The Virtual Mobius Strip: access to and use of ICTs in higher education

Laura Czerniewicz, Cheryl Brown

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Access to and use of Information and Communication Technologies (ICTs) in higher education in the Western Cape

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Acronyms and abbreviations

Acronym/ abbreviation	Meaning
CAI	computer-aided instruction
CALICO	Cape Library Consortium
CHEC	Cape Higher Education Consortium
CITTE	Conference on Information Technology in Tertiary Education
CPUT	Cape Peninsula University of Technology
CTech	Cape Technikon
DoE	Department of Education
HictE	The Information and Communication in Higher Education Project
HODs	heads of department
ICS	information and communication services
ICTs	information and communication technologies
IIS	integrated information strategy
IT	information technology
KEWL	Knowledge Environment for Web-based Learning
LMS	learning management system
MCQ	multiple-choice quiz
NTIA	National Telecommunication and Information Authority
PC	personal computer
PenTech	Peninsula Technikon
SALDRU	Southern Africa Labour and Development Research Unit
SE	socio-economic
SU	Stellenbosch University
UCT	University of Cape Town
UWC	University of the Western Cape
WWW	World Wide Web

Executive summary

About the study

This report is a regional study into the access to and use of Information and Communication Technologies (ICTs) in five higher education institutions in the Western Cape, South Africa. The research was conducted in 2004 – through a survey of 6577 students and 515 academic staff, and in 2005 - through interviews with key informants in the region.

This study is one component of the larger HictE (Information and Communication Technologies in Higher Education) Project, which is a cross-institutional Carnegie-funded project designed to improve understandings of quality and equity issues in educational technology in higher education in the Western Cape, South Africa.

The investigation takes place in a higher education context characterised both by resource constraints and increased expenditure on ICT infrastructure. Despite the lack of a Higher Education national educational technology policy and funding incentives as in other countries, there have been indications in recent years of increased ICT uptake for teaching and learning.

This use has either been driven by institutional strategies or by changes in academic and student practices, presumably because of the need for participation in the knowledge society about which there is general consensus.

While there has been a sense that the use of ICTs has shifted from administration to supporting research, teaching and learning, most of the evidence has been anecdotal or in the form of case studies. This study therefore fills a gap by providing a meso level description of both access and use in one region, the Western Cape.

The study set out to provide baseline information about access and use, as well as to identify factors hindering or encouraging the use of computers for teaching and learning.

The framework for understanding access is based on a "thick" concept which understands access to four kinds of resource groupings being required, as summarised in Table 1.

The study examines the extent and the breadth of the resources that students and staff have access to, in order to use ICTs for teaching and learning. It also considers how access is differentiated for different demographic groups, and how academic staff and students access resources differently.

Students' and staff ways of using computers are described in terms of a framework adapted from Laurillard's conversational framework (2002), providing a way of linking particular media forms with specific kinds of teaching and learning events.

Findings about use describe the breadth and extent of different events and media forms, as well as their use across the curriculum and in different disciplinary domains.

The relationship between access and use is also explored.

Table 1: Conceptual framework: resources for access

	Technological		Personal	Contextual		Digital Content
	Physical	Practical	Agency	Social	Institutional	
Definition	tangible components of computers and associated telecomm. infrastructure	control over when and to what extent computers are used	person's disposition towards using computers as well as their aptitude	interest and support received from a community social network	integration of technology into the institution	availability of suitable digital material online
Indicators	Location Availability Adequacy	Time Autonomy	Disposition: interest attitude Aptitude: experience ability training	Support Networks	Extent Policy Support Intention	Relevance Local production Language

Findings about access

The findings make it clear that technological access for students does exist across the region. However, it varies considerably for students in terms of difficulty and adequacy. Also students from low or average socio-economic groups, those who do not speak English as a home language and those with disabilities are disadvantaged in terms of technological access.

With regards physical resources, quantities of student computers within universities tell a limited story. Institutional provision ranges between 12: 1 and 6: 1 students per computer; yet factors such as support and availability make the crucial difference to student satisfaction. Thus practical access to technological resources is an enabling or constraining factor, with on-campus facilities having differing levels of availability, and many facilities not available after working hours.

At the same time, the majority (78%) of students also have some form of access to a computer off campus. However, only a small group of students has convenient access to a computer and the Internet where they live. Practical considerations such as sharing of computers affect the majority of students. Arising from the qualitative data are additional constraining considerations relating to practical access, these being the conduciveness of the physical environment and the affordability of physical resources. With regards different groupings, students from low or average socio-economic groups, those who do not speak English as a home language and those with disabilities are disadvantaged in terms of off-campus access.

Divides between institutions affect students' ease and adequacy of access to ICTs. Students from two of the five Western Cape institutions consistently report difficult access on campus and a high percentage of students from one institution reports that Internet access and ICT support is inadequate for their learning requirements. Staff reports are regionally highly critical of the access available to students on campus.

Academic staff generally have adequate access to computers on campus. Yet their days are not traditionally structured and their commitment to being able to work off campus is manifest in the extent to which they have invested in computers at home. This is true across the region despite the resource intensiveness or historical wealth of the institutions in which they work. Access for academics is constrained by the lack of integration between on and off campus systems and by the fact that they shoulder the cost of home access themselves.

With regard access to resources of personal agency, the majority of students report a high level of access. They are overwhelmingly positive about the role of computers in learning and have a high opinion of their own self efficacy. While their actual skills would need to be tested by other research methods, the findings do suggest that students' use of ICTs is enabled by their motivation and confidence. Academic staff are similarly enabled by a positive disposition. More than half have availed themselves of some computer training and most express great confidence in their own abilities.

Differences between staff and students exist with regards access to contextual resources. Overall, students have good access to supportive contextual resources, with friends even more supportive in terms of interest and actual use than families. There is, however, less support reported by students from lower socio-economic backgrounds, students who speak English as a second language, and students with disabilities.

Academics, on the other hand, generally do not report access to good institutional resources. They know surprisingly little about their colleagues' attitudes to computers suggesting limited support networks or communities of practice. Their use is not being enabled or driven by formal institutional factors or policies, except in the case of one institution where staff both know about and feel enabled by institutional policies. Certainly across the region there is no shared language about the use of computers in education.

Unexpected findings from this study are the high levels of access to appropriate online content reported by both staff and students. Students overall are satisfied with the adequacy of online content irrespective of age, socio economic group and language. Staff are very positive about being able to find Internet content that is relevant to both their courses and the South African context. The majority

Table 2: Conceptual framework: teaching and learning events, teaching strategies, learning experiences and educational media

Teaching & Learning Event	Teaching strategy	Learning experience	Related media form	Examples of non-computer based activity	Example of computer based activity
Acquisition	Show, demonstrate, describe, explain	Attending, apprehending, listening	**Narrative** Linear presentational *Usually same "text" acquired simultaneously by many people*	TV, video, film, lectures, books, other print publications	Lecture notes online, streaming videos of lectures, DVD, Multimedia including digital video, audio clips and animations
Discovery	Create or set up or find or guide through discovery spaces and resources	Investigating, exploring, browsing, searching	**Interactive** Non-linear presentational *Searchable, filterable etc but no feedback*	Libraries, galleries, museums	CD based, DVD, or Web resources including hypertext, enhanced hypermedia, multimedia resources. Also information gateways.
Dialogue	Set up, frame, moderate, lead, facilitate discussions	Discussing, collaborating, reflecting, arguing, analysing, sharing	**Communicative** Conversation with other students, lecturer or self	Seminar, tutorials, conferences	Email, discussion forums, blogs
Practice	Model	Experimenting, practising, repeating, feedback	**Adaptive** Feedback, learner control	Laboratory, field trip, simulation, role play	Drill and practice, tutorial programmes, simulations, virtual environments
Creation	Facilitating	Articulating, experimenting, making, synthesising	**Productive** Learner control	Essay, object, animation, model	Simple existing tools, as well as especially created programmable software

Adapted from Laurillard's *Rethinking University Teaching* (2002)

of staff feel that computer resources are available in the language they want as well as in more than one language as required.

A comparison of staff and students shows that staff unsurprisingly have much better access to technological resources than students do, both on and off campus. Staff are also more critical of the inadequacies of student technological access than students themselves are.

There are similarities and differences in terms of resources of personal agency. Staff have been using computers for greater lengths of time. Yet the lack of experience does not affect student confidence in their own abilities. Both students and staff have high levels of self rating in terms of skills and experience. However, staff are critical about student knowledge being sufficient for their learning requirements.

Both staff and students have a high disposition towards the use of computers generally and for teaching and learning, although student disposition is on average higher than that of academic staff. Students notably have a high expectation of staff in terms of their use of computers and provision of support.

While students and staff have generally supportive social networks, many staff are unsure about colleagues' attitudes and use of computers. Once again, staff are more critical of support both for themselves and for students than students are for themselves.

Findings about use

The first decade of computer use in higher education started in the mid-1980s and was characterised by use to support educational administration. The second decade of use starting in the mid-1990s saw a shift to use for teaching and learning. This study shows that a considerable change has taken place over the past 20 years. The findings show that 98 % of students report using computers for learning. While this suggests pervasive and extensive use, a closer analysis shows that while the extent of use is substantial, the breadth of use remains narrow.

Additionally, the study notes that take-up does not appear to be only driven by lecturer requirements within courses, although indications are that this does encourage higher frequency of use. Uptake also seems to occur as students use computers as part of their own learning activities. However variation of use does seem to be strongly related to lecturer requirements. Also academic staff use computers less often themselves than they expect students to use them.

With regards type of use, computers are used most frequently for the teaching and learning event of discovery. One of the most frequent activities involves finding information using the Internet; next is the use of a computer to find general information about the course and to access lecture notes. Discovery events are associated with the use of interactive media; these are not used uniformly across the curriculum. Students in preliminary years report less frequent use of computers for finding electronic readings compared with postgraduate students who do so frequently. On the other hand, students in undergraduate years access lecture notes and examples of assignments more frequently than postgraduate students. Other than a higher frequency of use of interactive media forms reported by staff in the hard disciplines of Science and Health Sciences, there are no distinctive patterns in terms of the use of interactive media between disciplinary groupings.

The next most frequently reported use of computers is for the teaching and learning event of creation. However despite the potential of computers to enable collaborative productivity, closer analysis reveals that the most frequent activity reported is the writing of assignments, with computers being used as little more than electronic typewriters. Productive activities are more frequently undertaken by students in later stages of the curriculum, especially frequent amongst postgraduates and undergraduate students in fourth year or above. Across disciplinary groupings, it emerges that the hard disciplines of Science, Engineering and Health Sciences have a higher frequency of use of productive media (both as reported by staff and students) than the soft disciplines of Humanities and Business.

The use of computer-based communicative media forms reported in our study is not widespread at 55%, a surprising finding in the light of the acknowledged potential of networked computers to support and transform dialogue and communication. Other than a higher frequency of post graduate students emailing their lecturers, there are no differences across the curriculum in communicative use. However, disciplinary groupings differ, with Health Sciences the most frequent in their use as reported by both staff and students. The applied disciplines of Business and Engineering report the lowest frequency of use.

Computers are also not being extensively used for opportunities of practice, such as self-paced learning, feedback, drill and practice, and automated feedback. Where used, students engage most frequently in activities which provide feedback and multiple choice quizzes. The activity which students and staff engage in the least frequently is the use of computer games for learning. The activities of using

multiple choice quizzes (MCQs) and online activities which provide feedback are more frequent among foundation and undergraduate students in particular. There is also a high frequency of use of computers in particular for simulations, role plays and case studies in the hard applied disciplines (Engineering and Health Sciences) which is consistent with these disciplines' strong practical focus in the application of course material.

From both student and staff perspectives there is little evidence of use of computers for the event of acquisition in our region. Narrative media such as presentation software and multimedia are little used and are likely to be constrained by limitations reported in classroom facilities.

This study is premised on a relationship between access and use. Correspondence analysis confirms that such a relationship exists, with low access and infrequent or no use strongly associated, and high access and frequent use also strongly associated. Additionally, infrequent users of ICTs are likely to have low access and frequent users of ICTs are likely to have high access. Although this does not account for all cases, it does indicate that increasing access also increases use.

Use is constrained by low access to: a computer at home, disposition towards using a computer, computer aptitude, contextual support and perceived adequacy of digital content. In addition, even where students have average access to these resources, they continue to be constrained by ease and adequacy of access, availability of access, necessary support, as well as the need for a reason to use a computer. This supports the study's assumptions that use is not binary, but rather exists in gradations.

Demographic divides

There are definite differences in access for specific student and staff groups. These differences vary more across some resources groupings than others.

Students from low socio-economic groups find access to ICTs on campus more difficult, have less access to ICTs off campus and rate their aptitude lower than their counterparts from high socio-economic groups. This lower access also translates into lower use as students from low socio-economic groups also use ICTs less.

In parallel, students who speak English as a second language have less access to computers off campus and rate their aptitude lower than their counterparts from high socio-economic groups. They also have less access to supportive social networks and have a slightly lower perception of the adequacy of online content.

While the group of students who report having a disability or illness that impacted in their use of ICTs is small, they are particularly disadvantaged in terms of off campus access and aptitude.

With regards gender, the findings show no gender differences with regards access to technological resources. However, there are differences in terms of autonomy of access amongst both staff and students with systematic differences recorded in men's and women's confidence as well as their length of experience using ICTs. An anomaly is that whilst male academics report higher technological interest there is no difference in the frequency of use between male and females academics with regard to using a computer to find information or for recreation. However the converse is the case with students, with male students indicating a higher technological interest and making more frequent use of a computer particularly for finding information and recreation.

Whilst there are no significant differences with regard to access and age, older staff members report less frequent use of most computer-mediated teaching and learning activities. There is also a decrease in use amongst older students with the exception of use for interactive media and communication, in particular emailing lecturers. In particular, younger students (under 30) are much more frequent users of adaptive media compared to those over 40 years. The most notable age-related difference is in the reported use of chat for communicating. Here younger students are considerably more frequent users compared to older students who hardly undertake this activity at all. Overall, the study confirms decisively differentiated access to and use of computers for teaching and learning in the Western Cape.

Key findings of the study

Finding 1: It is easier to clearly identify constraining factors than enabling ones

When students have low access they are very likely to have low use. While students with high access have generally high use, they more also have low use and they are demographically differentiated

Finding 2: It is not about the numbers of computers - it is about the conditions of use

The institution in the Western Cape with the worst computer: student ratios has the highest satisfaction levels. This is because of availability and ease of access, adequacy of computers and support. Practical issues such as opening hours, booking conditions and the conduciveness of the learning environment prove crucial.

Finding 3: Students and staff are enabled by very positive dispositions

There is remarkable consensus about the value of computers. People are overwhelmingly positive about the benefits of computers, both generally and particularly, for teaching and learning.

Finding 4: Students are enabled by highly supportive networks

Students' family and friends place a high value on the use of computers.

Finding 5: Staff are constrained by poor or ambivalent social and institutional networks

Many staff don't know if their colleagues think computers are important. In all but one institution staff feel that the institutional support and vision of ICTs for teaching and learning is average or poor.

Finding 6: On-campus access is more equitable than off-campus access for students

Students from low socio-economic groups, those who speak English as a second language or have a disability, have less access off campus whereas only students with a disability indicate difficult access on campus.

Finding 7: On campus- off campus integration is a constraint for staff

Whilst they have good physical access to computers, staff need more seamless home/ work portability.

Finding 8: The use of computers for teaching and learning is pervasive

97% of staff and students use ICTs in some way for teaching and learning.

Finding 9: There is narrow use of ICTs

ICTs are used primarily for finding information and writing assignments, while more interesting uses are less common. There is a broader range of use at post graduate level than at undergraduate level.

Finding 10: Students use computers for teaching and learning more than staff do

45% of students use a computer daily for study compared to 32% of staff who use it daily for teaching.

Finding 11: Students use computers for learning even when they are not asked to do so

For example 55% of staff ask students to use communicative media as part of their course whereas 75% of students report using communicative media regularly for their learning.

Finding 12: Use in particular courses is enabled by staff

When staff require use of ICTs in a course, students use is both more frequent and more varied.

Finding 13: Computer use is generally aligned with traditional disciplinary linked teaching and learning strategies except in the Health Sciences

Health Sciences has the highest frequency and variety of use across all teaching and learning events.

Finding 14: There are no overall gender differences regarding access or use

But women (both staff and students) are less likely to be sole or primary users of home computers and report lower interest in and confidence using computers.

Finding 15: Students from low socio-economic groups are more disadvantaged

They have less access to computers off campus, and rate their aptitude lower than their counterparts from high socio-economic groups. Students from low socio-economic groups also use computers less.

Chapter 1

Introduction

1.1 Background to the study

Recognising the need for full participation in the "knowledge society", South African higher education institutions today are refocusing their positions in global economies and rapidly adopting information and communication technologies (ICTs). The process of repositioning themselves has required institutions to re-examine the foundations of who they are and what they do. Participation in this ICT-based knowledge society has led to the reassessment, amongst other things, of complex notions of "graduateness", access and ICT usage.

Because ICTs are considered a basic requirement of the knowledge society for which universities now prepare their students (Castells, Flecha, Freire, Giroux and Macedo 1999; Burbules and Callister 2000), South African higher education institutions are spending more on ICTs than previously, despite their resource constraints (Czerniewicz, Ravjee and Mlitwa 2006). At the same time there is evidence of growth in and rapid take-up of ICTs in higher education in the country (Paterson 2004; Czerniewicz, Ravjee et al. 2006).

This increase in expenditure and use is taking place despite the lack of a national educational technology policy, unlike in countries where the use of ICTs in education is funding and policy driven. However, the assumed role of ICTs in education is evident in South African national and institutional policy documents such as the *National Plan for Higher Education* (Department of Education 2001), the *National Research and Development Strategy* (Department of Arts, Culture, Science and Technology 2002), the *National Research and Technology Foresight ICT Report* (Department of Science and Technology 2000), and the *White Paper on e-Education* (Department of Education 2003b). These argue that using ICTs will, variously, add value to education, improve teaching and learning, encourage innovation and contribute to transformation.

We know very little about how these arguments play out in practice or about the ways in which this investment is supporting teaching and learning. Access to ICTs alone may not ensure use nor does it determine added value for education. This study is therefore one of a growing number of empirical investigations which explore the use of ICTs in higher education. The majority of these are case studies and no national level studies of ICT use in higher education presently exist; this is therefore a rare meso-level investigation in South Africa.

This research study is one of six projects conducted under the auspices of the umbrella "Enhancing quality and equity in higher education through the innovative application of ICT (HictE)". HictE (http://www.hicte.uwc.ac.za/) was funded by the Carnegie Corporation and formed a complex multidisciplinary and inter-institutional collaboration across the Western Cape. The overall goal of HictE was to improve understanding of both quality and equity in educational technology in higher education in the Western Cape. The other HictE projects were Master's programmes

on information management and higher education policy management; teaching-and-learning support; ICT support through innovative software development; and support in terms of transformation.

1.2 Purpose and aims of the study

The problem is threefold: in a rapidly changing environment there is little knowledge of ICT access and use; the conditions which constrain and enable access and use have not been made explicit; and to date concepts of both access and use have tended to be thin and superficial.

Work done on ICTs in education has tended to focus on the technical hardware and software; it is, however, becoming evident that, although these are necessary, they are insufficient factors for productive pedagogical engagement. 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 multifaceted teaching and learning terrain.

It is therefore essential that baseline information regarding South African higher education staff and students' access to computers and use of computers for teaching and learning is gathered. It is also necessary to understand how academics and students do (and do not) make use of ICTs for teaching and learning. This is done by exploring conditions of take up, identifying and explaining enabling and constraining factors; and developing a more nuanced and appropriate explanation of ICT access and use in higher education in a developing country.

The overall purpose of the project is therefore to describe the landscape of ICT access and use in higher education in the Western Cape in a nuanced way, which means collecting baseline information on academic staff and student access to and use of information and communication technology.

During the conceptual and planning stages of the survey project it became evident that this research offered an opportunity to move beyond descriptive fact-gathering. This data is certainly useful since such baseline data does not exist at all, making planning particularly difficult. However, the research offered the opportunity to design a richer and more complex and nuanced analytic investigation, one which enabled identification of relationships and patterns both within and between access and use. This has the potential to enrich understanding of the changing nature of teaching and learning in an increasingly technology-mediated environment.

Consequently, the specific aims of this report are as follows:

1. To examine the different resources students need to access in order to use ICTs for teaching and learning
2. To examine the different resources staff need to access in order to use ICTs for teaching and learning
3. To compare student and staff access to the different resources
4. To determine if staff and students are using ICTs to support teaching and learning
5. To describe staff and student use of specific media forms as part of specific teaching and learning events
6. To compare student and staff use of specific media forms as part of specific teaching and learning events
7. To explore staff and student use across the curriculum in relation to level of use, year of use and disciplinary grouping
8. To examine access and use in terms of the relationship between them
9. To identify specific groupings for whom access to and use of ICTs is a particular challenge/concern
10. To identify the factors which enable or constrain the take up and use of ICTs for teaching and learning.

1.3 Assumptions and theoretical framing

Our investigation is underpinned by key assumptions which include that access is a "thick" concept which must be understood as extending beyond technological resources; that the resources that need to be accessed are interrelated; that ICT use needs to be understood in relation to its purpose; and that specific media forms (both ICT and non-ICT) are associated with particular teaching and learning events.

As it became evident that the project offered an opportunity to do more than collect baseline data, we began 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, (Laurillard 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 ICTs, we found little local research to help us name and frame access to ICTs in higher education.

On the basis of our readings and of the results of a pilot study survey with staff and students, we refined, polished and redeveloped four key areas until we agreed on four categories of resources to form the analytical foundation of our study. That we would need some kind of dualist distinction between macro and micro, or structure and agency, was unavoidable. Mindful that this is hotly contested and deeply theorised terrain, we acknowledge that structure and agency are interdependent (Freeman 2001) and interpenetrated (Lehman 2003), and that they presuppose each other (Giddens 1979). We therefore suggest four categories of resources: technological resources, resources of personal agency, contextual resources and online content resources.

