Access to ICTs for teaching and learning – from single artefact to inter-related resources

By *Laura Czerniewicz and Cheryl Brown, University of Cape Town*

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 (ICTs) in teaching and learning at the five higher education institutions in the Western Cape[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 ICTs 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, 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 ICTs, we found little local research to help us name and frame access to ICTs in higher education.

This paper charts the journey we traveled on to develop a conceptual framework to specifically understand access to ICTs 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 HE 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

[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”.

doubt that ICTs can be very effective tools. The question is, tools for what?" A discussion about access to ICTs must therefore make explicit what its envisaged purpose is, or might be.

Most policy statements provide broad sweeping, apparently self evident, purposes relating to the information age, the knowledge society or the digital age. The United States (US) National Telecommunication and Information Authority (NTIA), for example, called the Internet the "key to the Information Age" which should be part of a universal service for all Americans (1995) while the South African government (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 ICTs enable, and prefer the term knowledge democracy rather than a knowledge economy because of the participatory and social dimensions with which ICTs are increasingly associated (Garnett and Rudd, 2002). Indeed, access to ICTs is considered a basic right of 21st century citizenship (Murdoch 2002).

Access becomes essential because "exclusion will mean severely limiting life chances" (Burbules and 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 creation of resources are inter-dependent.

For many, ICTs offer opportunities for improved education. The South African Department of Education's white paper on e-education (2003 p.8), for example, states that ICTs can "create access to learning opportunities [and] improve the quality of learning and teaching and deliver lifelong learning". In addition, "ICTs can accommodate differences in learning styles and remove barriers to learning by providing expanded opportunities and individualised learning experiences". The South African National Plan for Higher Education (2001, S1.1) argues that the appropriate use of new media can support curriculum transformation and improve educational quality. 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".

We believe that there is always a relationship between technology, teaching and learning. New kinds of technologies bring new possibilities; existing practices in turn impact on the technologies themselves. As educators, our interest is specifically the use of ICTs in teaching and learning activities. Using Laurrilard's (2002) taxonomy as our basis, we have five categories of teaching and learning activities and associated new media forms. This aspect of our research will be the subject of a later paper, although a brief discussion of the possible relationships of, between and within access and use is presented in the last section of this paper. Rather, we focus here on concepts of access to ICTs for teaching and learning in higher education.

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

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 and Callister 2000). They have argued for "real access" (Bridges 2001), "thick conceptions of access" (Burbules and Callister 2000), and "social inclusion" (Jarboe, 2001 & Warschauer 2002, 2003a) and are suggesting multifaceted concepts of access (van Dijk 2002), enabling resources (Warschauer 2002, 2003c), and dimensions of digital in/equality (Kvarsky 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, nor 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 as successive stages and are conditional on each other. Mental access (motivation) is required first. Once this has been achieved a person can mobilize to material access (hardware). This will lead to skills access (which incorporates strategic, instrumental and informational) 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 were insufficient to sustain their use. They set out twelve determining factor 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 doesn't include the specific aspects of individual access that our pilot results gave us reason to consider relevant.

We found Kvasny and Truex's (2002) framework insightful. They use Bourdieun 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 ICTs and access to literacy this theoretical approach notes (Warschauer p.46) that: there are many types of ICT access, their meaning and value is specific to their social context, they exist in gradations, alone they bring no automatic benefits, they are a social practice, acquisition of both is not only a matter of education but also 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 have provided a comprehensive model which describes all the resource elements or indicators which are relevant to people using ICT’s for teaching and learning. For example Warschauer (2002, 2003c) does not include the practical aspects of time, autonomy and control Kvasny (2003) does not consider content and form. Neither Bridges(2001) or Van Dijk (2003) consider the role of social support and Bridges (2001) does not consider the specifics of human agency. For our purposes we need a wider 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 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 and Freebody 1997) as well as in sociology (Giddens 1979, Sewell 1992). In literacy studies resources are about sociocultural 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 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 some 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), interpenetrated (Lehmann 2003) and presuppose one another (Giddens 1979). In addition to personal resources and contextual resources, we also suggest two other important resource categories: technological and content. While the former is inevitable, the latter requires may requires some persuasion, arguments we take up later. Overall, we take a relational view (van Dijk and Hacker 2003) in order to map networks, conditions, positions and connections as explained in the last part of this paper. Mapping relationships between resources does, however, require 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 ICTs 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 and 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 and Callister 2000, Government of Japan 2002, NTIA 1995, 1998, 2000) technological (Kling 2000, Kvasny 2002) or material (van Dijk and Hacker 2002) 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 and 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 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 and 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 and 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 ICTs are not neutral. They 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 ICTs, we also need to ascertain their location, availability and adequacy for use (or fitness of purpose).

