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Access to ICT for teaching and learning: From single artefact to inter-related resources

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ABSTRACT

In the past few years, concepts of the digital divide and theories of access to ICT have evolved beyond a focus on the separation of the "haves" and the "have nots" to include more than just physical access to computers. Researchers have started considering the conditions or criteria for access and broadened the concept by including additional components. Terms such as "real access", "thick conceptions of access" and "social inclusion" give some indication as to the change in thinking about access to ICT.

These broader views of access are particularly applicable in the Higher Education context. However, in examining the applicability of the existing theories of ICT access, we found that no single model fully encompassed that range of resources required for access to ICTs in Higher Education in South Africa. We therefore combined, simplified and enhanced the existing models to develop a comprehensive framework for ICT access. Our model of access describes what people use, need and draw on in order to gain or acquire access to specific ICT uses and practices in terms of different kinds of resources namely technology resources; resources for personal agency; contextual resources; and online content resources.

The applicability of this model has been tested in a survey of academic staff and students in Higher Education Institutions in the Western Cape, South Africa. The aim of this research is to explore access to and use of ICT and how they may support or hinder a range of educational technology practices.

Keywords: *Higher education, access, teaching and learning, digital divide*

INTRODUCTION

The ideas described in this paper arose during the conceptual and planning stages of a project which aimed to investigate access to, and use of, Information and Communication Technologies (ICT) in teaching and learning in higher education institutions in the Western Cape of South Africa.[1] The project set out to develop baseline information through a survey of academic staff and students in the respective institutions, as well as to identify factors, which may be hindering or encouraging the use of computers for teaching and learning.

In the process of developing a survey instrument, it became evident that the project offered an opportunity to move beyond descriptive fact-gathering. The data to be gathered would (and will) certainly be useful since such baseline data does not exist at all, making planning particularly difficult. At the same time, it became clear that a richer and more nuanced analytic investigation could also be designed, one which would allow for identification of relationships and patterns both within and between access and use. This has the potential to enrich our understanding of the changing nature of teaching and learning in an increasingly technology-mediated environment.

We set out to develop a more refined and informed understanding of access to ICT for teaching

and learning in the South African higher education context. Our motivation was primarily to develop an analytical model which could be used as the basis of our empirical investigation. While we were able to draw on an established international theorist, Laurrilard (2002), for usefully explaining ICT use for teaching and learning, we did not find a ready-made model of access which suited our purposes in the local context. And despite important enthusiastic national policy support for access to ICT, we found little local research to help us name and frame access to ICT in higher education.

This paper charts the journey we travelled to develop a conceptual framework specifically to understand access to ICT in higher education. Firstly, we examine the local and international literature on the purposes cited for ICT access, and we confirm our own focus on teaching and learning. The main part of the paper discusses ways of framing access in general and examines the debates around the concepts, as well as the dimensions we believe are relevant to our context and why. Our decisions were based both on our interpretations of the literature and on our findings from the pilot study we conducted in 2003 with 137 respondents from three Western Cape higher education institutions. Finally we describe the questions, relationships and patterns that we are investigating as part of our project.

ACCESS FOR WHAT?

ICTs do not have any meaning in isolation – they have meaning only in relation to an implicit or explicit purpose. That purpose is the way they acquire meaning; this in turn contextualises them. As the South African Minister of Communications bluntly stated (Matsepe-Casaburri 2004), "There is no doubt that ICTs can be very effective tools. The question is, tools for what?" A discussion about access to ICT must therefore make explicit what its envisaged purpose is, or might be.

Most policy statements endorse broadly sweeping, apparently self-evident, purposes relating to the information age, the knowledge society or the digital age. The United States National Telecommunication and Information Authority (NTIA 1995), for example, called the Internet the "key to the Information Age" which should be part of a universal service for all Americans, while the South African government (Department of Education, 2003, p.16) views e-education as the platform to "ensure that all learners will be equipped for full participation in the knowledge society".