Overall, we take a relational view (Van Dijk and Hacker 2003b) in order to map networks, conditions, positions and connections. While mapping relationships between resources requires distinctly bracketed resource groupings, 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 section of this report about access we explain our access categories in more detail. A summary of our framework is provided in Table 1.1; our analytical framework in turn informs the specific research questions.

As many others have done before us, we argue that ICTs have no intrinsic benefits in themselves, but are most usefully understood as interwoven in practices which exist in specific contexts and for particular purposes (Snyder 1998; Kling 2000; Warschauer 2002; Warschauer 2003a; 2003b; 2003c; Lamb and Johnston 2004). Our focus is on the connections which exist between ICTs and teaching and learning events. This approach means that, unlike many other related studies (Collis, Peters and Pals 2001; Norris, Sullivan and Poirot 2003), our primary interest is not to quantify use of a particular software or functionality (although we do need to know the extent of use), but to emphasise ICTs as "functional ensembles", that is to consider the ways in which ICTs are accessed, as well as the link between people and ICT uses, as opposed to a view of ICTs as a collection of features (Sawyer and Crowston 2004).

This study does not evaluate the use of particular ICTs in relation to one another nor to other technologies, as do others, such as Mason 1998; Collis, Peters et al. 2001; Cantoni, Cellario and Porta 2004. Rather, we note that particular ICTs are more likely to be used for particular events. While the studies of use which categorise types and levels of courses have been useful in contextualising the extent and nature of ICT use, they do not focus on teaching and learning interactions (Mason 1998; Bonk, Cummings, Hara, Fischler and Lee 2000). We therefore recognise that our study is bounded by the curriculum, and that the

Table 1.1: Conceptual framework: resources for access

	Technology		Personal agency	Contextual		Digital content
	Physical	Practical		Social	Institutional	
Definition	Tangible components of computers and associated infrastructure	Control over when and to what extent computers are used	Person's disposition towards using computers as well as their aptitude	Interest and support received from a community social network	Integration of technology into the institution	Availability of suitable digital material online
Indicators	Location Availability Adequacy	Time Autonomy	Disposition: interest attitude Aptitude: experience ability training	Support Networks	Extent Policy Support Intention	Relevance Local production Language

Table 1.2: Conceptual framework: teaching and learning events, teaching strategies, learning experiences and educational media

Teaching & learning event	Teaching strategy	Learning experience	Related media form	Examples of non-computer-based activity	Example of computer-based activity
Acquisition	Show, demonstrate, describe, explain	Attending, apprehending, listening	**Narrative** Linear presentational *Usually same "text" acquired simultaneously by many people*	TV, video, film, lectures, books, other print publications	Lecture notes online, streaming videos of lectures, DVD, multimedia including digital video, audio clips and animations
Discovery	Create or set up or find or guide through discovery spaces and resources	Investigating, exploring, browsing, searching	**Interactive** Non-linear presentational *Searchable, filterable, etc. but no feedback*	Libraries, galleries, museums	CD-based, DVD, or Web resources including hypertext, enhanced hypermedia, multimedia resources. Also information gateways
Dialogue	Set up, frame, moderate, lead, facilitate discussions	Discussing, collaborating, reflecting, arguing, analysing, sharing	**Communicative** Conversation with other students, lecturer or self	Seminars, tutorials, conferences	Email, discussion forums, blogs
Practice	Model	Experimenting, practising, repeating, feedback	**Adaptive** Feedback, learner control	Laboratories, field trips, simulations, role play	Drill and practice, tutorial programmes, simulations, virtual environments
Creation	Facilitate	Articulating, experimenting, making, synthesising	**Productive** Learner control	Essays, objects, animations, models	Simple existing tools, as well as especially created programmable software

Source: Adapted from Laurillard's *Rethinking university teaching* (2002)

macro level of the course and the micro level of pedagogical interactions frame the investigation.

Understanding ICT use at the level of pedagogical engagement will provide valuable insights into their relationship with teaching and learning. Pedagogy is about the various forms of interaction between three agents: teacher, student/s and knowledge domain. These three agents comprise three elements in a triangle of interaction (Garrison and Anderson 2002). Pedagogy is not only about both process and content, but also about context. Discussing technology and pedagogy requires consideration of the interrelations between teaching approaches, learning experiences, the nature of the content under discussion and the knowledge being created (Lusted 1986; Bernstein 2001; Loveless, DeVoogd and Bohlin 2001).

Teaching and learning interactions and activities are likely to be linked with specific forms of technology. In order to be able to describe the relationship between pedagogy and technology we looked for a framework that could describe teaching and learning interactions, link them to purpose (allowing us to contextualise them), name types of ICT use, categorise types of ICT forms, and explicitly link them to particular teaching and learning events.

This is a challenge which has been taken up by researchers who have developed theories focusing on one of those

elements (for example Johnson and Aragon 2003). A comprehensive holistic approach is offered by activity theorists, who provide a way of describing the whole learning environment, including linking social, cultural and historical influences, and examining relationships between people and new technologies (Ravenscroft 2001; Issroff and Scanlon 2002; Mwanza and Engestrom 2003). Lim has specifically proposed using activity theory to examine elements of ICT use within an academic course but like the others does not offer an explicit way of describing the kinds of ICT use for teaching and learning, nor models of ICT media forms (Lim 2002). The only model we found which explicitly links specific ways of using ICTs to pedagogy is the conversational framework developed by Laurillard (2002) and used and extended by others (Britain and Liber 2004; Conole, Dyke, Oliver and Seale 2004). This framework classifies different types of media forms in relation to key teaching and learning events in a way that makes it possible to link them to specific teaching strategies and learning experiences.

In the section about use for teaching and learning we explain how we adapted Laurillard's (2002) conversational framework, which provides a way of describing teaching and learning in terms of five key events: acquisition, discovery, dialogue, practice and creation. These events involve specific teaching strategies, roles or actions which interact with specific learning strategies, roles, actions and experiences. The framework then links five media forms with the key teaching and learning events. Together they describe the most dominant learning experiences and teaching strategies currently employed in higher education. An overview of this framework is provided in Table 1.2; it too informs our specific research questions.

We conceptualise access to and use of ICTs as a virtual Möbius strip. A Möbius strip is only one-sided and has no beginning or end. It has the mathematical property of being non-orientable. This image captures the relationship between access to and use of ICTs as they are inherently related, beyond being linked or cyclical. If one has access to ICTs, one has a use of ICTs, and as one uses ICTs, one in turn requires more or different access. It is a cycle that can start at any point and never ends. The two concepts are forever locked together in a never-ending path and one cannot separate them out.

1.4 Research questions

The research questions for this study are informed both by its aims and by our theoretical understanding of the issues. The questions are presented in clusters related directly to the aims.

1. **Aim:** To examine the different resources students need to access in order to use ICTs for teaching and learning

   Questions

   - What resources do students have access to?
   - What technological resources do students have access to?
   - What resources of personal agency do students have access to?
   - What contextual resources do students have access to?
   - What digital content resources do students have access to?

2. **Aim:** To examine the different resources staff need to access in order to use ICTs for teaching and learning

   Questions

   - What resources do staff have access to?
   - What technological resources do staff have access to?
   - What resources of personal agency do staff have access to?
   - What contextual resources do staff have access to?
   - What digital content resources do staff have access to?

3. **Aim:** To compare student and staff access to the different resources

   Questions

   - In what ways are staff and students' access to resources similar?
   - In what ways are staff and students' access to resources different?

4. **Aim:** To determine if staff and students are using ICTs to support teaching and learning

   Questions

   - To what extent are ICTs being used by students as part of teaching and learning events in higher education in the Western Cape?
   - To what extent are ICTs being used by staff as part of teaching and learning events in higher education in the Western Cape?

5. **Aim:** To describe staff and students' use of specific media forms as part of specific teaching and learning events

Questions

- Which teaching and learning events are most often supported by or used in conjunction with ICTs?
- What kinds of activities are most often supported by or used in conjunction with ICTs?

6. **Aim:** To compare student and staff use of specific media forms as part of specific teaching and learning events

Questions

- In what ways are staff and students' use of media forms similar?
- In what ways are staff and students' use of media forms different?

7. **Aim:** To explore staff and students' use across the curriculum in relation to level of use, year of use and disciplinary grouping

Questions:

- How are the media forms being used to support the different teaching and learning events at
  - undergraduate level?
  - postgraduate level?
  - in different years of study?
  - in the different disciplinary groupings?

8. **Aim:** To examine access and use in terms of the relationship between them

Questions

- Does lack of access to these resources mean that ICTs are not used to support teaching and learning activities?
- Does greater access to these resources equate with more frequent and/or varied use of technologies for teaching and learning?
- Is there a relationship between technological access and frequency or variety of use?

9. **Aim:** To identify specific groupings for whom access to and use of ICTs is a particular challenge/concern

Questions

- Do the differences in access affect various social groups of students differently?
- Do the differences in access affect various social groups of staff differently?
- Do various social groups of students use specific media forms as part of specific teaching and learning events differently?
- Do various social groups of staff use specific media forms as part of specific teaching and learning events differently?

10. **Aim:** To identify the factors which enable or constrain the take up and use of ICTs for teaching and learning

Questions

- What enables the use of ICTs for teaching and learning?
- What constrains the use of ICTs for teaching and learning?

1.5 Structure of this report

We begin in Chapter 2 by contextualising the study in terms of the five institutions' location in the Western Cape and the ways they are framed by South African higher educational conditions and concerns. We provide a brief historical overview of the use of ICTs in the Western Cape over the past two decades.

The research methodology is presented in Chapter 3. We present our findings on access and use in Chapters 4 and 5 respectively. These are structured in terms of our conceptual frameworks.

In Chapter 4 we explain our understanding of access, present and discuss our findings. We examine staff and student access in two separate sections and explore these according to our resources groupings of technological, personal, contextual and digital access.

In Chapter 5 we then examine staff and student use of ICTs for teaching and learning in terms of the five key events: acquisition, discovery, dialogue, practice and creation.

The relationship between access and use is explored in Chapter 6 and our concluding discussion is presented in Chapter 7.

It is necessary to note that we viewed this research as a regional survey; our primary interest was not the comparison of different institutions within the region. However, when discussing issues that were directly related to institutional differences (for example on-campus technological access or institutional policies on e-learning) an institutional breakdown of data was necessary and is therefore provided.

The baseline data as provided by the survey is provided in appendix 1.

Chapter 2

Regional context

2.1 South Africa

ICTs are only one strand in a whole range of interconnected issues that have engaged South African educators and policy makers since 1994. It is hard to pinpoint when and whether they are the cause or the consequence of these issues. In this study we disentangle ICTs and examine them as an isolated component. However, we are mindful that this is an artificial separation and that issues of globalisation, diversity, equality and restructuring are intimately connected with ICTs and all form part of the transformation of South African higher education.

With transformation being shaped by the imperatives made explicit since the 1994 elections, South Africa is in the process of giving attention to social equity. In higher education this has meant restructuring a fragmented, divided and unequal sector; the development of clear goals; and the formulation and implementation of policies towards transformation (Gillard 2004). These changes are currently impacting on the sector, with many institutions merging in 2005, including two in the Western Cape, soon after our study was conducted.

More students appear to be entering higher education and South African universities now have a racially desegregated student composition. At the level of transforming institutional practice and culture, the Minister of Education notes that there is an "evident lack of progress" (Pandor 2004). In addition, "worryingly" low graduation rates are evidence that whilst higher education has opened the doors to students it has not assisted them in passing through them successfully (Pandor 2004).

Higher education's role in developing a knowledge society in South Africa is made clear in the *National Plan for Higher Education* which states that the sector has "a critical and central role to play in contributing to the development of an information society in South Africa both in terms of skills development and research" (Department of Education 2001). The *Plan* notes the argument of the noted social theorist of the information revolution, that "if knowledge is the electricity of the new informational international economy, the institutions of higher education are the power sources on which a new development process must rely" (Castells, Section 1.1 para 6).

In order to build South African's information economy it is essential to ensure that higher education graduates have the necessary skills and knowledge to participate fully in this knowledge society, both locally and globally. This requires the interrogation of notions of "graduateness" which in turns means understanding more about access to ICTs within the higher education context and what enables or inhibits their use by staff and students. Access to ICTs has become essential as "exclusion will mean severely limiting life chances" (Burbules and Callister 2000, p.19).

The opportunities ICTs are perceived to offer for improved education can be seen in the South African Department of Education's *White Paper on e-education* (Department of Education 2003b, p.8), which 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* (Department of 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 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" (2003).

The view that ICTs are great equalisers has receded as the local realities and complexities of implementing ICTs in education in a diverse and divided terrain have become more evident. It is also noted that a more "cautious view is evident in the growing research on the existence of digital divides and strategies to deal with them. Much of this literature accepts broadly that ICTs can change the way higher education institutions operate, but also points to the existence of new digital divides, emerging out of existing social divides around class, race, gender, nationality and disability as impediments to that potential role. These divides restrict higher education access and participation and therefore lead to the continued exclusion and under-representation of historically excluded groups in ICT fields" (Czerniewicz, Ravjee et al. 2006, p.63).

South Africa is considerably under-resourced in terms of technology and infrastructure compared to the developed world. Teledensity rates are low: 11 in 100 people have fixed lines, and 36 in 100 people have mobile phones (Bridges.org 2002; International Telecommunication Union 2003). 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 having access – is way ahead of the rest of Africa, which averages 1.4 in 100 people with access. But the country still lags behind developed countries: 42 in 100 people in the United Kingdom and 55 in 100 people in the United States have Internet access (International Telecommunication Union 2003).

Nationally, 39% of South African schools have a computer and 26% have one dedicated to teaching and learning (Department of Education 2003a; 2003b). While direct figures are hard to pin down, it is clear that school access to computers in developed countries is substantially higher. For example, the percentage of computers available to 15-year-olds at secondary schools in the US in 2002 was 73% and in the UK 78% (Organisation for Economic Co-operation and Development 2002).

In US higher education, computer access is now being quantified in terms of wireless networks with a quarter of university campuses having campus-wide wireless networks and wireless networks available in more than a third of college classrooms (Green 2004). Research on student ownership now seeks to quantify the percentage of students who own one or more computers (88% in 2005) and those that own two or more computers (27% in 2005) rather than whether or not students have a computer available to them (Mangan 2006).

Comparable data does not exist in the South African higher education sector and needed to be collected as part of this project, even at the level of institutional student–computer ratios.

ICTs therefore form one thread in a complex net of transformation, and use of ICTs is dependent both on the broader socio-economic and political contexts, as well as on the local struggles and strategies around the distribution of resources and other aspects of redressing historical inequities in educational institutions. This makes access to ICTs a redress issue (Ravjee 2005) and highlights a final and crucial reason why it is important that issues of ICT access and use in the South African higher education sector need to be better understood.

2.2 The Western Cape

This research study set out to provide a regional perspective of academic staff and students in higher education institutions in the Western Cape. Whilst the information has value at an institutional level, our interest as researchers is primarily regional. It is not our intention to compare or make judgments about each institution, especially as each is so firmly located in its own specific context. Indeed, many of our observations about ICTs would be likely to have little to do with the technologies themselves and would be more likely to reflect historical realities.

The five institutions surveyed are located in the Western Cape region of South Africa not more than 50km apart. They comprise two established technikons, the Cape Technikon (CTech) and the Peninsula Technikon (PenTech) (since merged as the Cape Peninsula University of Technology – CPUT); a historically white, predominantly English university, the University of Cape Town (UCT) (South Africa's oldest); a historically white, well-established predominantly Afrikaans

university, Stellenbosch University (SU) and a historically black university, the University of the Western Cape (UWC).

The two older universities, Cape Town and Stellenbosch, have historically had contrasting ideologies. Stellenbosch University was an Afrikaans-language institution with strong ties to Afrikaner history and culture. UCT was a liberal institution and a bitter opponent of apartheid; it encouraged black student enrolment, often in opposition to government policy.

The University of the Western Cape was created by apartheid policy in the 1960s as a "coloured university". In defiance of government policy it became known as a non-racial "intellectual home of the left". Cape Technikon was a white institution that developed its city campus in District Six after the notorious Group Areas Act had enforced the removal of all people of colour from this neighbourhood. Peninsula Technikon, created in the 1960s as a "coloured technikon", was vigorously opposed to government policy explicitly setting out to transform itself into a quality, non-racial institution (Leatt and Pretorius 2004).

Whilst it was not our intention in this project to chart the history or evolution of the use of computers in higher education in our region, we were aware of the need to contextualise this research study historically. It was observed early in the process that our research took place a decade into South Africa's democracy. It was also noted that the higher education institutions in our region had made significant inroads into the use of computers for teaching and learning, which made us realise that some historical perspective of where we had come from was indeed helpful as it would set the "mark" against which we could compare where we are today.[1]

2.3 Historical context

2.3.1 The first decade of computer use in higher education: mid-1980s to mid-1990s

The use of computers in South African higher education effectively began in the 1980s, especially from the middle of the decade. Indeed, the 1980s and early 1990s have been described as "the first decade" of computer use in higher education (Lippert 1993). The focus in this first decade was on administration and infrastructure, with much less attention on teaching and learning. Use of computers for teaching and learning was fragmented, and when it did occur it usually took the form of behaviourist individual instruction.

While research on the use of computers in education in the US was well established by the 1980s (Abelle 1973; Andrews and Hakken 1977), very little published research on the use of computers in South African higher education in this period is to be found. A rare exception of research with a historical perspective is the book *Computer-based education and training in South Africa*, (Lippert 1993), a title which reveals the focus on teaching and suggests the role of the computer as an assistant or a tutor.

Administrative focus of computer use

In the Western Cape, the priority during this first decade was on the institutional computer for financial management and core administration (Greaves 2005). For example at UCT there was "very limited use in terms of ICT to the campus community as a whole" and the use was "largely limited to things like the student admin system, the finance system, the HR system and the like" (Naicker 2005).

Staff personal use

As networked computers were barely in existence, attention was paid to providing staff with computers for personal use to support their work, rather than to enable collaboration – this came much later. As one source commented, the use of personal computers "started off as an individual sort of notion" in the late 1980s (Hall 2005). The value was seen to be in improving staff productivity and aiding staff development; funds were raised for this purpose. At UCT for example, "the initial major investment came from the Mellon Foundation … where there was a programme to put PCs on the desk of as many people in the then Arts and Social Sciences Faculty as possible". This was a "sort of accelerated personal level investment" (Hall 2005). These early-generation machines were really used for "personal production and were wired for email use but nothing much really beyond that" (Hall 2005).

Teaching and learning use

In terms of teaching and learning, this period is characterised by computer-aided instruction (CAI) and the rise of the multimedia machine. The interest was in the possibilities of the computer as instructor, with individual students engaging with educational software on individual computers. This was also the decade that saw the rise of the teaching lab to support the use of instructional software.

This kind of software was used to support training of specific skills. In particular, the software was designed to

assist individual learners to work at their own pace and test themselves. At CTech, for example, software was used to improve problem-solving abilities in maths and science:

In those days we had the idea that computers would be used to teach people problem-solving abilities. For example CBT Science and the Mathematical programmes was where it was – there were Mathematical programmes available that we still use in Science and Maths at school – where they put the floppy in a computer, like the computer was still considered as a machine – and you go through the steps by typing in the numerical things and not being evaluated but a kind of a self-testing.
(Smit and De Kock 2005).

CAI software also offered the possibility to rethink educational approaches and methodologies. At UWC, for example, CAI was implemented as part of renewal exercise which sought to transform its teaching philosophy to more learner-centred teaching methodologies to assist their students who experienced severe learning and knowledge backlogs. CAI formed part of the Teaching Centre, which was focused not on educational media *per se* but rather on how media could play an enhancing role in enriching the learning environment (Mehl and Sinclair 1993). Despite the intention to use the computers as catalysts for new kinds of methodologies and philosophies, the software itself was linear and pre-packaged, and tended to support behaviouristic teaching and learning approaches.

Similarly, the use of computers at UCT started with a combination of purchased packages and self-developed tutorials. Although they were used at first only by one department (biochemistry), there was soon a realisation that there was a need for a integrated management system. The UCT Manager was therefore developed. Comprising up to 900 "lessons" and 300 students, it encompassed courses, topics and lessons as well as student assessment and reports, online messaging and computer-based testing. The successful implementation of the pilot in the biochemistry department meant that the University declared it would support those departments with an active interest in CAI. The use of educational software then spread to other departments including chemistry, biochemistry, psychology, geology and engineering (Delpierre and Sewell 1993).

The early 1990s also saw the growth of multimedia capabilities on stand-alone machines, with the potential of multimedia for education being the cause of excitement. The possibilities of audio and visuals in multimedia were exploited for the teaching of languages at both UCT and Stellenbosch University.

Thus at Stellenbosch University, "pockets of the university were using very much still stand-alone applications delivered on a CD, very rich in media content. For example language applications were being developed using *Authorware* and a Master's programme had started up on technology in language learning" (van der Merwe 2005).

Similarly at UCT, multimedia for language classrooms was cutting edge.

What was happening there was that the old Language Departments were using tapes and *the vision there was to shift them onto Multimedia capable computers for language teaching and that lab was partly equipped but you have to remember that that was a stage where the name "Multimedia" was significant because the choice then was the standard machine that everybody was using would not have had a sound card or any graphics, so you had to motivate a considerable additional financial investment to equip computers with in fact sound and graphics capability of any sort. So the multimedia bit signalled that this was very much a cutting edge lab.*
(Hall 2005).

Sites of innovation

The primary sites of innovation for educational computing were in research units and departments with intrinsic needs for computational power. In 1991 there was a "clear distinction between research units and their activities as far as ICT was concerned" with some areas such as physics, oceanography, climate change and the South African Labour and Development Research Unit (SALDRU) engaging in high-performance research computing (Naicker 2005).

As noted there was a concentration of educational software use in the languages, with innovations taking place at UCT (Hall 2005), Stellenbosch University (van der Merwe 2005) and UWC (Mehl and Sinclair 1993). Certainly the audiovisual capabilities were well suited to the languages. One source suggested that "of course the languages moved ahead of everybody else in establishing student-based IT for the natural reason that multimedia became available" (Hall 2005). Others areas of early adoption were the areas of engineering and maths education at UCT, and pharmacology at UWC.