It is also important to recognize 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 and 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 and Hargittai 2001, Kvarsky 2002). In addition to time, childcare was mentioned as a potential 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 ICTs 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.

Resources of personal agency

[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.

In order for individual students or academics to use ICT's meaningfully for teaching and learning they need access to personal, collective and contextual resources. While committed to the importance of context (described in the next section), we argue it is important to identify specific resources which need 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, give meaning to objects and events and to act with intent (Drislane nd). 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 ICTs.

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 and Hacker 2003, and Burbules and Callister 2000), mental access (van Dijk and Hacker 2003), literacy (Warschauer 2003 a,b,c, Garnett and Rudd 2002 and Carvin 2000), competency (Jarboe 2001, and Di Maggio and Hargittai 2001), and capacity (Bridges 2001) . Allied cognitive dimensions are mentioned twice (Wilson 2000, Di Maggio and Hargittai 2001). In one case (Di Maggio and 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 use of new technologies and they exist on a continuum (Warschauer 2003c).

In the light of the varying phraseology used in the literature, and on the basis of our review of concepts based on the pilot 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 on 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 and Callister 2000) mental attitudes (van Dijk and 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 to additionally explore a person's interest in and attitude to using computers for learning and teaching specifically.

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

Contextual resources

In order to use ICT's, 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's and how enabling the context is to the integration of ICT's 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 organizations, need to be accessed in order to successfully utilize ICT's 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 recognized by several researchers (Carvin 2000, Warschauer 2003 a,b,c and 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 and 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 and 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 and 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 indicated that most students and many staff were unaware of the existence and implications of broader economic and other societal regulatory frameworks. Certainly aspects in term 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.

Content resources

Social scientists debating the agency- structure relationship have been criticized for neglecting content (Sewell 1992). It was not an object of interest for many of the researchers we have reviewed who theorized and explored access to ICTs, although a handful stressed that scarcity of suitable content is a factor contributing to the schisms of digital divides (Garnett and 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 ICTs 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 attention to the use of ICTs for teaching and learning, investigating access to online content is an essential. We realize that content can potentially play several roles. It may be a mediational means (to use Wertch's term, 1991); 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 and 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 as 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, people's notions of themselves as computer users, or not (Murdoch 2002). And 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 and Callister 2000).

Now that ICTs make online content part of the pedagogical process in higher education, we need to know what access to that content staff and students have. We need to know whether access to content that is relevant, locally produced and in the required language is an issue, and whether its lack is a constraining factor. Therefore, we define content resources as the availability of suitable digital material online. Our research indicators focus on relevance, local production and language.

Research - Questions, relationships and patterns

As is evident from the research we have discussed in this paper, our project adds to a growing body of work investigating access to ICTs in general and in higher education, use of ICTs in education and a few considering the relationship/s between access and use. These studies tend to be more narrowly scoped with fewer dimensions than ours.

As mentioned earlier we believe it is important not only to track availability but also frequency and ease of access and use. Consequently we have developed a questionnaire conceptualised around four constructs of access and use: types and ease of access; types and frequency of use. The two constructs on access cover the four categories of resource groupings described in this paper (60 questions in the survey focus on these aspects).The second two comprise 34 questions on types and frequency of use of ICT's for teaching and learning (as described earlier).