Some researchers stress the economic importance of ICT, stating, for example, that access to information technology is crucial for governance and economic development (Jarboe 2001). Others foreground the democratic and citizenship possibilities which ICT enable, and prefer the term 'knowledge democracy' rather than 'knowledge economy' because of the participatory and social dimensions with which ICT is increasingly associated (Garnett & Rudd 2002). Indeed, access to ICT is considered a basic right of 21st century citizenship (Murdoch 2002).

Access becomes essential because "exclusion will mean severely limiting life chances" (Burbules & Callister 2000, p.19). This leads some researchers to focus on the value of social equity and inclusion. Warschauer (2003c), for example, argues that the very resources that people need access to are the same resources to which they will be able to contribute. Thus access and use are closely inter-related: access to resources and the use of resources are inter-dependent.

For many, ICT offers opportunities for improved education. Some international research focuses on how ICT can enhance efficiency (Cantoni et al. 2004; Mason 1998; Collis et al. 2001) and

provide new opportunities for learning through facilitation of contextual, social, active and reflective learning processes (Johnson & Aragon 2003). National South African policy at schools level states that ICTs can "create access to learning opportunities [and] improve the quality of learning and teaching and deliver lifelong learning" (Draft White Paper on e-Education, DoE 2003, p.8). In addition, "ICTs can accommodate differences in learning styles and remove barriers to learning by providing expanded opportunities and individualised learning experiences". Higher education policy argues that the appropriate use of new media can support curriculum transformation and improve educational quality (The South African National Plan for Higher Education, National Department of Education 2001, S1.1). The Partnership for Higher Education in Africa (2003) extends this by proposing that ICTs "can enhance effective teaching, learning, and research in Africa", thus providing "easier access to and input into the world of international scholarship".

Our interest is ICT's contribution to better teaching and learning. The model which we found useful in linking specific types of ICT to pedagogical elements is the conversational framework developed by Laurillard (2001) and used and extended by others (such as Britain & Liber 2004; and Conole, Dyke, Oliver & Seale 2004). This framework provides a way of organising prior pedagogical analysis around a classification of the media in terms of their logistics. It is not a way of classifying and delivering a verdict about quality in terms of use of new media forms; rather it is a way of linking and relating media types to learning and teaching interactions. We are therefore not seeking to make a value judgement about specific teaching or learning strategies or theories, but instead ask in which context a particular technology is or might be appropriate for a specified purpose.

ACCESS TO TECHNOLOGY – FROM SINGLE ARTEFACT TO MULTI-DIMENSIONAL RELATIONSHIPS

Given comparisons with countries in the developed world, and given the skewed access to resources and the fundamental inequalities that continue to characterise South African society internally, an emphasis on technological access is understandable. Teledensity rates are low: 11 in 100 people have fixed lines and 36 in 100 people have mobile phones (ITU 2003; Bridges 2002). Estimated personal computer density is lower at 7.2 in 100 people. In terms of Internet access, South Africa – with 6.8 in 100 people – is way ahead of the rest of Africa, which averages 1.4 in 100 people. But we still lag behind developed countries: 42 in 100 people for the United Kingdom and 55 in 100 people in the United States have Internet access (all figures ITU 2003).

Nationally 39% of South African schools have a computer and 26% have one for teaching and learning (DoE 2003). While direct figures are hard to pin down, it is clear that school access to computers in developing countries is substantially higher. For example, the percentage of computers available to 15-year-olds at secondary schools in the United States is 73% and in the United Kingdom 78% (OECD 2002).

Despite this rather bleak physical landscape, there has been a growing recognition that access to technology itself is necessary but insufficient. Internationally, researchers have been criticised for their pre-occupation with physical access and shallow demographics (van Dijk 2003), suggesting there is an overfocus on conditions and not criteria (Burbules & Callister 2000). People have argued for use of new terminology such as real access (Bridges 2001), thick conceptions of access (Burbules & Callister 2000), and social inclusion (Jarboe 2001; Warschauer 2002, 2003a), and are suggesting multifaceted concepts of access (van Dijk 2003), enabling resources (Warschauer 2002, 2003c), and dimensions of digital in/equality (Kvasny 2002, Di Maggio and Hargittai 2001). While there is little local academic research on ICT access in higher education

specifically, the same point has been made by the Minister of Communications (in Mbeki 2001), who has stressed that efforts to bridge the digital divide must be primarily about people, not technology.