These innovations were possible because of increased and improved infrastructure. One of the "first serious interventions" in the early 1990s at UCT was when a "relatively significant amount of money" was donated for student-oriented PCs in the Arts building which was

"focused very particularly on language teaching and learning" (Hall 2005). Donations were also raised for the expansion of the health sciences library with the inclusion of computers that resulted in innovations in this faculty at much the same time (Hall 2005).

In summary, the first decade of computer use saw computers and networks expand across institutions for individual staff use as well as into libraries. Stand-alone computers were the norm, multimedia was cutting edge. Student teaching laboratories were beginning to be established. Teaching and learning use of computers was fragmented and focused on tutorial-type activities with computers being used primarily as tutors rather than as tools (Taylor 1980).

2.3.2 The second decade of computer use in higher education: mid-1990s to 2004

By the end of the first decade, in the mid-1990s at UWC, academic staff began to become involved and started a process of "agitation and activism" within the university to get the decision-making process to take the use of computers for teaching and learning seriously. Up till then computers were used "as part of the academic programme mainly for the purposes of enabling the academics to do their administrative part of their work, not to do the academic part of their work". They were "not [used] as a means to supplement or impact in any way on teaching and learning or research" (Keats 2005).

By the second decade of ICT use, things had changed substantially. Higher education institutions in the Western Cape were in a position where ICT use for teaching and learning had become enabled by institutional policies, culture or practices. While the purpose of this section is not to provide a comprehensive historical account, it is worth showing the timeline (in Table 2.1) developed by consolidating the key events mentioned by our informants when reviewing the past decade.

Although each institution evolved in different ways and at different times, overall the second decade saw networked computers become the norm in higher education. Significant shifts occurred as cross-institutional networks were put in place, email was mainstreamed and the World Wide Web (WWW) became ubiquitous. This expansion of the computer into a technology which could more easily facilitate sharing of communication saw the move to information and communication technologies – ICTs rather than just information technology (IT). Institutions started to make strategic decisions about computer use, not just for staff but also for students. Organisational units were established to support and encourage the use of computers specifically for teaching and learning.

Establishment of specialised organisational units

The "second decade" saw the establishment of formal structures devoted to ICTs in teaching and learning at four of the Western Cape's higher education institutions. Stellenbosch University formed a new teaching and learning centre with a co-ordinator responsible for e-learning. CTech's centre for e-learning was established. UCT first formed a multimedia education research and development group and then an educational technology unit accountable to the university as a whole. UWC formed the Teaching and

Table 2.1: Timeline of key institutional developments with regard to use of ICTs for teaching and learning in the second decade

1997	1998	2000	2001	2002	2003	2004
UCT Multimedia Education Group	PenTech Decision made to establish IT Centre SU Centre for e-learning	CTech e-learning programme	CTech Appointment of e-learning project manager UWC Appointment of exec. director ICTS SU Introduction of WebCT	CTech Decision to make e-learning part of core business PenTech IT Centre opened UWC ITS strategy	UCT Educational technology policy	UCT Centre for Educational Technology formed UWC e-learning strategy

Learning Technologies Unit (TLTU) after an executive portfolio of information and communication services (ICS) was established in 2001.

These new structures and their activities were funded either by the universities themselves (as at Stellenbosch University) or by large external grants (as at UWC) or by a mixture of both (as at UCT).

The early days of the work saw a variety of activities, including research comparing the use of computers with traditional teaching and learning approaches.

At the early stage the project was very focused on actually trying to demonstrate scientifically and statistically the difference by those sorts of interventions so there was a lot of emphasis on setting up control groups and trying to measure significant improvements in students marks. Now the overall result of all of those is that you can't find significant improvements.
(Hall 2005).

Such comparisons have not proved useful locally or internationally, and such research no longer dominates the field.

In some cases the structures had production responsibilities. In all cases, the new structures were primarily tasked with co-ordinating the use and uptake of new technologies for teaching and learning.

One of the respondents observed that their facilitation model was a "lean and mean teaching profession model where the advisor of e-learning only could advise, maybe get involved in prototype development which is very vaguely defined but not do any extra development work. Training, advice, co-ordinating, that was the role of the learning co-ordinator" (van der Merwe 2005).

In another case – at UWC – the priority was to sort out the infrastructure and streamline processes so that the foundation was laid for use of computers for teaching and learning. "So largely I could not do very much in terms of e-learning and application of IT in the academic programme until I was sure that the back end stuff was in place because the worst thing you can do is go out there and create expectations and then you can't deliver on those expectations" (Keats 2005).

Priorities and plans of actions for the new organisational units have varied to date depending on their locations, histories and institutional needs. Their work has also differed according to the dictates of individual institutional policies.

Development of policy

During this decade all five institutions instituted policies relevant to the use of ICTs for teaching and learning. These policies contained principles which determined approaches to ICT uptake, infrastructural choices and the allocation of resources.

Stellenbosch University developed its first five-year plan in 1998, with a policy requiring a minimum Web presence for all courses, a stance not adopted by other institutions locally (although with international precedents in existence). The approach to teaching and learning has been to embed it in a broader campus-wide strategy. By the early 2000s, "things started coming together on the strategy level with our strategy for teaching and learning in which e-learning was one of the action plans – tried to integrate it, but then of course also our e-campus strategy in 2002–2007" (van der Merwe 2005).

UCT's educational technology policy was formalised in 2003, and while it led to the formation of a new structure (the Centre for Educational Technology), the policy direction decided on was the encouragement of and enablement for the use of ICT rather than its requirement. The policy specified a development and integrative approach linking technology to pedagogy, emphasising that pedagogy should be the key driver.

While PenTech did not formalise an educational technology policy, its intentions were enacted through the allocation of resources and through its information technology strategy. During 1998, PenTech identified information technology as a key outcome required in the curriculum of most courses offered on the campus. PenTech then set themselves the goal of offering students access to a central facility in 2001 and now provides 9000 students with access to 1400 computers on average 16 hours a day, 7 days a week.

At CTech an e-learning project was started in 2000 and a policy decision was made at council level that e-learning should be part of core business (Smit and De Kock 2005). In tandem with this was the adoption of WebCT as a learning management platform and the building of an e-learning centre with 24-hour access.

The first step at UWC after 2000 "was to create a information strategy for the institution and raise awareness about what ICT could do for the institution and also try and mobilise budget (Keats 2005). The university's integrated information strategy (IIS) (Keats 2002) led to a draft e-learning strategy. The IIS set out to enable

UWC to strengthen its participation in the global academy of scholarship, and build a world-class research and publication profile while producing postgraduates who are internationally competitive in their fields (Keats 2002).

Establishment of infrastructure

This decade also saw a growth in infrastructure, with a variety of infrastructural forms being pursued. PenTech, for example, decided on a centralised facility, the IT Centre. This Centre was opened at the start of the 2002 academic year. In his opening address on 23 April 2002, the then Minister of Education, Professor Kadar Asmal, endorsed the notion of ICT as a social necessity when he said, "The exciting thing about this Centre is the fact that it provides access to students across the entire spectrum, irrespective of their fields of study. Computer literacy has become a way of life and is no longer a domain of the chosen few. It is the language required to pursue research at all levels. It is the language used at all workplace environments" (Asmal 2002).

UCT was an early adopter. The university also established student learning centres where interactive computer-based education developed in the late 1990s (Hall 2005). However, as the university operates on a decentralised budget, each faculty had to make its own provision for student computing. As a result, faculties differ with regard to types and numbers of labs, and each uses them in different ways. These inequalities have led to a rethinking of the decentralised approach as, for example, "if you registered for Economics in the Humanities faculty you will wait three times longer for a place in the lab than if you registered for Economics in Commerce" (Hall 2005). Soon after the start of the new millennium the university made a decision that "what we had was just not sustainable" (Naicker 2005) and committed to a massive infrastructural investment in 1993 in the form of the Supatsela project (http://www.supatsela.uct.ac.za/).

Whilst Stellenbosch University also took a decentralised approach, there was always a "very tight partnership between us and the IT division, so that the relationship was so good that the infrastructure basically was maintained by them for the purpose of teaching and learning so the infrastructure was in place from the start. They invested and with our e-campus initiative more investments were made in infrastructure so much so that as a result of that we actually now have a very sustainable solution because the big investment was made by means of one injection and now it is relatively sustainable, we can actually maintain it" (van der Merwe 2005).

The differing infrastructural decisions and investments together with the institutional historical contexts have led to divergent infrastructures from the student perspective.

A regional data collection exercise has shown that student: computer ratios differ across the institutions, ranging from 6:1 to 12:1 (Brown, Arendse and Mlitwa 2005). There are also strong inequities between faculties; in one institution, for example, this ranges from 3:1 to 160:1 (Mlitwa 2005). Restrictions inhibit who uses these labs and how they are used, so many of these computers are not accessible to the average student (Mlitwa 2005).

Inter-institutional cooperation

Despite profound differences, there have been shared problems and attempts at shared solutions. Commentators have noted that the five institutions – poles apart in many ways – faced generic problems, with cuts in government subsidy and a weaker currency taking their toll on ICT infrastructures, along with the adverse effects of the academic boycott (Leatt and Pretorius 2004). This led to cooperative ventures like the Cape Library Consortium (CALICO), a venture whose objectives intersect directly with the possibilities of educational technology. In addition to CALICO's work under the auspices of the Cape Higher Education Consortium (CHEC), the joint bandwidth structure UNINET provided bandwidth to higher education and research institutions throughout the 1990s (Leatt and Pretorius 2004).

Emergence on research agendas

Nationally, educational technology began to develop a research profile, as evidenced by the launch of CITTE, the Conference on Information Technology in Tertiary Education, in 2000. At the same time, academics started to become aware of possibilities technology offered for their research in general. A Western Cape respondent commented:

In 1999 I delivered a paper on my chemistry programme before the school started and there was a Prof. and he said that we must share our information with the world wide web and I think everybody looked at him like "where are you coming from – what is this world wide web?" – at that stage he said, "This is the way to share academic information" – we are at an educational conference and that is where we are going to share our information, that to me was the first kind of encounter with the fact that there was something like the internet and I realised that was my connection with their university and I went there to work on some programmes there

and I think from there it just opened up, the Window 95 and the connection with the Internet from there …
(Smit and De Kock 2005).

From about the year 2000, ICTs in education also began to be the object of research and of publication outputs, as noted by the distinct increase in relevant articles in one local publication, the *South African Journal of Higher Education* (Czerniewicz, Ravjee et al. 2006). While the use of ICTs in and for research is not directly relevant to this report, its increased profile in the 1990s is worth noting as it is an additional indicator of the way that reflective practitioners and researchers began to take ICTs for teaching and learning more seriously.

Spread of teaching and learning practices

All indications at the end of the second decade were that ICTs were starting to be used for teaching and learning.

Enabling policies were in place, infrastructural commitments had been made and organisational structures formed. Yet there was no real sense of the extent to which ICTs were being used for teaching and learning, nor exactly how they were being used. No audits had been conducted, no trends recorded. Unlike other countries there was, and still is, no systematic recording of trends of ICT access and use. There was an urgent need for a study focusing specifically on ICT for teaching and learning – a gap this study set out to fill.

Endnotes

[1] For this historical section, we draw on the limited secondary data available as well as on interviews with key role players in the field in the Western Cape, as described in our methodology chapter.

Chapter 3

Methodology

3.1 Introduction

Between March and May 2004, academic staff and students from the five higher education institutions in the Western Cape were invited to participate in a survey on access to computers and how they were being used for teaching and learning, including issues which may be hindering or encouraging use of computers for teaching and learning.

In this research we have adopted a mixed-method approach, as described by Creswell (Creswell 1994). Our choice to combine our research methods was based on the need to collect baseline information across a wide group as well as to move beyond fact gathering to a multi-layered understanding of the issues of access and use for academic staff and students in our study. We had several reasons to use a mixed-method approach. We have used qualitative data from open-ended questions in the survey to elaborate on survey results and interviews to extend the breadth of our inquiry. This is a well-established approach in social science research which can "illuminate quantitative data, reducing the need for speculation or subjective interpretations" on the part of researchers (Selwyn 2000). Our statistical analysis has been both descriptive and exploratory, and we have presented themes that have emerged from both qualitative and quantitative data. Consequently we do not present our findings from qualitative and quantitative data separately but integrate both in our findings and discussions, an approach that is common in mixed-methodologies research designs (Creswell 1994).

We are mindful that many may consider qualitative and quantitative data to be at odds with each other. Like others (Trochim 2006) we feel that the difference is in the approach one takes to the data and not in the data itself. Fundamentally whilst qualitative data primarily consists of words, it can be coded quantitatively and, likewise, whilst quantitative data primarily consists of numbers, the numbers themselves are based on qualitative judgments and cannot be interpreted without understanding the assumptions and judgments that underlie them.

Our epistemological approach is critical to understanding the way we have used and interpreted our data. Despite the large body of quantitative data in this study we are operating from an interpretivist paradigm. We acknowledge that some researchers might feel this is contradictory; however, we are not alone in this approach. Others have reasoned that an interpretivist paradigm does not preclude deployment of both quantitative and qualitative methods (Creswell 1994; Roberts 2002; Bjoern 2005).

As interpretivists, we do not assume there is a single unitary reality and are not seeking to only catalogue access and use of ICTs for teaching and learning in the Western Cape. We have not approached our research with an imutable hypothesis but rather our research questions have evolved and emerged as our familiarity with our study has increased.

We have used our data to contextualise and understand various perspectives, as the survey focused on experiences and perceptions. Whilst our analytical framework did

influence the way we interpreted our data, we were inductive in our interpretations of the data describing what has been reported to us and seeking new patterns particularly through the qualitative data. We have painted a picture of the issues experienced by staff and students, highlighting which are enabling or constraining, and examining how these impact on students in terms of their demographic context.

3.2 Research design and methodology

We collected data in the form of a survey, interviews and institutional audits.

A quantitative methodology was seen to be the best suited methodology for the systematic documentation about access to and the use of technology for teaching and learning, as no baseline data existed on which we could draw for this research. We also provided additional contextual information to the survey through the collection of data about institutional infrastructure in terms of computer availability to students.

However, we realised that whilst surveys are particularly useful in collecting descriptive information, the information is relatively superficial. It is difficult to obtain in-depth information about what the responses may mean, or why people gave certain responses. To answer such questions, a more qualitative research approach certainly is usually recommended. We took account of this limitation by including a number of open-ended questions in the survey. This qualitative data was used to fill in gaps and to better illustrate issues raised by the quantitative data as well as to highlight new issues. Interviews were used in order to provide a background context to each institution in terms of the evolution of the use of educational technology.

3.2.1 Quantitative

3.2.1.1 The survey

The project proposal stipulated that a "quantitative audit" would be conducted on the penetration and level of usage of ICT-enhanced teaching and learning in the region. It was acknowledged in the proposal that "a limiting factor in making policy for technology in teaching and learning in the region has been opaqueness around current levels of usage" (University of the Western Cape 2001). Little had been systematically documented about the use of technology for teaching and learning, and no baseline data existed on which to draw. Consequently this type of methodology seemed appropriate as the population was large and distributed across five institutions and several campuses, and the type of baseline information we were seeking was suited to a quantitative methodology.

3.2.1.2 The pilot

Two questionnaires were developed, one for academic staff and one for students. The draft questionnaire was distributed to HictE colleagues as well as to research experts with prior experience in this type of methodology who provided specific feedback and input into the questions and structure of the questionnaire.

A pilot of the student survey was conducted in October 2003, and 137 responses were received from three institutions (appendix 2). Observations were made about the time it took students to complete the survey. They were asked to give feedback on completion about what they found confusing, difficult or ambiguous about it. Details on the process for the pilot and some of the feedback we received can be found in appendix 3. This process and the pilot findings significantly informed a refinement of the survey instrument and our analytical framework.

3.2.1.3 The final survey

The final survey instrument comprised three parts:

Part A: Access to computers

Part B: Your modules/courses and computers

Part C: Information about yourself

Part A: Access to computers

There were 35 questions about access to computers. These were grouped in three sections, namely:

- About your computer access on campus – six questions
  Two on a 4-point Likert scale of "never" to "daily" and "not applicable"
  One on a 4-point Likert scale of "very difficult" to "very easy" and "not applicable"
  Two selected from a range of between five and six options
  Two open ended questions
- About your computer access when off campus – ten questions
  Two open-ended questions
  Five on a binary scale of "yes/no"

Three selected from a range of between six and seven options
One on a 4-point Likert scale of "very difficult" to "very easy"

- Your experience using a computer – 28 questions
  Three open-ended questions
  Five on a 4-point Likert scale of "strongly disagree" to "strongly agree"
  Ten on a binary "agree/disagree" scale
  Four on a binary "yes/no" scale
  Three selected from a range of between six and ten options
  One on a 4-point Likert scale of "poor" to "excellent"

Part B: Your modules/courses and computers

- Using a computer for learning: your modules/courses – six questions
  Number of courses
- Using a computer for learning: about the types of media you use – 31 questions
  Eight on a binary scale "yes/no"
  Twenty-three on a 5-point Likert scale from "never" to "often"
- Using a computer for learning: your experience – 12 questions
  Seven on a 4-point Likert scale of "strongly disagree" to "strongly agree"
  Five on a binary "yes/no" scale
- Three open-ended questions

Part C: Information about yourself

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

3.2.1.4 Approval/support

Permission and support for the survey was sought and received from senior management at each institution. This support was critical in enabling us to get support from faculty deans and to send institutional emails. Each "institutional sponsor" wrote a covering letter for the print survey and online correspondence indicating their support for the research and the usefulness of the data for the institution (see covering letters in appendix 4). This was seen as important as we felt institutional recognition would further encourage participation in the survey.

3.2.1.5 Research ethics committees

Approval was also sought from research ethics committees or people at each institution where these existed. It was granted by all three of the committees from which approval was sought. A copy of the research ethics submission can be found in appendix 5.

3.2.1.6 Sampling strategy

Given that we were aiming to obtain a regional perspective we felt it was essential that all institutions complete the survey over the same period of time. Finding a time period that suited five different institutions and coincided with the academic year and student presence on campus was difficult and the start of the survey had to be delayed. Eventually the survey was conducted between March and May 2005 with each institution participating for different lengths of time.

The five institutions surveyed have very different organisational cultures and internal processes. It was clear that an inflexible or mandated sampling approach would not be feasible if we wanted to reach our target audience.

We sought out a liaison person at each institution to assist us in the process of getting the survey out to staff and students. We also appointed interns based at each institution to assist in the logistical task of administering the survey.

In addition we wanted to make sure that we sampled people who were both using and not using technology, so we developed both a print and an online survey, which were used to a different extent by each institution (Table 3.1).

The sampling process was also different for staff and students, and across institutions.

The primary method of sampling students in four of the five institutions was print based.

The print-based method was based on the proportional stratified random sampling strategy used by Sayed (1998)

Table 3.1: Details of the sampling process and duration of sampling at each institution

		Strategy	
	Time	**Online**	**Print**
CTech	Mar/Apr	✓	✓
UWC	Mar/Apr	✓	✓
UCT	Mar/Apr	✓	✓
PenTech	Apr/May		✓
SU	May	✓	

in a survey on information literacy in higher education conducted in the Western Cape in 1998. This approach, first classifies the population into two or more strata (sub-populations) and then ensures that the ratio of the sample size to the sub-population size is equal for all the sub-populations (Jackson 2002).

The process involved the following:

1. The total student population at each institution with respect to undergraduate and postgraduate students in each faculty was ascertained.

2. From this, a sample size of approximately 10% of the student population was respectively chosen within each faculty across each institution.

3. In each main faculty, subjects or courses which broadly represented the field of knowledge were chosen and the students divided proportionally between undergraduate and postgraduate.

4. In each of the subjects (where possible) the undergraduate group was sampled at a first-year level and then third-year level (in order to sample senior undergraduate students). However, where a subject did not have a third-year equivalent we sampled second-year students.

The aim of sampling students at first year and then ideally at a later year in their degree programme was to see how our research issues were different for students who were new to their course and/or university compared to students who had been at university for a while and were at a different level of study.

An illustration of how this was conducted can be seen in Table 3.2 from the faculty of science at UCT. Firstly the 2004 enrolments were ascertained for the faculty for undergraduates (in various years) and postgraduates (Table 3.2).

Representative courses were then selected for sampling (Table 3.3). Out of a prospective sample of 793 students we obtained 307 returns (in this case a return rate of 38%). Of these 299 or 97% were completed (Table 3.3).

Once the sample had been selected, an intern at each institution approached the course lecturer for permission to administer the survey towards the end of a lecture or tutorial period, and selected an appropriate time to attend the class. The lecturer then handed over to the intern who introduced him/herself, explained the purpose of the research, and advised students that participation was voluntary and anonymous. Surveys were then handed out to students and the intern stayed to collect them once they were completed. In one case (amongst health science students at UCT) this process was conducted online – as opposed to in print – during a lab tutorial, which involved the same process.

Due to variations in institutional process, we used an online sampling strategy, at Stellenbosch University only. It

Table 3.2: Example of how samples were selected for students in the science faculty at UCT

Science faculty	Undergraduate		Post-graduate	Total
Population (2004 enrolments)	1632 –	1st year 660 3rd year 363	744	2420
Sample surveyed	261 –	1st year 204 3rd year 103	38	299

Table 3.3: Example of how courses were selected for sampling in the science faculty at UCT detailing actual versus realised sample

Course code	Course name	Expected enrolment	Returns	Complete
CEM 100W	Chemistry 1	140	28	28
ERT 100F	Intro to Earth and Environmental Sciences	223	53	49
BIO 100F	Cell Biology	255	123	119
EGS 313F	Environmental Analysis	80	49	49
ZOO302F	Zoology 3	45	16	16
EGS 406F	Environmental Assessment	50	38	38
Total		**793**	**307**	**299**

involved inviting the participation via email of all students at the institution through an invitation from the Deputy Vice Chancellor (DVC-Research) and providing them with an URL.

As we wanted to also give all students the opportunity to respond to the survey at all institutions, we used the Stellenbosch approach at UWC, CTech and UCT as well. However, the student response to this strategy was negligable.