The last section, comprising 16 questions on demographic and related questions, ensures that we are able to explore social location (Sewell 1992) as this may be an important individual factor which will affect a person's experience of using ICTs, especially in a historically stratified deeply unequal society such as ours.

At the time of writing we are capturing the data from 553 academic staff and 5925 student responses. This range represents 10% to 30% of academic staff and 4% to 11% of students in the five Western Cape higher education institutions respectively. With this data, we will be able to do three things: firstly, describe the landscape; secondly, test the results of other studies as described below; and thirdly, explore the various and complex relationships within and across access and use.

Firstly, we need to describe the landscape because to date, we have no factual foundation to describe our work in the region. We will be able to answer numerous basic questions, such as

- Which resources do staff and students have access to?

- What percentage of student and teaching staff has a computer at home?
- How many people are using ICTs as part of teaching and learning?
- What is staff and student frequency and ease of access?

Secondly, it will add value to other research to ascertain whether our findings accord with their results. Thus we will have local data to test findings from the following studies doing related, or partially overlapping work, for example:

- ScreenPlay Project researchers from Bristol University (Facer, 2002) who found that young people were more likely to make effective use of computers if they had a computer at home, if they had access to supportive social networks, and if the use of computer had a meaningful purpose/ relevance in their lives.
- Similarly Knobel, Stone and Warshauer (2002) found that out of school access, training and support networks were important to support use by English language learners.
- Carey et al (2002) found that college students in different parts of the world with increased access opportunities had more positive attitudes towards computer technology.
- Michigan researchers (1999) found that time, support and reliability were the three top factors which enable or constrained faculty staff in their college
- Collis, Peters and Pals (2001) found that organizational aspects and self confidence were strong linked to use. We will be able to test this, although unable to test the other two key factors they identified ie learning impact, long term payoff.

Thirdly, 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). We believe that we will be able to gain an enriched understanding of relationships, patterns, interaction and conditions by, asking, and answering, some of the following questions.

- Does greater access to technological, personal contextual and or content resources equate to more frequent and/or varied use of technologies for teaching and learning?
- Is there a relationship between home computer access and ownership and varieties of use? What dimensions of home computer ownership are significant to use?
- We think that different kinds of access count unequally in different circumstances. Which kinds count more in which circumstances? For which purposes?
- Access to which resources can be significantly associated with which teaching and / or learning activities?
- Given our hypotheses that certain resource clusters are more or less facilitating of use for learning, which clusters are considered more enabling, and in which conditions? By which social groupings?
- Given our assumption that access exists in gradations rather than polarities, what are the dimensions of access in terms of ease and frequency?

Of course, some of the most interesting relationships may well be the unexpected ones. The data and patterning will also tell us which questions to ask, and which way to go next.

Conclusion

Analyzing the data will provide some answers and hopefully will enrich our insights. It will no doubt also cause us to rethink our theoretical concepts. Already we are facing the limitations of the survey as a methodological tool. While we expect it to provide statistically rigorous frequencies and analyses, we envisage that this will also point us to related areas of research to be conducted by other methods.

As to why it all matters? Because 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 ICTs 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.

References

Akst, D. and Jensen, M. (2001). Africa goes online. Digital Divide Network [online] Available from http://www.digitaldividenetwork.org/content/stories/index.cfm?key=158 Accessed on [17 June 2004]

Allen, I.E., and Seaman. J. (2003). Sizing the opportunity: The quality and extent of Online Education in the United States, 2002-2003. The Sloan Consortium.

Bannon, L. (1997). Activity theory [online]. version 2.0 Sept 30 1997. University of Limerick. Available from http://www-sv.cict.fr/cotcos/pjs/TheoreticalApproaches/Actvity/ActivitypaperBannon.htm Accessed on [17 June 2004]

Boldi, P., Codenotti, N., Santini, M., and Vigna, S. (2002). Structural properties of the African web. The Eleventh International World Wide Web Conference, Hawaii

Bridges.org. (2001). Spanning the Digital Divide: Understanding and tackling the issues [online]. Bridges.org. Cape Town. Available from http://www.bridges.org Access on [17 June 2004]

Bridges.org. (2002).Taking stock and looking ahead: Digital divide assessment of the City of Cape Town, 2002. Bridges.org. Cape Town. Available from http://www.bridges.org Accessed on [17 June 2004]

Burbules, N. and Callister, T. (2000). Watch IT: The risks and promises of information technology for education. Westview. Colorado.