We were encouraged by this growing consensus regarding the complexities of access and hoped to find a comprehensive model for our own purposes. Many studies (some cited in this paper) did not have explicit theoretical frameworks, or explicit theories of access/the digital divide. A few had developed frameworks of access which we found useful to varying degrees.

Van Dijk (2003) developed what he calls a cumulative model of access, whereby different kinds of access are experienced at successive stages and are conditional on one another. Mental access (motivation) is required first. Once this has been achieved, a person can mobilise material access (hardware). This will lead to skills access (which incorporates strategic, instrumental and informational skills) and only then is access to full usage obtained. We did not agree with this linear progression since our sense was that a more networked, relational perspective would be more useful. However, we had to agree that there were certain conditional aspects to access, with what he calls material access being, in our view, a primary condition.

Working from on-the-ground initiatives, Bridges (2001) developed a bottom-up theory by examining what worked best, what failed, and why. They concluded that access to technology was critical but that access to computers and connectivity alone was insufficient to sustain their use. They set out 12 determining factors ascertaining whether or not people had 'real access' to technology (making it possible for people to use technology effectively to improve their lives). Many of these factors have proved useful to us. However, for our purposes the model is too focused at the macro level (focusing at a regional level and including factors related to the economic, political and legal environment), is not scoped for higher education, and does not include the specific aspects of individual access that our pilot study results gave us reason to consider relevant.

We found Kvasny and Truex's (2002) framework insightful. They use Bourdieuian constructs to analyse how the digital divide is 'defined away' by policy makers. Their theoretical framework's core concepts include four kinds of capital: cultural (experience with computers); symbolic (expertise and training); social (relationships with others knowledgeable about computers); and economic (ability to acquire computers). In addition, they use the concepts of habitus (aspirations and attitudes), and symbolic violence (power and control). While we were concerned about some of their categories and interpretations, their suggestion that key concepts should be 'cross-mapped' also informed our relational approach. We found this very useful and note that our choice of the term 'resources' is close in meaning to 'capital'.

Indeed, Warschauer, who also uses the term 'resources', acknowledges his debt to literacy theorists such as Gee who in turn draw on Bourdieu. Examining the similarities between access to ICT and access to literacy, this theoretical approach notes (Warschauer2003 a, p.46) that: there are many types of ICT access; their meaning and value are specific to their social context; they exist in gradations; alone they bring no automatic benefits; they are a social practice; and acquisition of both is a matter not only of education but also of power. Similarly we found Warschauer's four categories for social inclusion – physical, digital, human and social – an excellent springboard to refine our own.

However, none of these researchers has provided a comprehensive model that describes all the resource elements or indicators which are relevant to people using ICT for teaching and learning. For example, Warschauer (2002, 2003c) does not include the practical aspects of time, autonomy and control and Kvasny (2002) does not consider content and form. Neither Bridges (2001) nor

van Dijk (2003) considers the role of social support and Bridges (2001) does not consider the specifics of human agency. For our purposes, we need a more widely ranging set of possibilities, given that we make no assumptions about which resources might be of particular importance. Indeed, this is one of our key research questions. We are interested in the relationship between resources at both a micro and a macro level.

We found the notion of access to different kinds of resources a powerful way to describe what people use, need and draw on in order to gain or acquire access to specific ICT uses and practices. This concept is used in both literacy studies (Lo Bianco & Freebody 1997) and sociology (Giddens 1979; Sewell 1992). In literacy studies, resources are about socio-cultural capital (Gee 1999). In sociology, resources are publicly fixed codifications (Sewell 1992), while the concept of 'rules resource units' describes rules which exist in relation to social practices (Giddens 1979).