Staff sampling strategies were also strongly influenced by institutional cultures.

At Stellenbosch University a memo was sent to all deans from the DVC (Research) indicating support and encouraging participation in the survey. All staff were then emailed by the DVC inviting their participation. They were later sent one reminder about the due date for completion.

At the UCT the dean of the Centre for Higher Education Development (CHED) emailed the other deans about the research. Heads of department were also emailed by the dean asking them to forward the invitation to participate in this research to staff. Presentations were made at faculty board meetings and print copies of the survey were handed out. Academics Association members were emailed separately, and desktop reminder notices as well as articles in the local staff newspaper advised staff of the due date.

The deans of teaching and learning at CTech and PenTech sent a memo to all heads of department (HODs) and then sent an institution-wide email to staff inviting participation. Print surveys were mailed to all HODs and collected centrally through the planning office and the office of the DVC (teaching and learning) respectively.

UWC staff were emailed directly by the executive officer of ICT and a reminder was sent by the vice-rector.

3.2.1.7 Capturing the data

Because of the large number of responses we collected for the print survey (79%), data capturing took approximately two months.

An online data capturing form was developed and initially tested with 100 staff surveys. Feedback from data capturers on ease of entry and ambiguities enabled problems about process and consistency to be resolved. The advantage of a form for capturing meant that capturers could not miss an entry (the form did not allow incomplete fields) and if there was no response to a question the data capturers selected "no response" as an option.

Four data capturers worked together to input data with the primary researcher, regularly checking on their progress and performing spot checks. Unfortunately we did not have budget to double-capture the data.

3.2.1.8 Institutional data gathering

Motivated by our need for comprehensive up-to-date information about the ICT infrastructure and availability and computer:student ratios in higher education institutions in our region, we participated in a collaborative project with colleagues in another HictE sub-project (Brown, Arendse and Mlitwa 2005). Existing information about student computer facilities were sourced from each institution where available. Based on the information that was provided and that which was being sought by the project team, a matrix was constructed for each institution. This was then sent to relevant people at each institution with a request for them to complete it.

The matrix looked at each student computer lab and sought to find out

- whether it was located in a particular faculty or residence, or centrally
- whether any student support was available and if so, what type and when
- how many PCs, printers, scanners and other facilities were available
- when the lab was open on weekdays and over weekends
- whether there were any restrictions (e.g. time limits, or on who could access the lab, e.g. departmental and teaching staff, postgraduates)
- whether it required booking or was available for student drop-ins (Brown, Arendse et al. 2005).

At UWC a comprehensive audit of computer labs had been conducted in 2004. This had involved walking around all the student computer labs and counting the number of available operational computers. At UCT a similar audit had also been conducted in 2004, which involved contacting all the lab managers and gathering details regarding the lab. At Stellenbosch University details about each lab were obtained through the e-learning centre, whilst at the Technikons central information only existed for centrally administered facilities, i.e. computer and e-learning centres (Brown, Arendse et al. 2005).

3.2.2 Qualitative

3.2.2.1 Open-ended questions

The survey was structured in sections which comprised both quantitative and qualitative questions. The questionnaire had two main parts, one on access and one on use for teaching and learning. The access section was further subdivided into sections on access at work, access at home, personal experience and general comments. The teaching part was divided into experiences of teaching and general comments.

There were eight specifically worded open-ended questions (which asked students to comment on aspects of access or use that helped them, and aspects that made it hard for them) and two general questions (which asked for additional comments) (see Table 3.4). The response to the open-ended questions was excellent – 80% of students answered at least

Table 3.4: Open-ended questions

Q #	Question	No. of responses	% of total
	What about your access when you are on campus helps or gets in the way of your use of computers for learning?	1097	16.84%
A5.1	Things that help me		
A5.2	Things that make it hard for me	1363	20.92%
	What about your access when [off campus] helps or gets in the way of your use of computers for learning?	582	8.93%
A16.1	Things that help me		
A16.2	Things that make it hard for me	639	9.81%
	What about your experience using a computer helps or gets in the way of your use of computers for learning?	511	7.84%
A34.1	Things that help me		
A34.2	Things that make it hard for me	400	6.14%
	What about your experience of using computers for learning helps or gets in the way of your use of computers?	281	4.31%
B25.1	Things that help me		
B25.2	Things that make it hard for me	237	3.64%
A35	Are there any additional comments you wish to make about your access to computers?	463	7.11%
B26	Are there any additional comments you wish to make about your use of computers for learning?	1097	16.84%

Table 3.5 People we interviewed as part of this study

Name	Position	Institution
Prof. Martin Hall	Deputy Vice-Chancellor	UCT
Prof. Prags Naicker	Head of Information and Communication Technology Services	UCT
Prof. Derek Keats	Executive Director: Information and Communication Technology	UWC
Dr Isaac Smit	Project Co-ordinator, E-Learning	CPUT (Cape Town campus)
Mr. Jaco de Kock	Instructional Designer	CPUT (Cape Town campus)
Dr Antoinette van der Merwe	Deputy Director, Centre for Teaching and Learning	Stellenbosch University
Mr Duncan Greaves	Deputy Director	Tertiary Education Network

one of the questions, with a small group of 10% responding to more than four of the eight questions.

3.2.2.2 Interviews

After the survey was complete we decided it would be useful to interview key personnel in each institution. We realised this was necessary in order to provide a background context to each institution in terms of the evolution of the use of educational technology. We chose interviewees we knew had knowledge about the evolution of educational technology in the region since 1994. We sought to talk to people in all the institutions we surveyed. The interviews were conducted in 2005 when CTech and PenTech had amalgamated into the Cape Peninsula University of Technology (CPUT).

The interviews were conducted in a guided but unstructured manner. Interviewees were asked to reflect on key issues they recalled with regard to

- what was happening in their institution (or region) in terms of the use of information and communication technologies for teaching and learning in 1994
- where they were in 2004
- what key events they believe contributed to the status quo in 2004.

3.2.2.3 Capturing the data

The qualitative data was captured electronically as full text associated with each question. This enabled us to view the data both on its own and in the context of the quantitative data (which made it possible for us to examine responses of specific groups of respondents such as non-users). The text was imported into *Microsoft Excel* for analysis.

3.3 The respondents

3.3.1 Demographics of respondents

Students and staff respondents from a range of faculties were represented with the majority being from business disciplines and the minority from health science disciplines. The majority of students were at the undergraduate level (64%) and were in the first or second year of study (66%).

Student respondents were evenly distributed in terms of gender. The majority of students were under 20 years old (57%). Their home language varied, with English being the most frequently spoken (39%) followed by Afrikaans (19%) and isiXhosa (14%).

Most staff had worked at their institution for more than 5 years, and were at Lecturer level (41%). The majority were male (59%) and older than 40 years (53%). 84% spoke English or Afrikaans as a home language.

3.3.1.1 Actual versus realised sample

Our aim was to obtain a sample of 10% of academic staff and students at each of the five institutions we surveyed. This was more successful in some institutions than others (see Table 3.9). Overall we have responses from 6577 students and 515 academic staff.

Details of the actual versus realised sample broken down by institution, level and faculty are contained in appendix 6.

Table 3.6: About the students' courses

Faculty (students)			**Faculty (staff)**		
	Count	**%**		**Count**	**%**
Science	987	16%	Science	105	21%
Humanities	1125	18%	Humanities	118	24%
Engineering	976	16%	Engineering	68	14%
Business	2404	39%	Business	142	29%
Health Science	711	12%	Health Science	61	12%
Student level			**Undergraduate year**		
	Count	**%**		**Count**	**%**
Preliminary/foundation	1440	23%	First year	1483	37%
Undergraduate	3990	64%	Second year	1154	29%
Postgraduate	760	13%	Third year	964	24%
			Fourth year +	374	10%

Table 3.7: About the students

Gender			Age		
	Count	%		Count	%
Male	2969	48%	<20 years	3575	58%
Female	3236	52%	21–25 years	2164	35%
			26–30 years	251	4%
			>31 years	211	3%
English as a home language			**Other home language**		
	Count	%		Count	%
Yes	2601	40%	Afrikaans	1291	42%
No	3975	60%	isiXhosa	941	30%
			Other South African	620	20%
			African	84	3%
			International	104	5%
First person in immediate family to go to university/technikon					
	Count	%			
Yes	2945	48%			
No	3258	52%			

Table 3.8: About the staff

Gender			Age		
	Count	%		Count	%
Male	304	60%	<25 years	44	9%
Female	196	40%	26–30 years	45	9%
			31–40 years	128	25%
			41–50 years	143	29%
			>50 years	138	28%
Home language			**Year at institution**		
	Count	%		Count	%
English	290	59%	<1 year	57	12%
English & Afrikaans	52	10%	1–2 year	40	7%
Afrikaans	72	15%	3–4 years	95	19%
isiXhosa	1	0	>5 years	312	62%
Other	80	16%			
Appointment level					
	Count	%			
Associate lecturer	41	9%			
Lecturer	184	41%			
Senior lecturer	112	25%			
Associate professor	56	13%			
Professor	53	12%			

Table 3.9: The breakdown of actual sample per institution and the percentage of the actual sample compared to the total sample

	Academic staff (n)	% total sample	Students (n)	% total sample
CTech	103	19%	1584	26%
UWC	113	20%	1200	30%
UCT	162	30%	2184	36%
PenTech	60	11%	731	10%
SU	115	20%	479	8%
Total	**553**		**5925**	

3.4 Analysing the data

Quantitative data

3.4.1 Postcoding of data

Whilst most of the demographic data was a matter of selection, three groupings were calculated from the demographic information. The first related to nationality. We asked respondents what nationality they were. People's conception of their nationality ranged from defining this as their country of origin, to their race, to their language or tribal group. We grouped their responses into three categories – South African, African and International.

The second related to language. We asked respondents what their home language was and the grouped their responses into English First (home) Language and English Second Language.

The socio-economic group index was calculated based on a cumulative score of three items: 1. Occupation of primary breadwinner; 2. Highest education level of primary breadwinner; 3. If respondent was the first person in their immediate family to go to university. The range of the index was 3–16. The index was then divided into three groupings: low socio-economic (SE) group (score <7.5 – 20% of student group); average SE group (score >=7.5 and <12.5 – 39% of student group); and high SE group (score >=12.5 – 40% of student group). We realise that determination of socio-economic status is complex (Higgs 2002). However, we adopted an approach based on potential income of the primary breadwinner, a measure that includes variables collected by the South African Census such as education, occupation status and occupation group. We included whether or not the students were the first person in their family to attend university as this has been determined to be a particularly effective measure of socio-economic status (Barraket and Scott 2001).

A score was calculated for each student (see appendix 7) and then grouped into three categories: low, average and high socio-economic group. Whilst we realise this is a more a measure of background and not an absolute indication of socio-economic status, it does enable us to examine students' experiences at different extremes of the socio-economic divide.

3.4.2 Calculation of groupings/ indices

Whilst we have examined the data question by question, we found that when trying to look at the big picture it was useful to group questions into indices which represented a cumulative picture of the constructs in our theoretical framework as outlined in Chapters 4 and 5.

Frequency of use

- On campus
- In general

Adequacy and ease of use

- Ease of use
- Adequacy of use
- Adequacy and ease of use on campus
- Adequacy and ease of use off campus
- Adequacy and ease of use overall

Off-campus access

- Physical
- Practical
- Overall off-campus access

Personal agency

- Individual disposition
- Individual aptitude

Context

Content

Teaching and learning events

- Event of acquisition
- Event of discovery
- Event of dialogue
- Event of practice
- Event of creation

Appendix 7 provides details on how indices were constructed from the survey questions.

The overall approach was to sum the responses of items in the index and create a new variable of interval data. So, for example, when creating an index for the use of computers for the event of acquisition we looked at five items:

How often have your lecturers explained or demonstrated a concept using

1. *PowerPoint* or another type of presentation software?
2. audio and/or video clips?
3. multimedia, e.g. animation?
4. images or slides?
5. text?

The responses to these questions were on a 5-point Likert scale of "never" to "often". In calculating the indices, the lowest point of the Likert scale, e.g. "never", was equal to 1, and the highest point "often" was equal to 5. This then created an index which ranged from a minimum of 5 (which indicates that there has been no use of any of these activities) to a maximum of 25 (which indicates that all of these activities are undertaken often). The index enables us to examine the overall use of the computers for the event of acquisition.

3.4.2.1 Discipline groupings

In order to examine use of ICTs for teaching and learning in terms of discipline, we needed to develop an analytical

Table 3.10: Organisation of institutional faculties into discipline groupings

Discipline grouping	Student (n)	Staff (n)	CTech	PenTech	UCT	UWC	SU
Science	988	105	Applied Sciences	Science (excluding education)	Science	Natural Sciences	Agricultural & Forestry Sciences, Science, Military Sciences
Humanities	1125	108	Education	Science (education only)	Law Humanities	Arts Education Law	Arts Education Law Theology
Engineering	977	68	Engineering, Built Environment & Design	Engineering	Engineering & Built Environment		Engineering
Business	2405	142	Management, Business Informatics	Business	Commerce	Economic & Management Sciences	Economic & Management Sciences
Health Science	708	61			Health Science	Community & Health Sciences, Dentistry	Health Sciences

framework that enabled us to logically group the 34 faculties we surveyed across the five higher education institutions in the Western Cape, as well as provide a means of comparing our findings internationally.

First we organised institutional faculties into disciplinary groups (Table 3.10). We are mindful that disciplinary differences within faculties may be lost in the creation of these groups. However, given the diversity of the way in which faculties are organised across institutions (the number of faculties ranged from three to ten in the five institutions surveyed), we needed to find a comparable way of grouping disciplines across the region.

As most of the studies we found which interrogated the differences in teaching and learning approaches between academic disciplines have used Biglan's method of classifying different disciplines (Smeby 1996; Neumann and Becher 2002; Whitmire 2002; Fry 2006), we decided to situate our disciplinary groupings within Biglan's framework (Biglan 1973a; 1973b).

This framework organises disciplines into four fields, these being hard pure fields (natural and pure sciences), hard applied fields (science-based professions, e.g. engineering), soft pure fields (humanities and social sciences), and soft applied fields (social science-based professions, e.g. business) (Becher 1994) (Table 3.11). Whilst there are limitations in categorising disciplines under these broad headings, (e.g. a discipline may straddle two categories or may differ within a category) (Neumann and Becher 2002), this has proved to be a useful way of examining disciplinary differences in university teaching at a macro level.

3.4.2.2 Calculation of an index for comparing disciplines

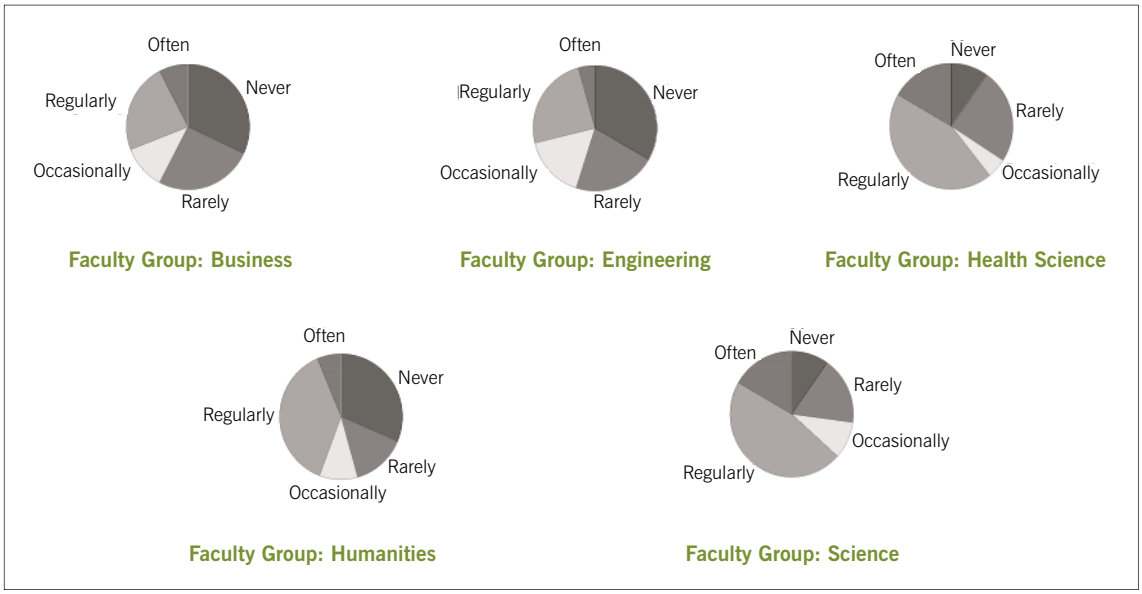
Comparing use across the disciplines had its difficulties. We could not directly compare the frequency of use as students consistently reported lower frequency of use as compared to staff.

Instead, we categorised the responses according to discipline and then ranked the response according to the median response. This created a new index where 1 = most frequent and so on. As an example, we can examine staff responses to one question. The science and health sciences disciplines have a median of "regularly". They were both given a ranking of 1. The humanities discipline has

Table 3.11: Our disciplinary groupings organised according to Biglan's framework

	Hard	Soft
Pure	Science	Humanities
Applied	Engineering Health Science	Business

Figure 3.1: Example of how medians were determined for each question



a median of "occasionally", so it was given a ranking of 2. The business and engineering disciplines have a median of "rarely" and were given a ranking of 3.

The ranking for this question was therefore as follows:

1. Health Science and Science
2. Humanities
3. Business and Engineering

Where the medians were all the same the disciplines were not ranked.

This ranking exercise was conducted for both staff and student responses. It enables us to examine in which disciplines students and staff are undertaking a particular activity frequently (in terms of each other), irrespective of the actual percentage frequencies, which we know differ.

The value of the index we created does not have a meaning in itself other than to indicate where that particular discipline lies in terms of overall ranking. For instance, in the example above staff from health science and science disciplines regularly undertake the activity listed in the pie chart above. They report the most frequent use of this activity and are ranked 1. However, in terms of another activity the disciplines which are ranked 1 might only be undertaking the activity occasionally. However their occasional use is still more frequent than other disciplines, which might be reporting rare use so its ranking (in terms of overall frequency of use for that activity) is still 1.

Qualitative data

The responses to open-ended questions were analysed in *Microsoft Excel* using aspects of Miles and Huberman's (1994) approach to qualitative analysis, which included use of coding start lists, descriptive and pattern coding, and mapping of concepts. The process of data reduction and display and verification were iterative.

Three types of codes were utilised in the coding process – descriptive, interpretative and pattern codes. A start list of codes and definitions, based on the conceptual framework, was initially used. Using the "find" function in *Excel* the responses were searched for the occurrence of descriptive words. Searches were created and the data sorted and reviewed each time, refining the search terms and developing new categories, or breaking down existing ones into further subsets. Whilst some respondents responded generally to the question when asked about things that helped or hindered them (e.g. "speed"), others were more specific and indicated whether it was fast or slow, thereby providing a level of interpretation about the factor as being one that helped them or made it hard for them in terms of access. Again, an initial list of positive and negative terms that respondents used was compiled. Synonyms and antonyms for each term were sought and the words grouped into categories, and the same process was followed.

Coding reports were generated (using *Excel* filters) in order to affirm or override the automatically assigned code. It is relevant to note that in searching for the occurrence of words in this way, only the presence or absence of the word or words within a single comment was noted. So if a respondent had written "slow, slow, slow Internet access" the term "slow" was noted as a single occurrence.

The second level of coding involved reducing the data by looking for patterns, and grouping together the material into smaller sets of themes or constructs. This process was much more inferential than the first-level coding. The frequency of codes was calculated by section. In order to make the categories more comparable across questions and institutions, a reflection of the frequency in relation to the total number of responses was calculated as a percentage. These summaries were compiled into tables, which enabled the categories to be more easily examined.

The interview data was analysed for themes. The data was used to provide a context for this study. Each "story" is contained in appendix 8.

When using quotations in the text, we selected responses that either epitomised the general comments related to a particular issue or ones that were unique in demonstrating a particular issue.

3.5 Limitations of the study

Surveys conducted via questionnaires not only have inherent strengths, but also inherent limitations. Their main strength is that they allow for the collection of information from a large number of people relatively easily. They are particularly useful in collecting descriptive information, but the information is relatively superficial. It is difficult to obtain in-depth information about what the responses may mean, or why people gave certain responses. To answer such questions, a more qualitative research approach certainly is usually recommended. We took account of this limitation by including a number of open-ended questions in the survey and conducting interviews as a supplementary strategy. Although we acknowledge that more detailed qualitative studies would certainly be useful as a follow on to this research.

The five institutions surveyed have very different organisational cultures and internal processes. An inflexible or mandated sampling approach was clearly not feasible if we wanted to reach our target audience. We therefore had to adopt flexible sampling methods and used a mix of print-based and online surveys, the proportions of which differed between institutions and which, by their nature, reached quite different groups of students. It was only possible to use the proportional sampling strategy in the print based method.

We realise this meant that we did not have comparable sample groups across institutions and nor could we say with certainty that we have been able to sample a completely representative range of students and staff in our region. However we made a choice to include all the institutions in our region and live with the methodological imperfections. We acknowledge that this survey cannot be representative of the diverse range of students and staff or teaching and learning activities which are present in higher education in our region. However, our intention is to not to view this data as an absolute description of practice. Rather, the data provides a carefully constructed map of the landscape of access to and use of ICTs for teaching and learning in higher education in the Western Cape.

Chapter 4

Access

4.1 Introduction

Most relevant government policies, both locally and internationally, endorse broad statements of principle relating ICTs to the information age, the knowledge society or the digital age. The US National Telecommunications and Information Authority (1995), for example, called the Internet the "key to the Information Age" which should be part of a universal service for all Americans. In South Africa the national ICT in education policy views e-education as the platform to "ensure that all learners will be equipped for full participation in the knowledge society" (Department of Education 2003b, p. 16).

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, "There is no doubt that ICTs can be very effective tools. The question is, tools for what?" (Matsepe-Casaburri 2004). A discussion about access to ICTs must therefore make explicit what their envisaged purpose is or might be.