Carey, J., Chrisholm, I.., and Irwin, L. (2002). The impact of access on perceptions and attitudes towards computers: An international perspective. Education Media International 29(3-4) 223-235.

Carvin, A. (2000). Mind the gap: The digital divide as the civil rights issue of the new millennium [online]. Information Today (Jan). Available at http://www.infotoday.com/MMSchools/Jan00/carvin.htm Accessed on [17 June 2004]

Chisenga, J (1999) Global information infrastructure and the question of African content presented at International Federation of Library Associations 65th Annual Conference [online]. Available at www.ifla.org/IV/ifla65/papers/118-116e.htm Accessed on [17 June 2004]

Collis, B., Peters, O., and Pals, N. (2001). A model for predicting the educational use of information and communication technologies. Instructional Science 29 95-125.

Department of Education. 2003. Draft White Paper on e-Education: Transforming Learning and Teaching through ICT. Pretoria.

DiMaggio, P and Hargittai, E. (2001). From digital divide to digital inequality: Studying internet usage as penetration increases. Center for Arts and Cultural Policy Studies, Princeton University. Working Paper 15, Summer 2001.

Drislane,R. (no date). Online dictionary of the social sciences [online]. Athabasca University and The International Consortium for the Advancement of Academic Publication. Available at http://bitbucket.icaap.org/dict.pl Accessed on [17 June 2004]

Facer, K. (2002). What do we mean by the digital divide? Exploring the roles of access, relevance and resource networks. In: digital divide: A collection of papers from the Toshiba/Becta digital divide seminar: 19 February 2002. British Educational Communications and Technology Agency, Coventry.

Freeman, D (2001) Antinomies of agency structure and technology: A case study. Melbourne Journal of Politics Annual 28 29-48.

Garrison, D.R. and Anderson, T. (2002).E-Learning in the 21st Century: A Framework for Research and Practice. Routledge Falmer Taylor &. Francis Group. London.

Garnett, F. and Rudd, T. (2002). Developing a digital divide 'headline' metric and resource: Initial concept ideas. . In: digital divide: A collection of papers from the Toshiba/Becta digital divide seminar: 19 February 2002. British Educational Communications and Technology Agency, Coventry.

Gee, J. <jgee@mail.soemadison.wisc.edu> (January 19, 1999) "What is Literacy" paper. Literacy Dialogue Project [online] Available at http://www1.appstate.edu/~moormang/wwwboard2/messages/34.html. Accessed on {17 June 2004]

Giddens 1979, A (1979). Central problems in social theory: Action, structure and contradiction in social analysis. Macmillan Press, London.

Government of Japan. (2000). Okinawa Charter on Global Information Society [online]. Available at http://www.dotforce.org/reports/it1.html. Accessed on [17 June 2004]

Harper, V. (2003). The digital Divide (DD): A reconceptualisation for Educators. Educational technology Review 11(1) 96-103.

Herselman, M. and Britton, K. (2002). Analysing the role of ICTs in bridging the digital divide amongst learners. South African Journal of Education 22(4) 270-27.

International Telecommunication Union (ITU) 2003 Africa, ICT Indicators [online]. Available at http://www.itu.int/ITU-D/ict/statistics/ Accessed on [17 June 2004]

Jarboe, K. (2001). Inclusion in the information age: Reframing the debate [online]. Athena Alliance. Available at http://www.athenaalliance.org/apapers/inclusion.html Accessed on [17 June 2004]

Jensen, M. (2002). Information and Communication Technologies (ICT's) in Africa. A status report [online]. UN ICT Task Force. Available at http://www.unicttaskforce.org/thirdmeeting/documents/jensen%20v6.htm Accessed on [17 June 2004]

Jones, S. (2002). The Internet goes to College. Pew Internet and American Life Project. Washington DC. Available at http://www.pewinternet.org/pdfs/PIP_College_Report.pdf Accessed on [17 June 2004]

Kling R. (1999). Can the next generation internet effectively support the ordinary citizen? The Information Society 15 57-63

Kling, R. (2000). Learning about Information Technologies and social change: The contribution of social informatics. The Information Society 16 217-232.