On the basis of our readings and on the results of a pilot study survey with staff and students, we refined, polished and redeveloped four key areas until we agreed on four areas of resources to form the analytical foundation of our study. It was unavoidable that we would need some kind of dualist distinction between macro and micro, or structure and agency. Mindful that this is hotly contested and deeply theorised terrain, we acknowledge that structure and agency are interdependent (Freeman 2001) and interpenetrated (Lehmann 2003) and that they presuppose each other (Giddens 1979). In addition to personal resources and contextual resources, we suggest two other important resource categories: technological and content. While the former is inevitable, the latter may require some persuasion, arguments we take up later. Overall, we take a relational view (van Dijk & Hacker 2003) in order to map networks, conditions, positions and connections as explained in the last part of this paper. Mapping relationships between resources requires distinctly bracketed resource groupings. At the same time, in our view, resources are not static or absolute; they are not binarily present or absent. Because they can be available to varying degrees, we needed to track frequency and ease of access as well as availability of resources.

In the rest of this paper, we will describe in more detail each of our identified resources groupings: technology resources; resources for personal agency; contextual resources; and online content resources.

TECHNOLOGY RESOURCES: PHYSICAL AND PRACTICAL

Clearly access to ICT as physical technology is the primary access required for use in teaching and learning. We note that such considerations are disappearing from investigations in some instances: two recent US higher education studies (Jones 2002; Allen & Seaman 2003[2]) simply assume physical access is in place. In the local context, as described earlier, this remains a burning issue.

In general, however, physical access is at the forefront of all accounts of access in the literature, *albeit* using slightly differing terminology. Most authors acknowledge the necessity for technological access, whether it is called physical (Wilson 2000; Warschauer 2003; Burbules & Callister 2000; Government of Japan 2002; NTIA 1995, 1998, 2000), technological (Kling 2000; Kvasny 2002) or material (van Dijk & Hacker 2003) access. In addition, almost every author asserts the importance of availability. Only three mention that the technology should be accessible (Bridges 2002; Warschauer 2003 a,b,c; Kling 2000), two that it should be adequate (Kling 2000; DiMaggio & Hargittai 2001) and one that it should be appropriate (Bridges 2002). We

also assume that teaching and learning needs can be quite narrowly defined. Our pilot study results suggested that user needs were about fitness for purpose, so rather than using appropriateness as an indicator, we decided that adequacy was a more useful physical indicator. Several authors (Kvasny 2002; Warschauer 2003; Burbules & Callister 2000; Government of Japan 2002; NTIA 1995, 1998, 2000) extend this category to telecommunication infrastructure, including all the physical infrastructure needed to "get wired" including the cost (to the individual) and maintenance of that infrastructure (Burbules & Callister 2000). Only one author mentions affordability (Bridges 2001). Given that in our context we assume that students and staff are not paying directly for ICT access, we did not track affordability as an indicator, although there is room for the issue to emerge in the survey instrument's open-ended probes.

We believe that ICT is not neutral. Technologies exist in time and space, and they carry in their structural properties a particular culture and history (Bannon 1997; Leont'ov 1978). They are never used in a vacuum, but are shaped by the social and cultural context where the use is taking place (Vygotsky 1978). Their location is important (Murdoch 2002; Mkhize 2004). The implications are that, when investigating access to physical ICT, we need also to ascertain their location, availability and adequacy for use (or fitness of purpose).

It is also important to recognise that ICTs are objects which can be used to enhance or maintain power (Sewell 1992, p.9). They can even be understood to represent a supreme assertion of agency (Freeman 2001). The need for everyday matters to be factored into an analysis of physical resource considerations has been acknowledged in the literature. Having the time to use the physical resources is a criterion for access (Burbules & Callister 2000). This component can be further broken down to include control (where, when, and to what extent people use computers) and autonomy (whether people are competing for use, or if that use is monitored or limited) (Di Maggio & Hargittai 2001; Kvarsky 2002). In addition to time, childcare was mentioned as a potentially constraining factor in one study (Murdoch 2002). Thus our category of physical resources has been expanded to incorporate practical considerations such as time and autonomy.

Because our focus is on ICT, and because of our understanding of the mediating nature of such technologies, we prefer the term 'technology resources'. In summary, we define technology resources as the tangible components of computers and associated telecommunication infrastructure. Our research indicators focus on location, availability and adequacy. We define practical resources as control over when and to what extent computers are used. Our research indicators focus on time and autonomy.