Some researchers stress the economic importance of ICTs, 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 "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, for example, argues that the very resources that people need access to are the same as those to which they will be able to contribute (Warschauer 2003b). Thus access and use are closely interrelated: access to resources and the use of resources are interdependent.

For many, ICTs offer opportunities for improved education. Some international research focuses on how ICTs can enhance efficiency (Mason 1998; Collis, Peters and Pals 2001; Cantoni, Cellario and Porta 2004) and provide new opportunities for learning through the facilitation of contextual, social, active and reflective learning processes (Johnson and Aragon 2003). The South African *White Paper on e-Education* states that ICTs can "create access to learning opportunities [and] improve the quality of learning and teaching and deliver lifelong learning" (Department of Education 2003b, 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 (Department of Education 2001, S1.1). The Partnership for

Higher Education in Africa 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" (The Partnership for Higher Education in Africa 2003).

Our interest is ICTs' contribution to better teaching and learning. We are therefore interested to know how the use of technology can best be supported or enabled. What resources are needed to make it possible for ICTs to improve pedagogy? Common sense tells us that access to computers is a basic prerequisite, but experience tells us that this – the physical artefact – is necessary but insufficient. Access to computers sounds simple – what does it actually involve?

4.2 Conceptual framework of access

In these sections we have organised the findings according to our conceptual frameworks of access and use. This is a theory-driven research study and, as explained earlier one where a pilot study allowed the refinement of analytical categories. This organisational approach allows for a richer and more interesting interpretation of the data. At the design stage, the survey questions were explicitly linked to our theoretical framework, the analytical constructs and our specific indicators (see appendix 7). The survey questions were then organised to render the questionnaire as accessible as possible. The findings, expressed as responses to the survey questions (rather than in relation to constructs), are provided in appendix 1.

The data on access to ICTs for staff and students is presented separately. While there is significant overlap, there were also different questions asked of each group (for example, staff were questioned about institutional context whereas students were not).[1] In addition we explore the relationship between access and use, and comment on how this is related to our original hypotheses about the two.

In order to develop a more sophisticated and informed understanding of access to ICTs for teaching and learning in the South African higher education context, we started by examining the local and international literature, and confirmed our own focus on teaching and learning. We were surprised by how little local research exists to name and frame access to ICTs in higher education. The next section therefore describes 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.

4.2.1 Access to technology – from single artefact to multidimensional 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, an emphasis on technological access is understandable.

However, there has been a growing recognition that access to technology itself is essential, but that a focus on technology alone is inadequate. Internationally, researchers have been criticised for their preoccupation with physical access and shallow demographics (Van Dijk 2003; Van Dijk and Hacker 2003), suggesting there is too much focus on conditions and not enough on criteria (Burbules and Callister 2000). Researchers have argued for new concepts captured in terms such as "real access" (Bridges 2001), "thick" conceptions of access (Burbules and Callister 2000), and "social inclusion" (Jarboe 2001; Warschauer 2003a, 2003b). There are also calls for multifaceted concepts of access (Van Dijk and Hacker 2003), enabling resources (Warschauer 2002, 2003c), and dimensions of digital in/equality (DiMaggio and Hargittai 2001; Kvasny 2002). While there is little local academic research on ICT access in higher education specifically, a similar point has been made by South Africa's president, who has stressed that efforts to bridge the digital divide must be primarily about people, not technology (Mbeki 2001).

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 report) did not have explicit theoretical frameworks, or explicit theories of access and the digital divide. A few had developed frameworks of access, which we found useful to varying degrees.

Van Dijk 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 (Van Dijk 2003; Van Dijk and Hacker 2003). 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 agree that a networked, relational perspective would be most useful. And what Van Dijk calls material access is, 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 not enough 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. It 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 framework insightful (Kvasny and Truex 2001). 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). 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 draws on Bourdieu. Examining the similarities between access to ICTs and access to literacy, Warschauer's theoretical approach notes that there are many types of ICT access; ICTs' 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 (Warschauer 2003b). 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 ICTs 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; van Dijk and Hacker 2003) consider the role of social support, and Bridges (2001) does not consider the specifics of human agency. For our purposes, we needed 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 also 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 and 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 the results of a pilot study survey with staff and students, we refined, polished and redeveloped four key areas until we agreed on four categories 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 (Lehman 2003) and that they presuppose each other (Giddens 1979). In addition to personal 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 set out to take a relational view (van Dijk and Hacker 2003) in order to map networks, conditions, positions and connections. 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.

We now describe in more detail each of our identified resources groupings: technological resources, resources for personal agency, contextual resources and online content resources.

4.2.2 Technological 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) 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 (Kling 2000), technological (Kling 2000; Kvasny 2002) or material (Van Dijk and Hacker 2003) access. In addition, almost every author asserts the importance of availability. Only three mention that the technology should be accessible (Kling 2000; Bridges 2001; Warschauer 2003a, 2003b, 2003c), two that it should be adequate (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 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 (National Telecommunication and Information Authority 1995, 1998, 2000; Burbules and Callister 2000; Kvasny 2002; Warschauer 2003a, 2003b, 2003c) extend the technology category to telecommunication infrastructure, including all the physical infrastructure needed to "get wired" as well as the cost (to the individual) and the maintenance of that infrastructure (Burbules and Callister 2000). Only one author mentions affordability (Bridges 2001). We did not track affordability as an indicator; it did, however, emerge as an issue from the survey instrument's open-ended probes.

Our stance is that ICTs are not neutral. They exist in time and space, and they carry in their structural properties a particular culture and history (Leont'ev 1978; Bannon 1997). They are never used in a vacuum, but are shaped by the social and cultural context within which 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 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). 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) (DiMaggio and Hargittai 2001; Kvasny 2002). In addition to time, childcare was mentioned as a potentially constraining factor in one study (Murdoch 2002); however, this was not tracked in our survey and did not emerge from the open responses. Thus our category of physical resources has been expanded by the addition of what we have called practical resources, with the specific indicators being time and autonomy.

In summary, we define technology resources as the tangible components of computers and associated 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.

4.2.3 Resources of personal agency

In order for individual students or academics to use ICTs meaningfully for teaching and learning, they need access to personal and contextual resources. While we are committed to the importance of context (described in the next section), we argue that it is necessary 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. 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 needed 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, 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 and Truex 2001), skills (Burbules and Callister 2000; Van Dijk and Hacker 2003), mental access (Van Dijk and Hacker 2003), literacy (Carvin 2000; Garnett and Rudd 2002; Warschauer 2003a, 2003b, 2003c), competency (DiMaggio and Hargittai 2001; Jarboe 2001), and capacity (Bridges 2001). Allied cognitive

dimensions are mentioned by three authors (Wilson 2000; Wilson and Patterson 2000; DiMaggio and Hargittai 2001). DiMaggio and Hargittai map out different kinds of knowledge domains – these being background, technical and recipe knowledge (2001), whereas Warschauer posits that different types of knowledge are required for the use of new technologies and that 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 two key resources of personal agency: aptitude and disposition. While these are not the only resources pertinent to teaching, they are the two which arose from our readings and from our preliminary work. They seemed to be the most pertinent and necessary as resources to access for ICT use. Aptitude is defined as: the ability to use a computer; appropriate training, and experience. Mindful that we would not be observing actual ability, we realised that we would only be able to capture reported self-efficacy.

The other grouping – covered to a lesser extent in the literature – can be broadly described as dispositional. It would encompass attitudes (Warschauer 2003a, 2003b, 2003c), 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 might be 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 resources of personal agency therefore focuses on aptitude – with the indicators being ability, experience and training – and disposition, incorporating interest and attitude. We probe disposition generally as well as in relation to teaching and learning.

4.2.4 Contextual resources

In order to use ICTs, 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 ICTs and how enabling the context is of the integration of ICTs for teaching and learning, specifically in a higher education institution.

We now identify which resources, forming part of the structure of human institutions, groups and organisations, need to be accessed in order to utilise ICTs successfully for teaching and learning. Two groupings of contextual 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 of ICTs by social networks has been recognised by several researchers (Carvin 2000; Jarboe 2001; Warschauer 2003a, 2003b, 2003c). Having access to the community and social resources has been described as having the capital to support access to ICT (Warschauer 2003a, 2003b, 2003c). By being able to draw on these networks, people can receive information and guidance from formal technical advisors, colleagues, friends or family (Garnett and Rudd 2002; Kvasny 2002). Having friends and family also using computers encourages use (Murdoch 2002). Networks of encouraging family and friends provide important emotional reinforcement in the form of positive interest (DiMaggio and Hargittai 2001). Social networks therefore provide both practical 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 have been identified as important (Van Dijk and Hacker 2003; Warschauer 2003c), as have 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 identified two contextual resource groupings for this study: social resources and institutional resources. Social resources are the interest and support received from a community social network. Our research indicators are specifically 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 of use, policy/strategies, support and intentions.

4.2.5 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 ICTs, although a handful stressed that scarcity of suitable content is a factor contributing to the schisms of digital divides (Bridges 2002; Garnett and Rudd 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 (comprising 74% of the African web), despite the fact that English first language speakers comprise no more than 0.007% of the whole African population (Boldi, Codenotti, Santini and Vigna 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's attention to the use of ICTs 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" (Wertsch 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 teacher (or expert or facilitator) and the S being student (or learner or apprentice) (Garrison and Anderson 2002; Laurillard 2002).

We presumed 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 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

Table 4.1: Conceptual framework: resources for access[2]

	Technological			Contextual		
	Physical	**Practical**	**Personal agency**	**Social**	**Institutional**	**Digital content**
Definition	Tangible components of computers and associated infrastructure	Control over when and to what extent computers are used	Person's disposition towards using computers as well as their aptitude	Interest and support received from a community social network	Integration of technology into the institution	Availability of suitable digital material online
Indicators	Location Availability Adequacy	Time Autonomy	Disposition: interest attitude Aptitude: experience ability training	Support Networks	Extent Policy Support Intention	Relevance Local production Language

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 staff and students have to that content. We need to know whether the content is relevant, locally produced and in the required language and 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.

4.3 Access: students

4.3.1 Introduction

In this section we present our findings on student access to ICTs according to our constructs of access, namely technological resources, resources of personal agency, contextual resources and digital content resources. We begin by describing the responses to the survey questions related to the construct. We then describe indices that capture the essence of the construct, examine how these are similar or different for various demographic groups, and look at what students said in the qualitative data that can elucidate our understanding of the issues related to each construct. In addition, where appropriate, we examine the ease and adequacy of technological access and the adequacy of personal agency, contextual resources and digital content in order to determine whether access to a particular resource is an enabling or constraining factor of use.

4.3.2 Student access to technological resources

ICT physical resources are the primary resource for which access is required for use in teaching and learning. Our pilot study results suggested that user needs were about fitness for purpose. Therefore, rather than using appropriateness as an indicator, we decided that adequacy was a more useful indicator of access to physical resources. As explained earlier, the other component of technological access is practical resources. We define this as a person's control over when and to what extent they use ICTs.

This means that in order to discuss overall student access to technological resources, we need to break up the issue into constituent elements. In the subsequent sections, we therefore discuss the following:

- **Physical access** – On-campus student access to physical resources; off-campus student access to physical resources
- **Practical access** – On-campus student access to practical resources; off-campus student access to practical resources
- **Difficulty of student access** – Difficulty of access to computers on campus; difficulty of off-campus student access
- **Adequacy of access for students' learning needs** – Adequacy of on-campus access for student learning needs; adequacy of student on-campus access – staff views; adequacy of off-campus access for student learning needs
- **How access to technological resources affects specific groups of students** – that is socio-economic (SE) groups, gender, age, nationality, language, disability

We now report on what physical and practical resources students have access to in two locations: on and off campus.

4.3.2.1 Physical access

On-campus student access to physical resources

The institutions in our case study have dissimilar ICT infrastructures. Reasons for this include history, differences in institutional types and varied institutional commitments to ICTs.

With regard to historical reasons, as described in Chapter 2, inequitable resourcing in the past is a legacy consideration which affects current infrastructure. Sources of ICT infrastructure funding have also differed. Regarding institutional types, despite all being tertiary institutions, two are technikons and three are universities with the concomitant divergences in emphases. Institutional policy commitments to ICT incorporation and integration have varied substantially. For example (as also described in Chapter 2), Stellenbosch University made a senior level policy and institution-wide commitment to take up and use ICT in the late 1990s, whereas other institutions such as UWC and UCT only developed formal policies in 2004.

As mentioned in the methodology chapter, we – together with regional colleagues – gathered data on institutional infrastructure in order to determine the number of computers available to students as well as to ascertain what the restrictions were on the use of these (Brown, Arendse and Mlitwa 2005). The full report is contained in appendix 8

Table 4.2: Student:computer ratio at the five institutions surveyed

Institution	2005 student enrolment	Number of student computers	Student: computer ratio
CTech	18 523	1588	11:1
PenTech	10 040	1654	6:1
UCT	21 716	3042	7:1
UWC	14 873	1455	10:1
SU	22 082	1631	12:1

Source: Brown, Arendse & Mlitwa (2005), appendix 8

– some interesting information emerged which sets the context for the survey data on on-campus access.

The number of computers at each institution and the associated student:computer ratios need to be considered in the light of these points. While the focus of this study is on regional access and use (rather than on differentiation between regional institutions), in the case of physical infrastructure it is useful to note the variability across the five institutions. Overall, student computer ratios differ across the institutions with the lowest being 6:1 at PenTech and the highest being 12:1 at Stellenbosch University.

This is consistent with the reported average for South African tertiary institutions of 11:1 and much better than the average for African tertiary institutions of 55:1 (Steiner, Tirivayi, Jensen & Gakio 2004). Universities in the US have stopped talking the language of student:computer ratios and whether or not to have network points in every residence room. Instead they talk about the number of wireless points on campus. The 2004 *Campus Computing Report* notes that a fourth of university campuses had wireless networks that are up and running and that wireless networks are available in more than a third of college classrooms (Green 2004). Research on student ownership now seeks to quantify the percentage of students who own one or more computers (88%) and those who own two or more computers (27%) (Mangan 2006).

Comparing student:computer ratios in this way obscures the differences within institutions, with faculty differences within and across institutions being a more revealing indicator. Table 4.3, for example, demonstrates how student:computer ratios vary across faculties from 6:1 in Business Informatics to 28:1 in Applied Sciences in one institution.

Further details of faculty differences in the other institutions can be found in appendix 8. However, as an overview in the other three institutions with faculty-based ICT infrastructure, they range from:

- 3:1 in Sciences to 15:1 in Humanities (UCT)
- 4:1 in Science to 251:1 in Community and Health Sciences (UWC)
- 4:1 in Science and 12:1 in Arts, Education and Law (SU).

The number of computers is linked to the intrinsic nature of the disciplines themselves. Clearly it would be virtually impossible for the sciences in the universities with their hi-tech needs to manage teaching and research without computers, and indeed we noted earlier how they were amongst the very early adopters of use in the "first decade". Similarly, CTech's ratio in the Business Informatics

Table 4.3: Example of faculty differences student computer ratio at CTech

Faculty	UG students	PG students	Total students	No. of computers	Ratio
Applied Sciences	2207	47	2254	80	28:1
Built Environment & Design	1376	8	1384	169	8:1
Business Informatics	3845	42	3887	590	6:1
Education	2249	110	2359	135	17:1
Engineering	3664	46	3710	223	16:1
Management	4771	158	4929	191	25:1
Central facilities				200	
Total	**18 112**	**411**	**18 523**	**1588**	**11:1**

Source: Brown, Arendse & Mlitwa (2005), appendix 8

disciplines can be linked to the professions for which students are being prepared.

Attributions for these differences indicate how ICT infrastructure is closely aligned with other institutional factors. The student computer ratio of 8:1 in Health Sciences at UCT, for example, can be attributed to that institution's faculty committing to a radically new problem-based curriculum closely aligned with ICT use.

ICT infrastructures also differ in terms of the extent to which computer access is centralised or decentralised, as shown in Table 4.4. PenTech has opted for a strongly centralised model, whilst Stellenbosch University has opted for a strongly faculty-based model. The other institutions have a dominant faculty-based approach to the provision of computer facilities with a small percentage of centrally managed facilities.

When we examine where students use computers on campus, we see that most do so through either faculty computers or in central labs. Once again, this differs across institutions as each is structured differently.

Table 4.5 shows that students at PenTech mostly access computers centrally. This institution is the only one of the five which has over 80% of its computers located in a central facility (see Table 4.4). The majority of students at CTech, UCT and Stellenbosch University access computers predominantly through their faculties (see Table 4.4).

It is interesting that 27% of students at CTech (which has 88% of its computers located in faculties) are accessing computers through central facilities. However, students at UWC access computers both centrally (39%) and through faculties (36%), even though 82% of computers are located in faculties. This inconsistency indicates an increase in demand on the central computing resources and suggests that there is something discouraging students from using faculty resources or encouraging them to use central resources.

Table 4.4: Structure of institutional computer access (where computers are physically located)

Institution	% centralised	% faculty	Total (n)
CTech	200 (12%)	1380 (88%)	1580
PenTech	1400 (85%)	254 (15%)	1654
UCT	330 (10%)	2712 (90%)	3042
UWC	273 (18%)	1182 (82%)	1455
SU	-	1880 (100%)	1880

Source: Brown, Arendse & Mlitwa (2005), see appendix 8

Stellenbosch University's high of use of residence computers is of note, especially against the backdrop of its surprisingly high student:computer ratio. Stellenbosch residence rooms all have networked points though, and it is a possibility that students are connecting their own computers in their rooms. Unfortunately this study did not specify personal ownership, let alone of laptops.

In their qualitative answers the few student comments about the location of computers on campus presented contradictory views. One comment suggested that faculty labs will improve access:

Let each faculty have its own computer lab that will be accessed by their students only.
(UWC, Natural Sciences, 3rd year undergrad., male, 31–40, SeSotho)

Another suggested that faculty-linked registrations caused problems:

I'm registered in the Health Science faculty. I cannot access a computer on the main campus because I'm not registered up there. Residences should have functional comp labs. Makes access easier.
(UCT, Commerce, 1st year undergrad., female, <20, Xitsonga)

Table 4.5: Location of where students access computers on campus

	CTech	PenTech	UCT	UWC	SU	Total
Faculty	53%	16%	63%	36%	52%	49%
Central	27%	80%	7%	39%	16%	28%
Residence	1%		10%	2%	24%	7%
Library	11%		11%	11%	6%	10%
Other	5%	1%	6%	9%		6%
(N)	**1451**	**751**	**2134**	**1128**	**638**	**6105**

Our specific interest in this investigation was in student use of the computers available to them on campus. We wanted to know how often they accessed available resources. We therefore asked them:

- How often do you use a computer at [your institution]?
- How often do you use this computer to access the Internet?

Our overall findings show a high – 61% – use of students who used a computer daily at their institution, as shown in Table 4.6.

However, frequency of on-campus use is highly differentiated across the five institutions surveyed (Table 4.7). For example, it ranges from 39% of students using a computer daily at UWC to 83% using one daily at Stellenbosch University. Students use the Internet less frequently than they use a computer, which suggests that computers are used more frequently for non-Internet-related activities. This issue is discussed in more detail in Chapter 5, where we specifically examine different types of use.

One needs to be mindful that the reasons for frequent use of computers on campus can range widely – from the requirements of a particular course to student familiarity with digital media to lack of access. While this study focuses on how computers are being used, we think it would be worth investigating why some students are more frequent users than others. We are also mindful that non-use is a future area of investigation in its own right. Comments from the qualitative data provide some tantalising leads:

Students indicated that they may not use a computer on campus because it is not required:

I try to use the [institution's] comps because of their access to data/journal resources and the cost of connection at home. Not required by my course for other than email and research but I would enjoy to try on-line communication if it was necessary.
(UCT, Health Science, 4th year undergrad., female, 21–25, English)

Students may have limited access:

It's very limited due to the shortage of computers around campus. I would love to use the computer on a daily basis but I'm limited by the shortage.
(UWC, Economics & Management Science, 2nd year undergrad., female, 21–25, isiZulu)

They have better access elsewhere:

mine's a laptop, so I can use it at anytime and in any place, at my own leisure.
(SU, no demographic details)

Table 4.6: Frequency of on-campus use of computers and the Internet

	Use of a computer on campus		Use of the Internet on campus	
	Count	Percentage of total	Count	Percentage of total
Never or monthly	662	10%	982	17%
Weekly	1883	29%	2053	35%
Daily	3936	61%	2755	48%
(n)	**6481**		**5790**	

Table 4.7: Frequency of on-campus use of computers and the Internet across institutions

	Use of a computer on campus			Use of the Internet on campus		
Institution	Never or monthly	Weekly	Daily	Never or monthly	Weekly	Daily
CTech	11%	34%	54%	24%	44%	33%
PenTech	8%	36%	57%	17%	43%	40%
UCT	4%	23%	72%	7%	28%	65%
UWC	24%	36%	39%	31%	32%	37%
SU	1%	16%	83%	10%	41%	49%
Total	**10%**	**29%**	**61%**	**17%**	**35%**	**48%**

We are mindful that unless students live on campus, they would undertake much of their study at home. We are therefore interested in what off-campus access students have, especially since this has been an area of much speculation.

Off-campus student access to physical resources

The picture of off-campus access that emerged from the survey data is quite complicated. We asked students where they lived (cognisant that for many where they live might not be considered "home") and then whether or not they had access to a computer and Internet at this "home". We then asked them if they had access to a computer besides where they lived and if so, where it was located.

The picture that emerges shows that 78% of students have some kind of access to a computer off campus. When examining what type of access these students have we can see in Figure 4.1 that 40% have access at home, 45% to a computer both at home and somewhere else, and only a small 15% have access somewhere other than at home. Of this latter group we can see that 49% of students rely on friends or relatives for computer access and only 7% of students are accessing computers at work Of those students with a computer at home, 54% also have access to the Internet.

