera italiana, Switzerland. Retrieved from http://doc.rero.ch/record/208833/files/2013COM011.pdf

Weick, K. E. (1990). Technology as equivoque: Sense making in new technologies. In P. S.

Goodman & L. S. Sproull, & Associates, *Technology and organizations* (pp. 1-44). San Francisco: Jossey-Bass.
Wertsch, J. V. (1998). *Mind as action*. New York and Oxford: Oxford University Press.