CONTENT RESOURCES

Social scientists debating the agency-structure relationship have been criticised for neglecting content (Sewell 1992). It was not an object of interest for many of the researchers we have reviewed, who theorised and explored access to ICT, although a handful stressed that scarcity of suitable content is a factor contributing to the schisms of digital divides (Garnett & Rudd 2002; Bridges 2002; Warschauer 2003c).

While researchers studying ICT use in developed countries may not identify content as critical, it cannot be ignored in our context. The African continent generates only 0.4% of global online content and, if South Africa's contribution is excluded, the figure drops to a mere 0.02% (UNECA, in Chisenga 1999). English remains the dominant language of publication for African producers, despite the fact that English first-language speakers comprise no more than 0.007% of the whole

African population (Boldi et al. 2002). Certainly the lack of local content has been identified by senior South African leaders as an essential issue to increase access to ICT for the majority of South Africans, who have called for local content (Mbeki 2001) and "information to bridge the digital and knowledge divide to ensure that our people can access information that can shape their lives in the languages of their choice" (Matsepe-Casaburri 2003).

Given our project's attention to the use of ICT for teaching and learning, investigating access to online content is essential. We realise that content can potentially play several roles. It may be a mediational means (to use Wertch's [1991] term); it may be the outcome of, for example, a collaboration; it may be the agreed discourse of a discipline community; it may be a knowledge domain; it may more prosaically be subject matter. However it is interpreted, content is essential to pedagogy. It is one of the three elements in a triangle of interaction comprising C-T-S, with the T being **T**eacher (or expert or facilitator) and the S being **S**tudent (or learner or apprentice) (Garrison & Anderson 2002; Laurrilard 2001).

We presume that this is an issue for local students and academics. In particular, it has been observed that digital content relates closely to literacy and literacy occurs most effectively when it involves content that speaks to the needs and social conditions of the learner (Freire in Warschauer 2003c). We assume that this applies equally to digital literacy and to academic literacy. Others have noted the need to consider whether content is locally produced, relevant to user needs and in the required language (Bridges 2001). Language has also been mentioned as being relevant to identity and to people's notions of themselves as computer users or not (Murdoch 2002). Finally, the form of the content is noted as important, given that access to content in new media forms often requires tacit knowledge of shortcuts, heuristics and conventions that travel within particular communities of users (Burbules & Callister 2000).

Now that ICT makes online content part of the pedagogical process in higher education, we need to know what access staff and students have to that content. We need to know whether access to content that is relevant, locally produced and in the required language is an issue, whether it is considered adequate or lacking. Therefore, we define content resources as the availability of suitable digital material online. Our research indicators focus on relevance, local production and language.

RESOURCES OF PERSONAL AGENCY

In order for individual students or academics to use ICT meaningfully for teaching and learning, they need access to personal, collective and contextual resources. While we are committed to the importance of context (described in the next section), we argue it is important to identify specific resources which need to be accessed by individuals in order to give them agency. We found the notion of an active orientation useful. This suggests (Etzioni in Lehman 2003) that an actor in a social structure is more likely to become an agent when able to use or generate knowledgeability, power, commitment, and consciousness. The need for accessing personal resources allows an individual to exercise agency, to give meaning to objects and events and to act with intent (Drislane n.d.). What we need to know is which human resources are particularly necessary to enable staff and students to become agents who can mobilise resources and purposefully use ICT and how these may differ according to purpose. For example, are different personal resources required for teaching purposes as opposed to learning purposes?

Given that agents are assumed to be knowledgeable (Giddens 1979; Lehman 2003), it should not be surprising that the most commonly expressed concept is knowledge – variously expressed as know-how (Kling 2000), knowledge or cultural capital (Kvasny 2001), skills (van Dijk & Hacker

2003; Burbules & Callister 2000), mental access (van Dijk & Hacker 2003), literacy (Warschauer 2003 a,b,c; Garnett & Rudd 2002; Carvin 2000), competency (Jarboe 2001; Di Maggio & Hargittai 2001), and capacity (Bridges 2001). Allied cognitive dimensions are mentioned twice (Wilson 2000; Di Maggio & Hargittai 2001). In one case (Di Maggio & Hargittai 2001), different kinds of knowledge domains are mapped out – these being background, technical and recipe knowledge. In another, it is posited that different types of knowledge are required for the use of new technologies and they exist on a continuum (Warschauer 2003c).