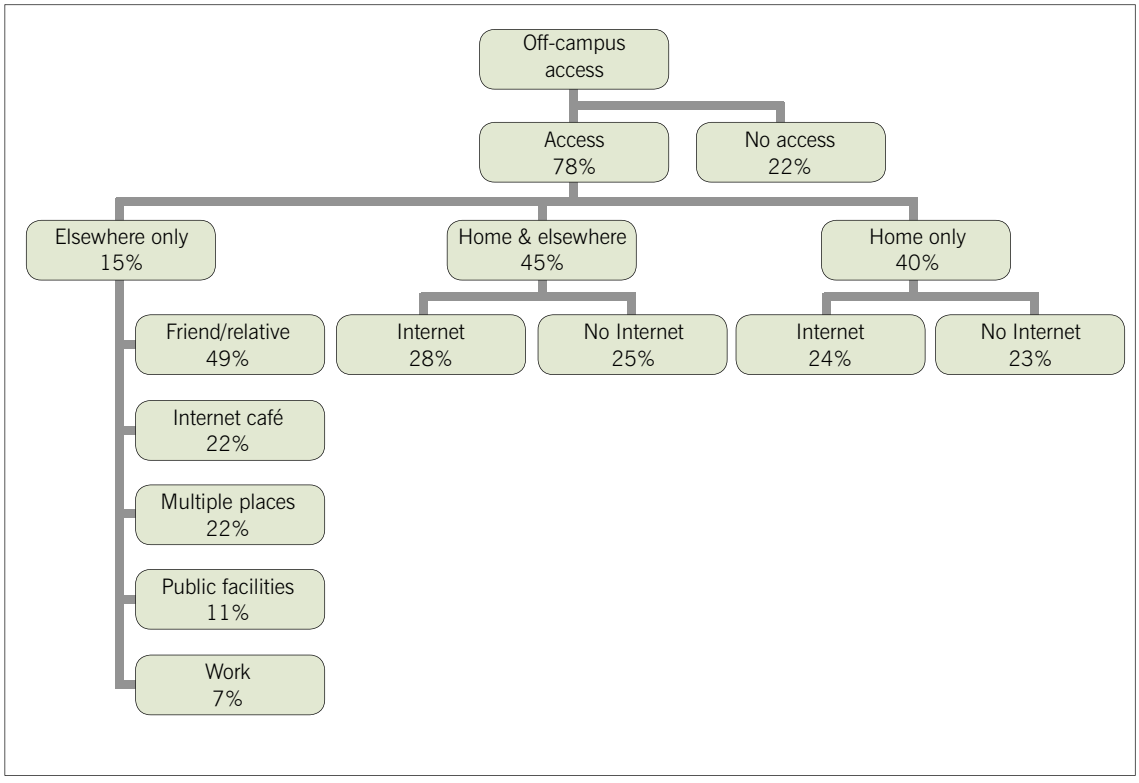
Table 4.8 provides an overview of the qualitative responses that were related to physical access.

We can see from Table 4.8 that most of the issues around physical resources relate to our existing indicators, namely computers (63%) and associated infrastructure (34%), adequacy (20%) and availability (56%) of technology. An additional indicator which we had considered might arise was that of affordability (13%).

Sometimes these factors are mentioned negatively, with a common reference being to the cost of printing or internet access both on and off campus

Expensive. Lower the price of bytes for internet. *Faculty labs must be open until later maybe 11pm. Allocate computers for those not living on campus.*
(PenTech, Science, preliminary level, 2nd year, male, < 20, isiXhosa)

Figure 4.1: Off-campus access amongst students



The frequency of codes was calculated in relation to the total number of responses. There were 3085 responses from students so a percentage of 79% for our construct of physical access means that 2487 students mentioned something about physical access in their qualitative responses. This is then examined to see what indicators these related to. In most answers students mentioned more than one indicator, hence it was possible for a person's response to occur or be counted in more than one category. Percentages in the indicators and descriptors column refer to the number of students who mentioned that concept and therefore do not add up to 100%. The column labelled "general code" indicates the codes that comprised each indicator.

Table 4.8: Overview of qualitative responses about physical access

Construct	Indicator % freq. of total comments	Descriptor % freq. within category	General code
physical (79%)	infrastructure (34%)	general (10%)	server, system, network, printing, password
		Internet (29%)	Internet, Net, Web, online
	computers (63%)	hardware (57%)	hardware, computer, printer, CD, scanner, PC, Mac, comp, stiffy, disk, drive, memory, screen
		software (16%)	software, programs, *WebCT, PowerPoint, KEWL, Blackboard, Windows Office*, licences, database, *Excel, Word*, Microsoft, MS, engines
	adequacy (20%)	reliable (6%)	quick, fast, stable, predictable, continuous, reliable
		unreliable (16%)	delay, slow, waiting, interrupt, downtime, unstable, unpred., freeze, hangs, offline, unreliable
	availability (56%)	positive (18%)	avail, accessible, new, excellent, adequate, good, reasonable, consistent
		negative (50%)	hinder, not available, inaccessible, don't, no, old, failure, inadequate, poor, unreasonable, inconsistent, inability, unable, low
	ease (7%)	easy (4%)	easy
		difficult (3%)	difficult
	affordability (13%)	cost (9%)	cost, finance, bill, pay, expense, money, purchase, credit, bites, bytes, fee
		free (5%)	can afford, free

Please give us free internet not a limit for a month *because when we search for info for assignments the balance is quickly finished and you cant login until the following month.*
(PenTech, Science, preliminary level, 2nd year, male, 21–25, isiXhosa)

Accessing computers is not easy for some of us especially coming from disadvantaged background wish i could have access anytime i want i.e. have my own pc.
(UWC, Economics & Management Sciences, 2nd year undergrad., male, 21–25, isiXhosa)

Internet & telephone costs in the country is high for home use of computer for research. Given mostly study & research is done at home - that is a bother.
(UCT, Engineering & Built Environment, 2nd year undergrad., male, 41–50, international)

But it was also mentioned positively, with students valuing being able to access the Internet and computers for free on campus.

free/unlimited internet*. unlimited/free internet access.*
(PenTech, Business, 3rd year undergrad., male, <20, Afrikaans)

free utility of the computer (all the needed programs) for the course are available*. no access to drives. able to store a lot of your course progress.*
(UCT, Engineering, 2nd year undergrad., male, <20, isiXhosa)

webct, accessing internet. cost, location. ***free access to internet, unlimited time,*** *location. [excellent computer literacy. cost.*
(SU, Economic & Management Sciences, 3rd year undergrad., female, 21–25, Afrikaans)

A few illustrative examples show how important off-campus access is to students and that students perceive themselves at a disadvantage if they do not have access off campus:

*I just wish we could be supported/subsidised to get a computer for personal use. I****t is essential for every student to have a pc***

at home as well.
(PenTech, Education, 1st year, female, 31–40, Afrikaans)

Research. Research purchases. ***Provide access to all the libraries in townships of computers ie. Langa and other townships.***
(UWC, Economic & Management Sciences, 1st year undergrad., male, 21–25, isiXhosa)

Students are innovative in the creative strategies they employ to get access off campus:

Well friends are helpful about me using it and the information on the web is extremely useful. I'm getting a computer ***but internet is to expensive don't want to intrude on my friends internet*** *cafe's can be pricey trying to find one.*
(UCT, no demographic details)

My girlfriend's parents' place is easily accessed. Attending classes on how to do electronic searches.
(SU, Agricultural & Forestry Sciences, 2nd year postgrad., male, 21–25, Afrikaans)

The faculty computer lab is open 24hrs a day to do research. ***My dad's office and his computer are close to my house.*** *I have to get my dad's permission to use his office computer.*
(SU, no demographic details)

In conclusion, in terms of access to technological resources on campus there is quite a lot of differentiation between institutions in terms of student:computer ratios. This is not the same across faculties within the institution and, due to practical issues of availability (when the facilities are open and available to students), perhaps not reflective of a realistic unrestricted ratio in all institutions.

At CTech, which has a student:computer ratio of 11:1, most of the computers are not available after working hours. However 12% of the computers on campus are located in a central facility that is available 24 hours a day. Consequently 27% of students at that institution indicate that they use this facility, thus placing a large strain on a small resource. Just over half the students in this institution use a computer daily on campus (54%), whilst the majority (44%) use the Internet weekly on campus.

PenTech is the only one of the five institutions surveyed that has the majority of their computers located in a centralised facility. This facility is open 16 hours a day, 7 days a week and is used by 80% of the students. Just over half the students in this institution use a computer daily on campus (57%), whilst the majority (43%) use the Internet weekly on campus.

UCT has a student:computer ratio of 7:1. However, the availability of access to computers 24 hours a day, 7 days a week is limited to only some facilities in two faculties, and only 10% of students use computers in their residence. Students are frequent users of on-campus computers (72% daily) and the Internet (65% daily).

UWC has a student:computer ratio of 10:1. There is high differentiation between faculties in terms of computer availability and most of the computers are not available after working hours. Consequently, despite the fact that only 18% of the computers at this institution are located in a central facility, there is a high level of demand on these resources, with 39% of student indicating they use them. Students at this institution make the least frequent use of computers on campus (39% daily) but an almost equal percentage also use the Internet daily (37%).

Stellenbosch University has a student:computer ratio of 12:1. However, with 24 hours a day, 7 days a week access as well as infrastructure in the residences which encourages 24% of students to use computers at the residences rather than the on-campus facilities, it has good availability. Students at this institution are the most frequent users of a computer on campus (83% daily) and 49% use the Internet on campus daily.

In terms of off-campus technological access, 77% of students have some kind of access to a computer but only about 50% of them have access to the Internet. The types of access are varied. Even students who have computers at home also make use of other alternatives, mainly other family and friends, to access a computer.

However, it is not enough to ascertain whether and where institutions have computers for student use. Those computers also need to be adequate, available and suitable, hence the investigation turns to practical access on campus.

4.3.2.2 Practical access

On-campus student access to practical resources

Practical resources are the second component within technological access. We define this as control over computer use and to what extent they are used. Our research indicators focus on time and autonomy.

The first aspect of practical access we examined was the availability of computers in terms of time. Table 4.9 summarises the restrictions on computer laboratories, suggesting different ratios for use during weekday hours.

Table 4.9: Overview of opening hours of computer laboratories across institutions

Institution	Central	Faculty
CTech	Centrally available facilities (12% of computers on campus) are available 24 hours a day, 7 days a week	88% of faculty computers are only available between 9am and 5pm
PenTech	All central computer facilities are available 16 hours a day, 7 days a week	Most faculty computers are available after working hours only by special request
UCT	Centrally available facilities (10% of computers on campus) are available 14 hours a day, 6 days a week	Some faculties do have some facilities available for extended hours, for example: Built Environment & Engineering: 66% of labs are available 24/7 COM: 59% of labs are available 24/7 Humanities: 20% of labs are available 14/7 Science: Only Computer Science department labs are open 24/7
UWC	Centrally available facilities (18% of computers on campus) are available 12 hours a day 7 days a week	Some faculties do have some facilities available for extended hours, for example: Economic & Management Sciences labs are available 12/7 Some Science labs are available 24/7
SU	–	89% of faculty-based facilities are available 24/7

Source: Brown, Arendse & Mlitwa (2005), appendix 8

Table 4.9 demonstrates that 24 hours/7 days a week access is widespread in Stellenbosch University, and PenTech has 16 hours/7 days a week access for most of their computers. However, for the other institutions only a small percentage of computers are available for extended hours during the week and on weekends, and this is better in some faculties than others (for example, at UCT two faculties offer 24/7 facilities).

When we examine the practical aspect of when students use computers on campus we can see – in Table 4.10 – that most students use on-campus facilities during the 9am – 5pm period.

Table 4.11 shows the distribution of when students access computers in each institution. Only 8% of students at CTech access computers after 5pm. However, 22% of students at Stellenbosch University access computers after 5pm.

This data reflects the availability of 24-hour access on campus (as shown in Table 4.9) as opposed to student preferences. For example, more students access computers after 5pm at the institutions with extended opening hours (e.g. PenTech and Stellenbosch University).

On the other hand, availability outside working hours is scarce at the other three institutions (e.g. UWC only has 18% of computers available 12 hours a day, 7 days a week) or limited to a small percentage in specific faculties (e.g. UCT offers 24 hours a day, 7 days a week access in only two specific faculties).

Table 4.10: Times when students access computers on campus

	Count	Percentage of total
Before 9am	307	5%
Between 9 and 1pm	1426	23%
Between 1 and 5pm	1490	24%
Between 5 and 10pm	730	11%
After 10pm	213	4%
Equally across the day	2059	33%
(n)	**6229**	

These limited hours of availability suggest that there is a high demand placed on computers during the day in most institutions. Student access may also be limited by other factors, including systems of booking as well as limits on how long students can use a computer. UWC, for example, has a booking system for computers and limits students to one hour of use at a time (Mlitwa 2005).

Table 4.11: Times of on-campus computer access across institutions

Institution	Before 9am	Between 9am and 1pm	Between 1pm and 5pm	Between 5pm and 10pm	After 10pm	Equally across the day
CTech	6%	27%	24%	4%	4%	35%
PenTech	4%	18%	31%	14%	6%	28%
UCT	7%	24%	21%	13%	3%	31%
UWC	2%	24%	31%	12%	3%	29%
SU	1%	14%	12%	21%	1%	50%
Total	**5%**	**23%**	**24%**	**11%**	**4%**	**33%**

These issues also emerge from the qualitative data:

I am early on campus. Internet not always on. ***Long lines to book computers.*** *Not enough computers available. Have to come before 8:30 am to book computer. Computer labs are not opened on weekends.*
(UWC, no demographic details)

The computer lab at the [university] campus sometimes close at 5 & on a Friday at 4 & our classes only finish 4.40. ***How are we supposed to type our projects if we do not get enough time.***
(CTech, Management, preliminary, 1st year, female, <30, Afrikaans)

The chances of actually getting a pc in time to complete the task at hand are very slim. ***One has to wait in a queue for quite a long time while.***
(UWC, no demographic details provided)

I have very limited access to computers ***& find it to time consuming to have want in lines to book computers.*** *[time of accessibility - it closes too early. not enough time to use them] [i think every residence should have computers in their respective location to allow students to do their work effectively and efficiently.*
(UWC, Community & Health Sciences, 2nd year undergrad., female, <20, English)

Off-campus student access to practical resources

Whilst the percentage of students with availability to computers paints quite a positive picture of off-campus access (Figure 4.1 shows that 77% of students have access to a computer off campus), practical considerations make the situation more complicated.

We examined this construct in terms of off-campus access by looking at autonomy of access, i.e. at how students shared computers.

We asked students to the following:

- Think about the computer that you most often use when not at [your institution]. How many people share use of this computer?
- If you share use of a computer, are you the primary (main) user?

Off-campus access looks less positive when one considers that only 22% of students have sole access to a computer off campus and the majority of students share a computer with three or more people (59%) (Figure 4.2).

In addition only 21% of those students who share a computer are the primary user with the majority indicating they are secondary users (46%) (Figure 4.3).

Although gender is addressed later (see section 4.3.2.5), it is also of note at this point that when students share computers at home, more female (48%) than male students (43%) in our study report being secondary users.

Figure 4.2: Percentage of students with sole use and who share access to a computer off campus

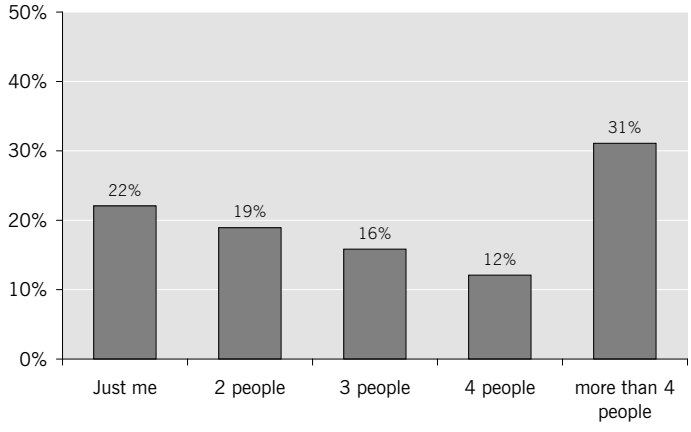
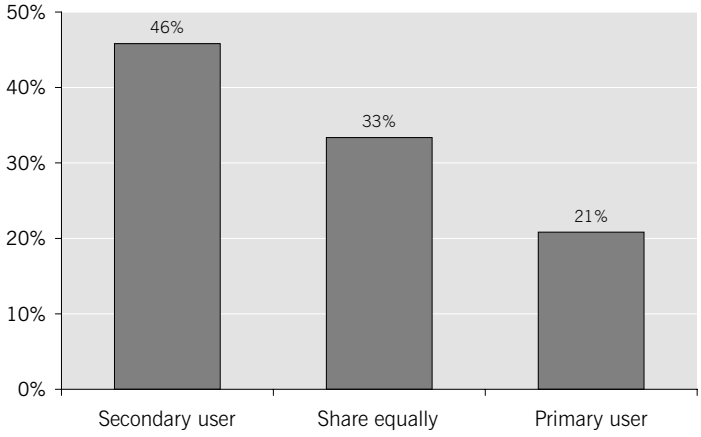


Figure 4.3: Percentage of students who share use and are primary or secondary users



Practical aspects of technological access are also dominant in the qualitative responses, where 79% of the responses focused on physical resources and 61% on practical resources.

Table 4.12 provides an overview of the qualitative responses grouped according to our constructs and indicators.

In terms of practical access, issues related to our indicators of time (18%) and location (48%) surfaced in the qualitative responses along with a third grouping, which we have called conduciveness of the learning environment (24%). Students commented that it was not enough to have access to a technology as it also needed to be in an environment that was conducive to its use. Factors which play a part in whether or not students can practically access the technological resources available include noise, safety, distance from where they live, as well as the actual configuration of space within the environment.

Students' comments are revealing:

sometimes its too noisy during the day, sometimes its too rainy or too dark to come in the evenings … i'm usually out in the areas where there is not much infra structure in place for computers and internets
(SU, Health Sciences, 4th year undergrad., female, 31–40, isiXhosa)

i have to travel to the main campus for computer use … wi-fi access for students staying in accommodation near uct would-be fantastic.
(UCT, Engineering, 1st year undergrad., male, 21–25, siSwati)

it's unsafe to walk to/from [the lab] at night to my res, my boyfriend often stays up so that i can use his pc
(SU, Arts, 1st year undergrad., female, <20, Afrikaans)

i do not have enough space to put out all my things i need to … the fact that there is constant movement and noise around me
(SU, Education, 1st year undergrad., female, <20, Namibian)

…the labs ... need to be adequately air-conditioned the stuffiness of labs … hinders a conductive environment for working.
(UCT, Engineering, 3rd year undergrad., female, <20, English)

There were also some interesting associations of concepts in the qualitative data. If we examine issues about the practical access indicator conduciveness in relation to specific locations (by cross-tabulating all references to conduciveness with the references to location) we see (in Table 4.13) that this is most mentioned in terms of a home context (49%) and then a residence context (36%).

This suggests that "conduciveness" as a factor is more of an issue at home and in residence than on campus. On-campus labs are therefore more enabling of teaching and learning than are computers off campus.

It is interesting to look beyond the fact that issues of hardware dominate all locations and to consider where specific issues are a challenge or are resolved. Infrastructure is an issue for students off campus (54%) and in residence (43%), software is a greater issue off campus (31%), and cost is mentioned most often in relation to off-campus access (19%). On the other hand, free access is mentioned most often in relation to on-campus locations (14%).

This seems to indicate that off-campus student issues that constrain students' physical access are infrastructure, software and cost of access, whilst in residences infrastructure is a constraining factor. On campus, free access is an enabling factor for students.

With regard to home use, family access can be either a positive or a negative determinant:

It's a problem ***when my mom needs the computer at the same time.***
(UCT, Health Science, 1st year undergrad., female, <20)

There is ***limited usage by family members, so can use at just about any time.***
(SU, Health Sciences, 5th year undergrad., male, 21–25, English)

Table 4.12: Overview of qualitative responses about practical access

Construct	Category % freq. of total comments	Code descriptor % freq. within category	General code
Practical (61%)	time (18%)	time (18%)	time
	location (48%)	where (23%)	home, res., campus
		on-campus facilities (31%)	
		when (12%)	weekends, open, closed, hours, night, 24/7
	conduciveness (24%)	environment (1%)	environment, children, air-conditioning, chairs
		peaceful (1%)	silence, friendly, peace, quiet, relaxed
		chaotic (13%)	noise, small, crowded, limit, booked, queues, lines, waiting, chaos, full, loud
		transport (4%)	car, shuttle, walk, bicycle
		near (5%)	nearby, close, convenient, central
		far (3%)	far, distance
		security (1%)	privacy, safe, freedom, security

As explained earlier, the frequency of codes was calculated in relation to the total number of responses. There were 3085 qualitative responses from students, so a percentage of 61% for our construct of practical access means that 61% of students mention something about practical access in their qualitative responses. This is then examined to see what indicators these related to. In most answers students mentioned more than one indicator, hence it was possible for a person's response to occur or be counted in more than one category. Percentages in the indicators and descriptors column refer to the number of students who mentioned that concept and therefore do not add up to 100%. The column labelled "general code" indicates the codes that comprised each indicator.

Table 4.13: Cross-tabulation of issues relating to conduciveness with location of use

	Conduciveness		(n)
Home	72	49%	147
Residence	159	36%	442
On campus generally	68	29%	238
On-campus facilities	263	28%	941
(n)	**749**		

Table 4.14: Cross-tabulation of main issues about physical access with location of use

	Off campus		On campus		Residence		(n)
Infrastructure (general)	27	18%	28	12%	54	12%	320
Infrastructure (Internet)	80	54%	77	32%	189	43%	898
Computer (hardware)	108	73%	185	78%	314	71%	1777
Computer (software)	45	31%	38	16%	98	22%	504
Affordability (cost)	28	19%	26	11%	46	10%	288
Affordability (free)	2	1%	33	14%	25	6%	157
(n)	**147**		**238**		**442**		

Off campus access may even be easier:

*At home i **can use a computer at any time of the day** without booking … if i use it in the library. there are not enough computers and you sometimes can stand in the queue for about 40 minutes.*
(UWC, Humanities, 2nd year undergrad., female, <20, Afrikaans)

In conclusion, when considering practical issues of technological access we can see that simply having a computer is not enabling of its own accord.