Knobel, M., Stone, L., and Warshauer, M. (2002). Technology and Academic Preparation: A Comparative Study [online]. Unpublished report to the University of California Office of the President. Available at http://www.gse.uci.edu/markw/research.html Accessed on [17 June 2004]

Kvasny L. and Truex, D. (nd) Defining away the digital divide: A content analysis of institutional influences on popular representations of technology.

Kvasny. L. (2002) A conceptual framework for examining digital inequality. Eighth America's conference on Information Systems. 1798 –1805

Lo Bianco, J. and P. Freebody (1997) Australian Literacies: Informing National Policy on Literacy Education. Melbourne :Language Australia.

Laurrilard, D. (2002). Rethinking University Teaching. 2nd edition. Routledge Falmer Taylor &. Francis Group. London.

Lehman, E.W. (2003). Culture, social structure and agency: a strong approach. 15th annual meeting of the Society for the Advancement of Socio- Economics, Aix-en-Provence, France, June 26, 2003. Available at www.sase.org/conf2003/papers/lehman_edward.pdf Accessed on [17 June 2004]

Leont'ev, A N (1978). The problem of activity and psychology. In: Activity Consciousness and Personality translated from the Russian by Marie Hall. Englewood Cliffs, NJ. Prentice Hall.

Luria, A.R. (1928) The problem of the cultural development of the child. Journal of Genetic Psychology 35:493-506

Matsepe-Casaburri, I (2003). Address By the Minister Of Communications, Dr Ivy Matsepe-Casaburri, at The Launch Of The Language Portal, Johannesburg, 4 November 2003 [Online] Department Of Communications. Pretoria. available at http://www.Info.Gov.Za/Speeches/Index.Html Accessed On [17 June 2004].

Matsepe-Casaburri, I. (2004). Address By Dr Ivy Matsepe-Casaburri, Minister Of Communications Of The Republic Of South Africa, On The Occasion Of The Official Opening Of The Nepad E-Africa Commission Offices, Csir, Pretoria 7 April 2004 [online] Department of Communications. Pretoria. Available at http://www.info.gov.za/speeches/index.html Accessed on [17 June 2004].

Mbeki, T. (2001). Bridging the digital and development divide [online]. ANC Today. 1(39) Available at http://www.anc.org.za/ancdocs/anctoday/2001/at39.htmAccessed on [17 June 2004]

McAnulla, S. (2002). Structure and Agency. In: D. Marsh and G. Stoker. Theory and Methods in Political Science, Palgrave. Available at www.psa.ac.uk/cps/1998%5Cmcanulla.pdf Accessed on [17 June 2004]

McKeown, S. (2002). Who are the marginalized? In: digital divide: A collection of papers from the Toshiba/Becta digital divide seminar: 19 February 2002. British Educational Communications and Technology Agency, Coventry.

Mkhize, S. (2004) Students access to and use of ICT's in laboratories at the University of the Western Cape, Unpublished Masters dissertation.

Murdoch, G (2002). Rethinking Communication Exclusion . In: digital divide: A collection of papers from the Toshiba/Becta digital divide seminar: 19 February 2002. British Educational Communications and Technology Agency, Coventry.

National Department of Education (2001) National Plan for Education. Pretoria

Norris, C., Sullivan, T., and Poirot, J. (2003). No Access, no use, no impact: snapshot surveys of educational technology in K-12. Journal of Research on Technology in Education. 23:(1) 15-27.