In the light of the varying phraseology used in the literature, and based on our review of concepts based in the pilot study, we decided on a second resource grouping of aptitude. Aptitude is defined as knowledge and skills in using a computer and would allow us to probe knowledge and skill, as well as to ask specific questions about experience and training (in terms of length and type). Our indicators of this resource are therefore knowledge, skill, experience and training.
The other grouping – covered to a lesser extent in the literature – can be broadly described as dispositional. It would include attitudes (Warschauer 2003 a,b,c), dispositions (Burbules & Callister 2000), mental attitudes (van Dijk & Hacker 2003) and motivations (Harper 2003). It has also been called psychological access, including interest and fear (van Dijk and Hacker 2003) A more unusual element in this resource group is that of trust (whether, for example, people have confidence in and understand the implications of the technology they use, in terms of privacy or security) (Bridges 2001). Given anxieties and fears which exist generally about technology in universities, we decided on a two-pronged approach to disposition. We thought it important to find out about individual interest in and attitude to using computers in general. Mindful that these might be different, we decided additionally to explore a person's interest in and attitude to using computers for learning and teaching specifically.

Our definition of personal resources therefore includes a person's interest in and attitude to using computers (generally and specifically for learning), as well as her or his knowledge and skills in using a computer. Indicators include interest, purpose, experience, knowledge, training, and skills.

CONTEXTUAL RESOURCES

In order to use ICT, people need access to resources in and from the context in which they function. These resources, together with mutually sustaining schemas, make up the structures that empower and constrain social action and that tend to be reproduced by that action (Sewell 1992, p.19). These resources determine how conducive the environment is to using ICT and how enabling the context is of the integration of ICT for teaching and learning, specifically in a higher education institution.

In this section, we set out to identify which resources, forming part of the structure of human institutions, groups and organisations, need to be accessed in order to utilise ICT successfully for teaching and learning. Two key kinds of resources could be identified from the literature, these being firstly social resources (in the form of networks and support) and secondly formal enabling frameworks of various kinds.

The importance of community support and valuing by social networks has been recognised by several researchers (Carvin 2000; Warschauer 2003 a,b,c; Jarboe 2001). Having access to the community and social resources has been described as having the capital to support access to ICT (Warschauer 2003 a,b,c). By being able to draw on these networks, people can receive information and guidance from formal technical advisors, colleagues, friends or family (Kvarsky

2002; Garnett & Rudd 2002). Having friends and family also using computers encourages use (Murdoch 2002). Networks of encouraging family and friends provide important emotional reinforcement in form of positive interest (Di Maggio & Hargittai 2001). Social networks therefore provide both practical support and emotional support. Shared social agreement that computers have value also encourages use.

The need for formal external frameworks was also widely observed, *albeit* from slightly differing angles. Thus institutional support and frameworks were identified as important (van Dijk & Hacker 2003; Warschauer 2003c), as were the related matters of governance (Jarboe 2001) and regulations (Government of Japan 2000). At an increasingly macro level, policies (Government of Japan 2000), political will, national regulations and economic frameworks (Bridges 2001) that affected technology use have also been examined in some detail.

We therefore defined social resources as the interest and support received from a community social network. Our research indicators focus specifically on support and networks. We limited our investigation of macro-level resources to the immediate institutional environment, as our pilot study indicated that most students and many staff were unaware of the existence and implications of broader economic and other societal regulatory frameworks. Certainly aspects of institutional context in terms of policy and leadership are more tangible to academic staff than to students. Our second set of contextual resources was therefore institutional resources defined as the integration of technology into the institution. Our research indicators here are extent, policy, support and intentions.

RESEARCH FINDINGS

We are presently analysing and writing up the results of our survey which was answered by 6 577 students (9% of the target sample) and 515 academic staff (20% of the target sample) in early 2004. While these findings are being reported in detail elsewhere, the way that we have conceptualised the study will allow us to describe the landscape, compare with the results of other studies and explore the various and complex relationships within and across access and use. Firstly, we are able to describe the landscape because to date we have no factual foundation to describe our work in the region. We are answering numerous basic questions and getting a sense of the resources staff and students have access to, and are finding that physical access remains a burning issue.