Table 4.15: Reported ease of access in the five institutions surveyed

	CTech	PenTech	UCT	UWC	SU	Total
Difficult/ very difficult	64%	35%	40%	74%	11%	51%
Easy/ very Easy	35%	64%	59%	25%	88%	49%
All groups	1451	752	2131	1156	681	6175

Hours of opening, booking systems and congestion in labs make the computers on campus less accessible to students. Whilst a majority (77%) of students have access to a computer off campus, less than a quarter (22%) have sole use of these computers. An additional issue which emerges from the qualitative data is the conduciveness of the environment in which the computer is accessed. Issues related to privacy, noise, safety and physical space constrain student use of computers. When students have increased autonomy over the use of a computer they comment on how positive this is.

4.3.2.3 Difficulty of student access

Having established the physical presence of computers and the autonomy of access students have to them, we were interested in how easy or difficult this access was for students both on and off campus. We asked this very simply as follows:

- How difficult is it to find a computer [on campus] when you need one?
- How difficult is it for you to use the computer you [use off campus]?

Difficulty of access to computers on campus

We asked students about ease of access to computers on campus, and received mixed responses. We would expect this, given that the institutional structures and histories are different.

Table 4.15 shows that students were divided about their ease of access to computers, with 64% and 74% at CTech and UWC respectively saying that computer access is difficult or very difficult, and 64% and 88% at PenTech and Stellenbosch University saying it is easy or very easy. Students at UCT are divided about ease of access, with 59% saying it is easy or very easy, and 40% saying it is difficult or very difficult.

These differences between institutions echo historical differences, advantages and disadvantages. Availability issues surface in terms of where and when students have access to computers. These are supported by qualitative responses which indicate that issues around ease and difficulty also relate to hours of access, printing and location.

This can be a negative experience:

Its very difficult to access comps in the xxx dept. They are never working or always experiencing difficulties. We also have very inferior printing facilities and not enough comps to handle the demand.
(UCT, Law, 4th year postgrad., female, 21–25, English)

But on the other hand:

[I am helped by]the lab's proximity to my department/faculty, and the fact that it's accessible 24hrs 7 days. Sometimes during school hours on occasions when the labs are busy with classes and/or exams I can easily get access if I badly need a computer.
(SU, Economics & Management Sciences, postgrad., female, 26–30, Afrikaans)

…that our computers are easily accessible … that i can use the computer and not be disturbed
(SU, no demographic details provided)

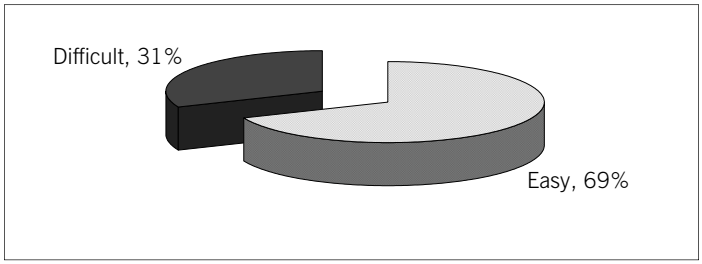
While it is important to consider the data in the light of institutional contexts, especially given historical inequities, such differences are not the primary finding. Whatever the differences, no matter how well or poorly resourced an individual institution is in the Western Cape, technological access remains a burning issue. From a teaching and learning perspective such access needs to include appropriate and meaningful access to practical resources, including sufficient time for tasks and short periods of waiting to use shared equipment.

Difficulty of off-campus student access

We then explored how difficult it is for students to access computers off campus. Only 31% of students report that it is difficult or very difficult for them to use a computer off campus, a similar percentage to those who indicate they have no access off campus. It is interesting that despite the multiple strategies students have to employ in order to obtain off-campus access, the majority report easy off-campus access.

We explored the concept of ease and difficulty of access because one of our assumptions was that access is not something that is present or absent – it exists in gradations. The institutions where the majority of students feel access is difficult are CTech and UWC where there are only a small number of computer facilities available centrally, and only a small percentage of computer facilities on campus are accessible after hours and on weekends. The majority of students at PenTech and Stellenbosch University think access on campus is easy. It is in these institutions that access is either available 24/7 or else 16/7. Students at UCT are divided about ease of access. This is probably because there are large discrepancies between faculties in terms of availability of computers both physically and practically. It appears that ease and difficulty of access on campus is related to flexibility of hours available, although we should explore this relationship further. It would be interesting to explore students' expectations of on- and off-campus access as more students report easier off-campus access compared to that on-campus.

Figure 4.4: Ease of computer access off campus



4.3.2.4 Adequacy of access for student learning needs

Adequacy of student support and Internet access on campus

One of the other aspects we explored with regard to technological access was adequacy. We were not investigating specifics in the infrastructure and support available to students nor were we trying to measure or compare the type of computers students were using. Rather, we asked them whether or not they felt the Internet access and general institutional support they receive is adequate for what they need to do for their learning.

Interestingly, despite reported difficulties most students across all institutions feel that Internet access and general institutional support are adequate for their learning requirements (Table 4.16). More students at Stellenbosch University feel that Internet access and support are adequate (93% and 80% respectively). However, a larger percentage of students at UWC feel that these are inadequate (43% and 47% respectively).

In the qualitative responses, lack of adequacy and lack of availability are also mentioned frequently. We examine the context of their associations in more detail in Table 4.17. We can see that comments about unreliability predominantly relate to general issues of infrastructure (43%) and that negative comments about lack of availability are related to all aspects of infrastructure and computers (Table 4.17).

Through qualitative data it is possible to ascertain that the most common expression of inadequacy is unreliability and that lack of availability is mentioned more frequently than availability.

Some examples of how physical resources proved unreliable are:

*Access to the net in the afternoon is sometimes slow and **many computers freeze** and are out of order. yes students should*

Table 4.16: Adequacy of Internet access and ICT support on campus in the five institutions

	CTech	PenTech	UCT	UWC	SU	Total
Internet access						
Inadequate	29%	25%	21%	43%	7%	24%
Adequate	71%	75%	79%	57%	93%	69%
(n)						**5761**
Support						
Inadequate	33%	25%	34%	47%	20%	
Adequate	67%	75%	66%	57%	80%	
(n)						**6121**

Table 4.17: Cross-tabulation of qualitative responses relating to physical resources and adequacy and availability of these resources*

	Adequacy				Availability				
	Unreliable		Reliable		Negative		Positive		(n)
Infrastructure (general)	136	43%	43	13%	206	64%	96	30%	320
Infrastructure (Internet)	227	25%	97	11%	581	65%	217	24%	898
Computer (hardware)	358	20%	133	7%	1058	60%	424	24%	1777
Computer (software)	124	25%	46	9%	329	65%	137	27%	504
(n)	**504**		**192**		**1537**		**554**		

**Note: The percentages are calculated as row percentages. Not all qualitative response made reference to adequacy or availability, and sometimes a response made reference to both of these concepts. The (n) value therefore reflects (as with the other tables referring to qualitative data) the number of individual students who mentioned a concept). So in total 504 students made a comment about unreliability (however, 854 comments about the various aspects related to computers and infrastructure, which indicates that most students mentioned both in their responses).*

Table 4.18: Staff perceptions of adequacy of student physical computer access

	Enough computers		Available when needed		Hardware and software sufficient	
	Agree	Disagree	Agree	Disagree	Agree	Disagree
CTech	27%	73%	20%	80%	72%	28%
PenTech	42%	58%	37%	63%	64%	36%
UCT	29%	71%	28%	72%	43%	57%
UWC	9%	91%	9%	91%	10%	90%
SU	49%	51%	49%	51%	49%	51%
Total	**29%**	**71%**	**27%**	**73%**	**45%**	**55%**

keep the computers in good conditions they should check their disks regularly for viruses.
(PT, Business, 2nd year undergrad., male, <20, isiShosa)

*It sometimes **takes too long** for it to get our computers hooked up to the network. Sometimes programs I use that run from servers give problems.*
(SUN, Engineering postgrad., male, 21–25)

*Most programs does not work. too little access at xxx campus - always full. Too little bytes to use internet for the info you need. **some software not working eg.** **Msword.** …the availability of computers is poor, internet access not always up to date and is often very slow. **Often broken computers everywhere.***
(CT, Management, 2nd year undergrad., male, <20 years, English)

Adequacy of student on-campus access – staff views

We were also interested in how staff perceive the adequacy of technological facilities and support on campus for their students as we felt this might impact on how they use technology in their teaching. Over 90% of staff from UWC feel that students' physical access to computers is inadequate (Table 4.18). Staff at Stellenbosch University are more positive, with only 51% feeling that physical access is inadequate with regards all three factors.

However, interestingly, staff from the other three institutions feel that access is inadequate in terms of there not being enough computers for students, and they are not available when students need them. However, they are more positive about adequacy of hardware and software, suggesting that the computers themselves are adequate for teaching and learning needs but that there are just not enough of them available to students when needed (Table 4.18).

Adequacy of student on-campus ICT support – staff views

We were also interested to know whether staff consider student support to be adequate. Clearly they did not. As Table 4.19 demonstrates, the majority of staff in CTech, UCT

Table 4.19: Staff perceptions of adequacy of student support on campus

Institution	Agree	Disagree	Total
CTech	36%	64%	83
PenTech	55%	45%	42
UCT	29%	71%	119
UWC	8%	92%	90
SU	49%	51%	75
Total	**32%**	**68%**	**409**

and UWC feel that support is inadequate, whilst they are divided at PenTech and Stellenbosch University.

In addition, staff are far more critical of computer adequacy for students than students are for themselves. For example, students from Stellenbosch University are very positive about adequacy of support (Table 4.16), whereas staff are divided about adequacy of support for students (Table 4.19).

Overall, students are divided about whether their Internet access off campus is adequate for their learning needs (Figure 4.5). Institutional access alone is not sufficient for students' learning requirements. Students need and want off-campus access and currently for many this is not adequate.

In the light of these difficulties and inadequacies, it is therefore surprising that 76% of students still say they are able to use a computer for long enough periods of time for their learning requirements.

4.3.2.5 How access to technological resources affects specific groups of students

The specific groups we were interested in were distinguished by socio-economic background, gender, age, nationality, language and disability.

Students from different socio-economic groups on campus are affected mainly in terms of ease of access. The cause of these differences is quite hard to pinpoint as institutions differ in terms of infrastructure and integration of ICTs for teaching and learning. There are also strong differences in the proportion of students from high and low socio-economic groups across the institutions, and so one cannot determine whether the divide is institutional or related to socio-economic background.

Socio-economic groups

In Chapter 2 we describe how we calculated a socio-economic index for students.[3]

Figure 4.5: Adequacy of Internet access off campus

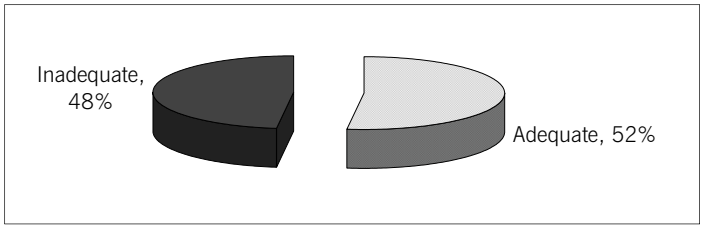


Figure 4.6: I am able to use a computer for long enough periods of time for my learning requirements

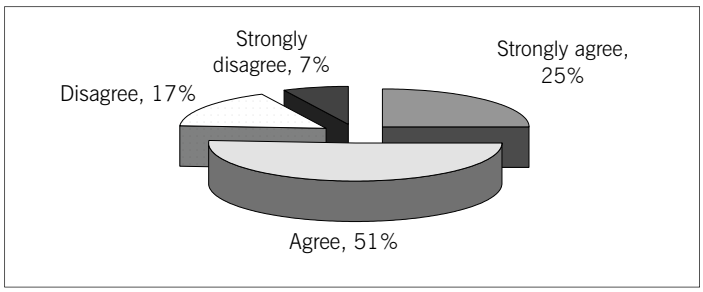
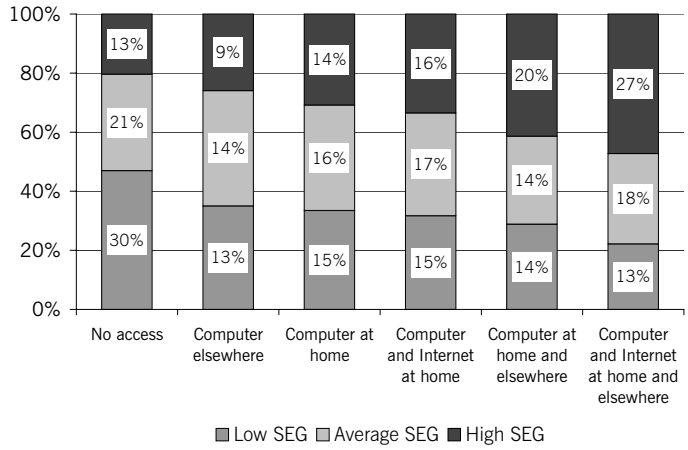


Figure 4.7: Off-campus access to computers: comparison of different socio-economic groups



When considering access to ICTs off campus we note that students with no or low access are predominantly from low or average socio-economic groups (Figure 4.7), whereas 27% students from high socio-economic groups have maximum access to ICTs off campus (compared to 13% of students from low socio-economic groups).

Figure 4.8: How many people share access to the computer you use off campus?: socio-economic comparison

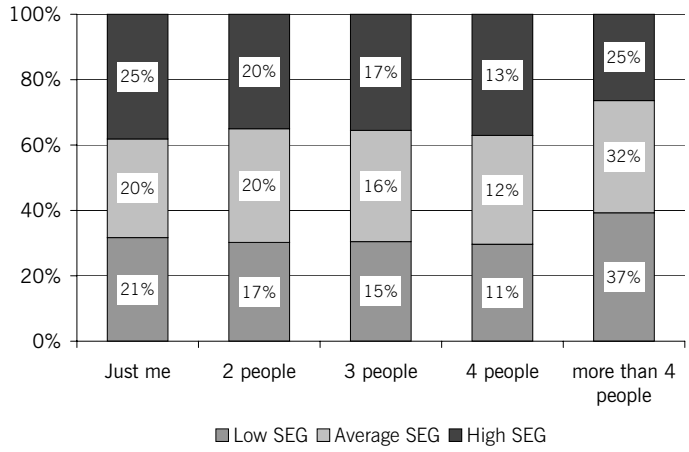
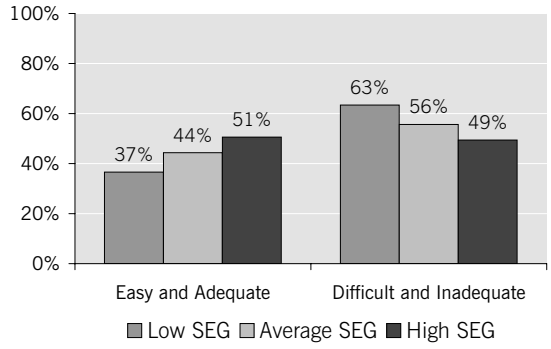


Figure 4.9: Ease and adequacy of access off campus: socio-economic comparison



Students from low socio-economic backgrounds have less autonomy in their use of computers off campus as fewer have sole use of a computer (21% compared to 25% of students from high socio-economic groups) and 37% share a computer with four or more people (Figure 4.8).

However, there is no difference in socio-economic groups in terms of whether or not students are primary or secondary users of a shared computer.

Of students from low socio-economic backgrounds, 63% indicate that they have below-average ease and adequacy of access to computers off campus compared to 49% of students from high socio-economic backgrounds (Figure 4.9).

However, the difference in terms of adequacy of access to the Internet on campus is negligible. In contrast, students from low socio-economic groups show a greater satisfaction with institutional support than students from high socio-economic groups.

Gender

In terms of gender we found that, overall, males and females in our regional study have the same access to physical resources. They have equal access to computers and the Internet on and off campus, as shown in Figure 4.10, with regard to off-campus access.[4]

However, while there is equal access to physical resources, a closer look at practical indicators show some revealing differences. The indicator of autonomy specifically shows that males have more autonomy than females. We found

Figure 4.10: Comparison of male and female off-campus access to computers

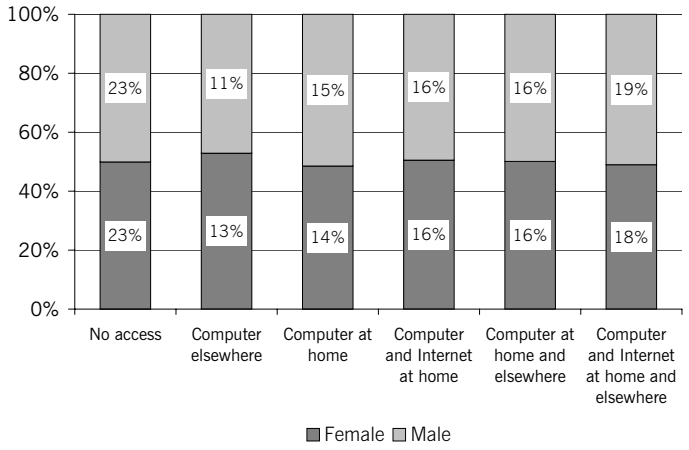


Figure 4.11: If you have access to a computer off campus, how many people do you share use with?

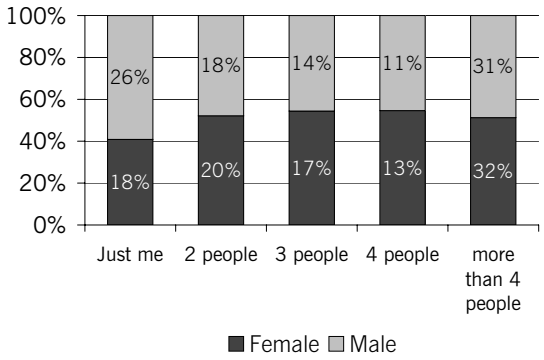


Figure 4.12: If you share use of a computer, are you the primary user?

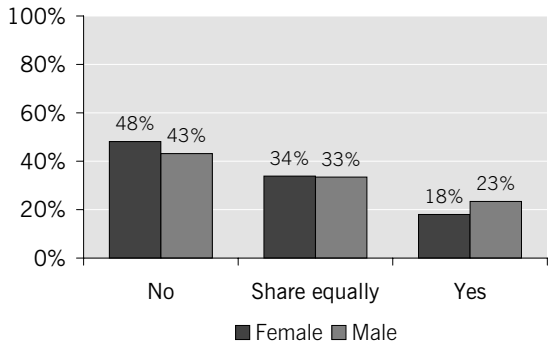
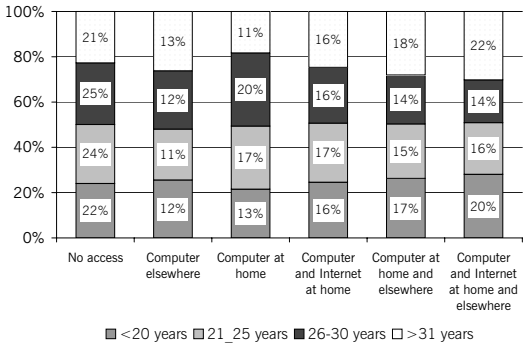


Figure 4.13: Comparison of male and female students' reported ease and adequacy of access to computers off campus



that 26% of male students have sole access to a home computer compared to 18% of female students, as shown in Figure 4.11. Of the male students who have sole use, 7% more male students from high socio-economic backgrounds have sole use than do males from low socio-economic backgrounds.

In addition, Figure 4.12 shows that, when students share computers at home, 43% of male students report being secondary users compared to 48% of female students.

When examining ease and adequacy of access both on and off campus, we see no gender differences despite female students less autonomy regarding access (Figure 4.13).