National Telecommunication and Information Authority (NTIA) (1995): Falling Through the Net: A Survey of the "Have Nots" in Rural and Urban America [online]. Available at http://www.ntia.doc.gov/ntiahome/digitaldivide/ Accessed on [17 June 2004]

National Telecommunication and Information Authority (NTIA) (1998): Falling Through the Net II: New Data on the Digital Divide [online]. Available at http://www.ntia.doc.gov/ntiahome/digitaldivide/ Accessed on [17 June 2004]

National Telecommunication and Information Authority (NTIA) (1999) Falling Through the Net: Defining the Digital Divide [online]. Available at http://www.ntia.doc.gov/ntiahome/digitaldivide/ Accessed on [17 June 2004]

National Telecommunication and Information Authority (NTIA) (2000) Falling Through the Net, Toward Digital Inclusion [online]. Available at http://www.ntia.doc.gov/ntiahome/digitaldivide/ Accessed on [17 June 2004]

Queens University. (2000). Faculty survey on educational technology [online]. Learning Teaching Faculty Associates. Last modification February 14, 2001. Available at http://www.queensu.ca/ltu/ltfa/ Accessed on [15 October 2003].

Sewell 1992, W.H. (1992). A theory of structure: Duality, agency and transformation. American Journal of Sociology Volume 98 (1) 1-29.

Smith, R. (2000). Emerging African Nations [online]. Access Denied. Available at http://www1.soc.american.edu/students/ij/co_3/digitaldivide/africa.htm Accessed on [17 June 2004]

Strover, S. (2003). Remapping the digital divide. The Information Society. 19 275-277.

The Partnership for Higher Education in Africa. (2003). Securing the linchpin ICT for teaching, learning, and research [online]. Available at http://www.foundation-partnership.org/linchpin/introduction.php Accessed on [17 June 2004]

University of Michigan. (1999). Faculty Survey: Information technology uses, resources and support. [online]. Unpublished report. Available at http://sitemaker.umich.edu/carat/files/1999umfacultysurvey.pdf Accessed on [17 June 2004]

Van Dijk J (2003) Getting past the digital divide? [online] Electronic Networks and Democracy. Available at http://www.albany.edu/wwwres/edemocracy/papers/VanDijk.htm Accessed on [17 June 2004]

Van Dijk, J and Hacker, K. (2003). The digital divide as a complex and dynamic phenomenon. The Information Society 19 315-326.

Vygotsky, L.S. (1978). Mind in society: Development of Higher Psychological Process. Cambridge, MA: Harvard University Press.

Warschauer: M. (2002). Reconceptualising the digital divide [online]. Available at http://www.firstmonday.dk/issues/issue7_7/warschauer/ First Monday 7(7). Accessed on [17 June 2004]

Warschauer: M. (2003a). Demystifying the digital divide. Scientific American. August. 289(2), 42-47. Available at http://www.gse.uci.edu/markw/papers.html Accessed on [17 June 2004].

Warschauer: M. (2003b). Dissecting the digital Divide: A case study in Egypt. The Information Society 19 297-304. Available at http://www.gse.uci.edu/markw/dissecting.pdf Accessed on [17 June 2004]

Warschauer: M. (2003c). Technology and Social Inclusion: Rethinking the Digital Divide. The MIT Press. Massachusetts.

Wertsch, James (1991) Voices of the mind A sociocultural approach to mediated action. Cambridge, MA. Harvard University Press

Wikipedia. (no date). Digital Divide [online]. Available at http://en.wikipedia.org/wiki/Digital_divide Accessed on [17 June 2004]

Wilson, E.J, and Wong, K. (2003). African Information Revolution: a balance sheet. Telecommunications Policy 27 155-177.

Wilson, E.J. (2000). The global Digital Divide: Strategies for Social research. National Academy of Sciences. Washington DC.

Wilson, E.J. and Patterson, R. 2000. New IT and Social inequality: resetting the research and policy agenda. Information Society 16 (1) p77-87.

World Economic Forum. 2002. Better faster cheaper: developing and leveraging world class ICT networks for social and economic advancement. World Economic Forum, Switzerland.