We can see that access to physical resources is the most differentiated of our resource groupings. Thus the 61% of surveyed students who use a computer daily at their institution, this ranged between 37–84% across the five institutions surveyed. Students were divided about their ease of access to computers, with 63–74% of students at two institutions saying it was difficult or very difficult compared to 67–88% of students at another two institutions saying it was easy or very easy. Perhaps unsurprisingly, it was within the two historically disadvantaged institutions that students found access to be difficult.

Our assumptions are being radically shaken up as we find that most students consider they have adequate access to online resources, with 79–89% stating they find online content relevant to their courses and 80% saying that it is the language they want. We are particularly surprised by this given that just less than half the students surveyed spoke English as a home language.

We now have an idea of idea of how many staff (60%) and students (81%) are using ICT more than occasionally as part of teaching or learning practices, and are interested to note that students are using ICT to support their learning more than staff are asking them to. We are also

able to ascertain whether our findings accord with results of non-South African studies, as we either asked the same questions or tested similar assumptions. For example, while University of Michigan (1999) found that time, support and reliability were the three top factors which enabled or constrained faculty staff in their college, we found that issues relating to physical resources (particularly adequacy and availability) dominated qualitative responses on enabling and constraining factors. This was followed by issues relating to personal ability and the context, particularly support and availability of appropriate facilities (Brown & Czerniewicz 2004).

Finally, we hope we have designed a study which will allow us to rise to the challenge of "getting past the digital divide by designing and testing causal models with multivariate analyses on the road to theory" (van Dijk 2003, p.1). We believe that we will be able to gain an enriched understanding of relationships, patterns, interaction and conditions. An example of this is the relationship between the number of years' experience students have using computers and their self-rating of ability, and the frequency and range of their use of ICT. Students who seldom use ICT (that is, those who never or rarely use ICT) or have a very narrow range of use of ICT (for example, use them frequently for only one or two specific activities) are more likely to rate their computer ability as average to poor (50%) and have less experience using a computer (38% used a computer for four years or less) than those that use a range of ICT frequently (where only 26% rate their ability as poor to average and 25% have used a computer for four years or less). However we found no relationship between frequency and range of use and reported difficulty in accessing computers on or off campus.

When considering which groupings of staff or student are using ICT to support their teaching and learning, we found no discernable differences in frequency or type of use in terms of gender amongst staff or students. We did find differences in frequency of computer use with regards to age. The older the staff member the less frequent the use and younger students (under 20 years old) report more frequent use of computers overall (63% use more than occasionally) compared to older students (over 40 years old) where only 40% of students use more than occasionally.
Of course, often some of the most interesting relationships are the unexpected ones. The data and patterning will also tell us which questions to ask, and which way to go next.

CONCLUSION

In a country where there is a paucity of research about ICT access and use in higher education in South Africa this study is also unusual as existing research has tended to take the form of local case studies rather than meso- or macro-level investigations (Henning & van der Westhuizen 2004; Czerniewicz, Ravjee & Mlitwa 2005). Work done on ICT in education has tended to focus on the technical hardware and software, while it is becoming evident that these are essential but insufficient factors. Furthermore, a binary notion of use – that ICTs have or have not been taken up for educational purposes – provides an uncontextualised perspective on more complex issues in an already multi-faceted teaching and learning terrain.

Those of us working in higher education in South Africa need to move beyond the rhetorics of ICTs as artefacts which simply need to be acquired, to the recognition that integrating ICT in teaching and learning requires access to a much fuller range of resources. If we see personal resources, contextual resources and content resources also as important, we can plan differently and better design educational interventions.

Endnote:

[1] The project is one of five being conducted as part of the HictE (Information and Communication Technologies in Higher Education) Project, a cross-institutional, Western Cape, Carnegie funded project on "Enhancing Quality and Equity in Higher Education through the innovative application of ICT".

[2] Jones 2002 conducted the PEW study of college student use of ICTs in the US and Allen and Seaman 2003 authored the SLOAN Consortium report on the quality and extent of online education in the United States.

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