Figure 4.14: Comparison of different age groups off-campus access to computers

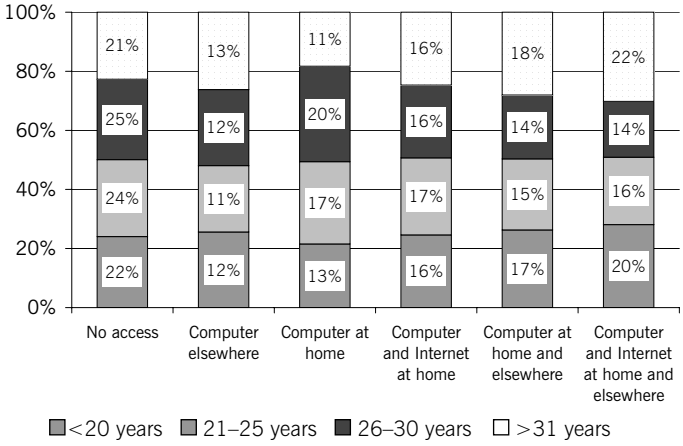


Figure 4.15: Comparison of different age groups' reported ease and adequacy of access to computers off campus

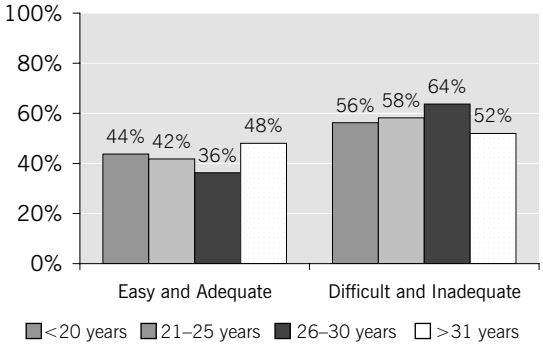


Figure 4.16: How many people share access to the computer you use off campus?: Age comparison

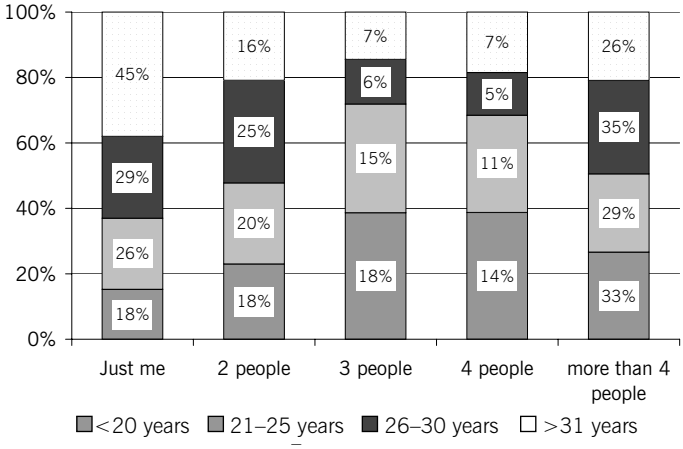


Figure 4.17: If you share use of a computer off campus, are you the primary user?: age comparison

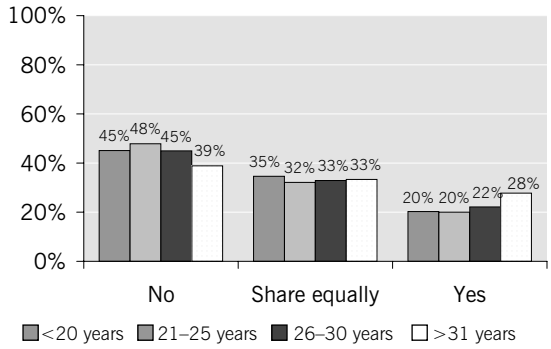


Figure 4.18: Off-campus access: a comparison of nationality

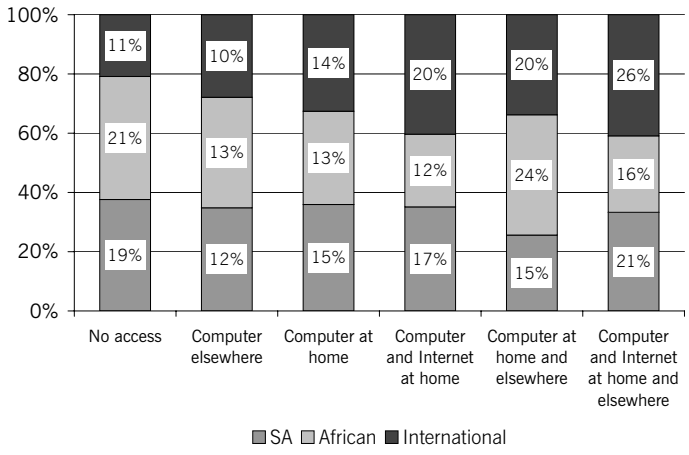
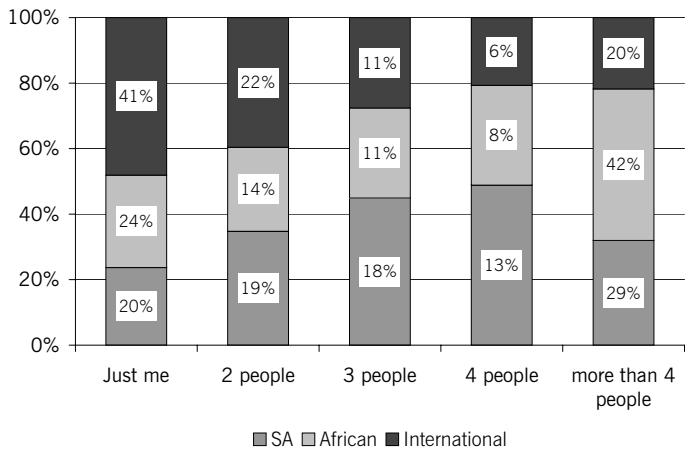


Figure 4.19: How many people share access to the computer you use off campus?: nationality comparison



Age

In terms of technological access we found no difference in terms of age with regard physical access on and off campus, nor in terms of ease and adequacy of access (Figure 4.14 and Figure 4.15).

Students older than 30 years have more autonomy of access, with 45% having sole use of the computers they use off campus compared to 18% of under-20-year-olds (Figure 4.16). If they share use of a computer, more older students are primary users of that computer than are younger students (Figure 4.17).

Nationality

Figure 4.18 shows 21% of students from other African countries indicate they have no access, compared to 19% of South African students and 11% international students. When looking at maximum off-campus access, 26% of international students indicate full access off campus compared to 21% of South African students and 16% of African students.

International students also have more autonomy of off-campus computer use. Of international students, 41% have sole use of a computer compared to 24% of African students and 20% of South African students, whereas 42% of African students share a computer off campus with four or more people, compared to 29% of South African students and 20% of international students (Figure 4.19).

Figure 4.20 demonstrates that 60% of African students who share computer use are secondary users compared to 49% of international students and 44% of South African students.

Figure 4.20: If you share use of a computer off campus, are you the primary user?: nationality comparison

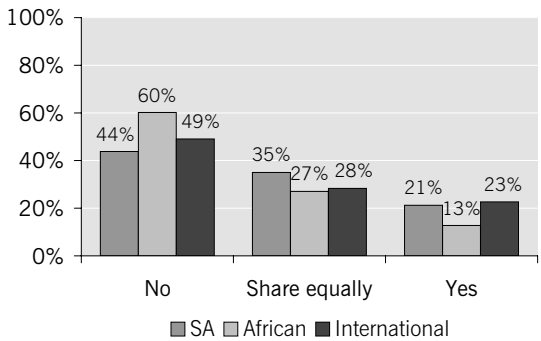


Figure 4.21: Ease and adequacy of access off campus: nationality comparison

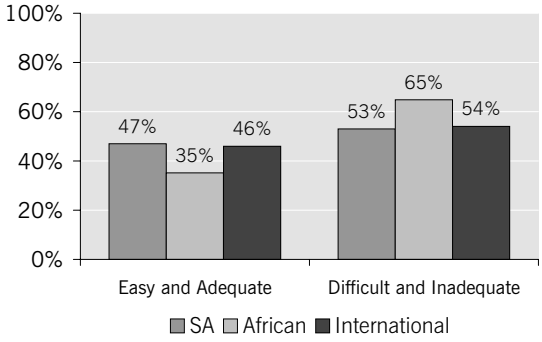
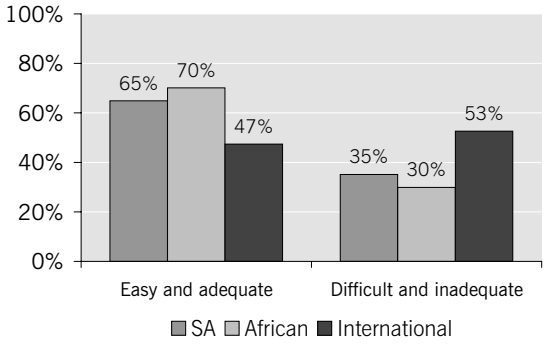


Figure 4.22: Ease and adequacy of access on campus: nationality comparison



International and South African students also have a higher percentage of primary use of a computer (23% and 21% respectively) compared to African students (13%).

Not surprisingly, 65% of African students indicate below-average ease and adequacy of off-campus access compared to 53% of South African and 53% of international students (Figure 4.22).

More international students (56%) indicate that they find on-campus access to be difficult or inadequate compared to South African (45%) and African (38%) students (Figure 4.22).

Language

Students who speak English as a first home language have much higher access to a computer off campus than those who speak English as a second home language. This is demonstrated in Figure 4.23, which shows that 31% of English second language speakers have no access to a computer off campus compared to only 10% of English first language speakers.

English second language speakers also have less autonomy of off-campus access, with 36% sharing a computer with more than four people (compared to 25% of English first language speakers) (Figure 4.24).

More English second language students are secondary users of shared computers (49%) compared to English first language students (42%).

At the same time, 64% of English second language students also indicate that off-campus access is more difficult and less adequate for their learning needs compared to 47% of English first language speakers.

Figure 4.23: Off-campus access: comparison of students who speak English as a first and second language

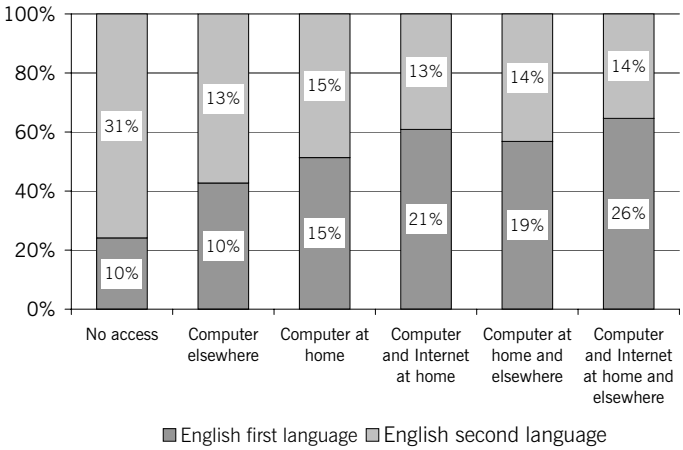


Figure 4.24: How many people share access to the computer you use off campus?: language comparison

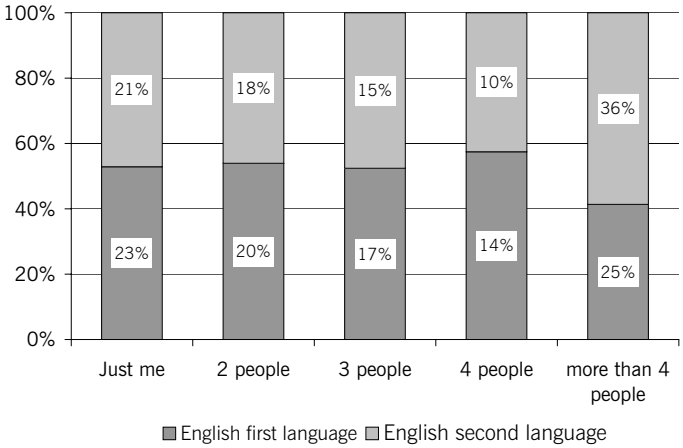


Figure 4.25: If you share use of a computer off campus, are you the primary user?: language comparison

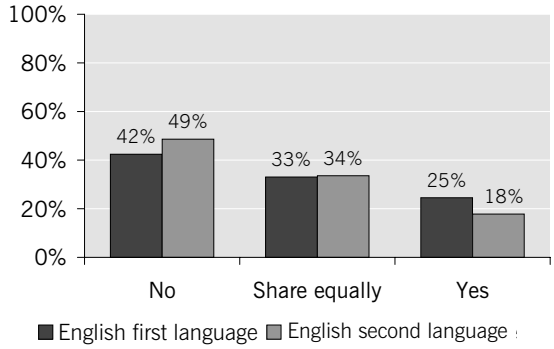


Figure 4.26: Ease and adequacy of access off campus: language comparison

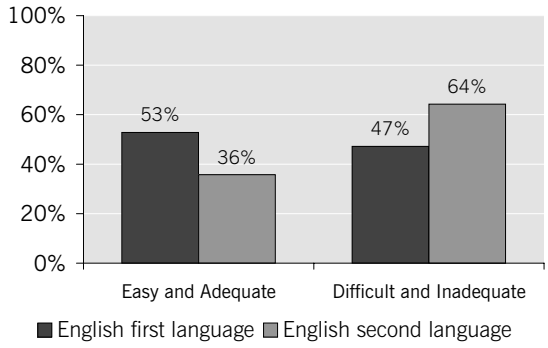
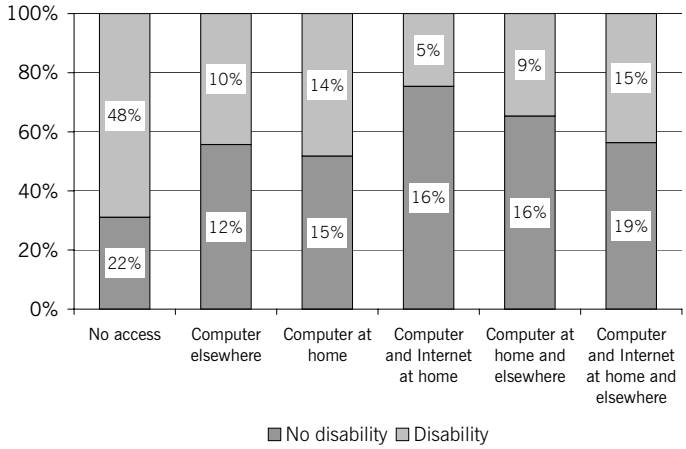


Figure 4.27: Off-campus access: comparison of students with and without a disability



There is, however, not much of a difference in students' reported ease and adequacy of on-campus access between the two groups.

Disability

The group of students who indicate they have a disability which limited their ability to use a computer is small (only 99 people in the entire survey). However, this group does indicate that technological access is an issue for them.

Figure 4.27 shows that nearly half (48%) of students with a disability have no access to a computer off campus. Amongst those that do have access, only 16% have sole access to a computer and of those who share access only 10% are primary users.

Understandably, 72% of students with a disability indicate below-average ease and adequacy of access off campus compared to 56% of students without a disability (Figure 4.28). This discrepancy between students with and without a disability is also notable in terms of ease and adequacy of on-campus access, with 56% of students with a disability indicating below-average ease and adequacy of access on campus compared to 36% of students without a disability (Figure 4.29).

4.3.2.6 Conclusions about technological access

Overall, we can conclude that access to technological resources is complex and diverse. Quantities alone do not tell the whole story. For institutions to provide numerous computers for their students is only part of provision; other factors such as support and availability may make all the difference.

Our study shows that technological access does exist across the region. However, it varies considerably for students in terms of difficulty and adequacy. Certain demographic groupings have better or worse access than others.

With regard to physical resources, we have noted that the institutions in our study are quite diverse in the way they have structured students' access to computers, with some providing predominantly central computer facilities and other faculty-based facilities. Where a faculty-based model is in place we note there are marked differences in terms of computer facilities across faculties. In these institutions central facilities are accessed quite extensively by students, placing quite a high demand on a small facility. Decentralised models of access have a high danger of entrenching inequalities.

Frequency of use of computers on campus is quite high in the region with the majority of students using computers

Figure 4.28: Ease and adequacy of access off campus: disability comparison

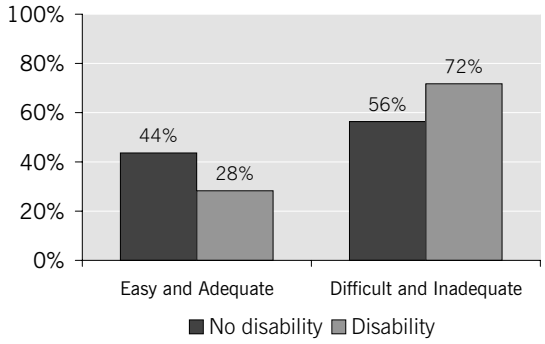
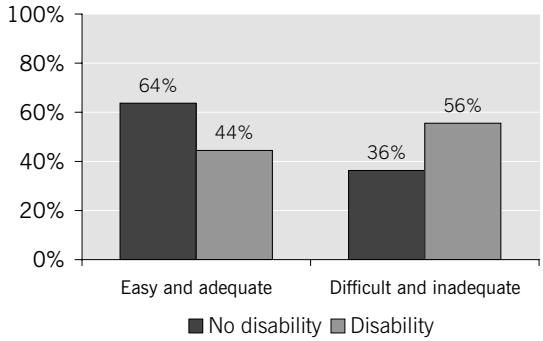


Figure 4.29: Ease and adequacy of access on campus: disability comparison



daily (although this does vary across institutions). The majority of students also have some form of access to a computer off campus, many where they live. The issue of affordability of physical resources arises from the qualitative data as an additional concern to students.

As for practical access, we saw that on-campus facilities have differing levels of availability, with many facilities not available after working hours. Whilst the majority of students have some form of off-campus access, only a small group has convenient access to a computer and the Internet where they live. Practical considerations such as sharing of computers affect the majority of students. An additional issue relating to practical access, viz. the conduciveness of the environment, emerged as an additional constraining consideration.

There are divides in terms of students' ease and adequacy of access to ICTs between institutions. Students from CTech and UWC consistently report difficult access on campus, and a high percentage of students from the latter report that Internet access and ICT support is inadequate for their learning requirements. Staff are generally highly critical of the access available to students on campus, with the majority of UWC staff indicating inadequate access.

Access affects students from different social groupings differently particularly off campus. Overall in terms of off-campus access students from low or average socio-economic groups, those who do not speak English as a home language and those with disabilities are particularly disadvantaged.

However, on campus access reveals fewer differences by social grouping suggesting that provision is fairer and that the digital divide on campus is being addressed.

4.3.3 Student access to resources of personal agency

It has been argued that the resources of personal agency need to be accessed first (van Dijk 2003).

As explained earlier, when exploring resources of personal agency we focus on two aspects. Aptitude is about ability, experience and training in using a computer. Disposition refers to a person's interest in and attitude to using computers, both in general and specifically for learning. We realise that there are likely to be other aspects of personal agency pertinent to learning, but decided that these two resources were the most relevant to learning with a computer, on the basis of our pilot and our review of the literature.

The reason that these resources need to be accessed by individuals in order to use computers is that such resources give them agency. An actor in a social structure is more likely to become an agent when able to draw on and generate knowledgeability, power, commitment and consciousness. Thus accessing personal resources allows an individual to exercise agency, to give meaning to objects and events and to act with intent (Drislane n.d.). Students who have access to these resources are therefore advantaged; these resources are enabling factors for computer use.

Knowing how students view their own aptitude and disposition tells us how well positioned they are to use ICTs purposefully. Since our methods do not test skills or observe implementation, this data tells us about reported aptitude and disposition. This is meaningful, as it provides a sense of ability and perception, and is directly related to confidence and motivation.

4.3.3.1 Student-reported ICT aptitude

One of the indicators which forms a strand of personal agency resources is that of reported aptitude. Students are

Table 4.20: Students' rating of their own abilities

Institution	Poor	Average	Good	Excellent	(n)
CTech	5%	35%	44%	17%	1572
PenTech	8%	38%	44%	10%	706
UCT	5%	30%	42%	24%	2165
UWC	7%	33%	41%	18%	1216
SU	1%	18%	43%	38%	590
Total	**5%**	**31%**	**43%**	**21%**	**6249**

generally confident of their own abilities, with 64% rating their computer ability as good to excellent. Whilst reported aptitude measures self-perception rather than observable skills, it does indicate that students in higher education are generally confident about their own abilities to use ICTs.

The qualitative responses tend to confirm student confidence in their own abilities, but they also reveal their doubts,

i'm complete able to use a computer, and have an above average knowledge on computers and how to use them. i know how to use a computer to its best, but do not know much about the technical stuff and hardware. i learned in a previous course to be a super searcher, thus a specialist in finding information on the web.
(SU, Arts, 4th year postgrad., female, 21–25, Afrikaans)

i am not good in computer because my first year doing comps but i try my best to learn
(CTech, Management, 1st year undergrad., female, <20, Setswana)

We also asked about the number of years' experience students have had using a computer. The majority (68%) report having in excess of five years' experience (Table 4.21) and a small group of 18% have less than two years' experience.

Table 4.21: Students' experience using a computer

When did you first start using a computer?	Count	Percentage of total
<1 year	501	9%
1–2 years	489	9%
3–4 years	787	14%
5–6 years	1092	20%
7–10 years	1444	26%
>10 years	1243	22%
(n)	**5556**	

Table 4.22: Students' attendance of computer training at their institution

Have you ever attended training on using a computer at your institution?		
Yes	2957	53%
No	2616	47%
(n)	**5573**	

About half (53%) the student respondents had attended training on using a computer at their institution (Table 4.22).

For students who feel they are lacking skills, training is highlighted in the qualitative responses:

The training for computer programs is usually only a week & knowledge gained is not enough.
(CTech, Built Environment & Design, 3rd year, undergrad., male, 21–25, English)

More courses should be offered to improve skills on computer use. The university should offer courses on internet use & learning how to type (speed & efficiency).
(UWC, Economic & Management Sciences, 1st year postgrad., male, 31–40, English)

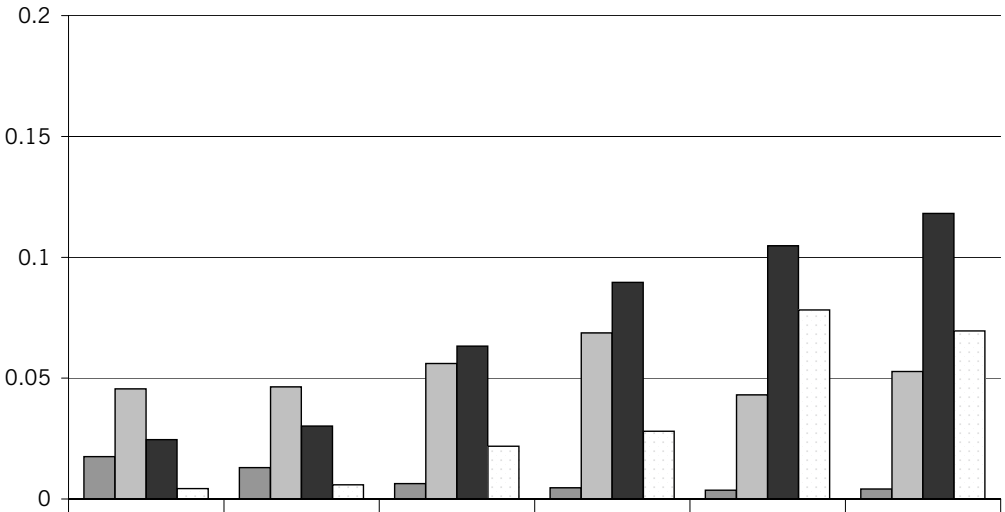
I have only basic knowledge about computers. [There are] limited opportunities to learn/gain more knowledge. I do get frustrated if I don't know why my computer does something or if I don't know how to solve a problem.
(SU, Education, postgrad., female, 26–30, Afrikaans)

Figure 4.30 brings all three indicators of aptitude together.

We are interested to observe the very small group of students (2%) which has been using a computer for less than two years, rate their ability as poor, and have never been to any computer training at their institution. Another small group (15%) has been using a computer for more than seven years and rate their ability as excellent. Whilst it is heartening to know that the group of students with a very poor aptitude for computers is low, this demonstrates the diversity in aptitude amongst the student group. This kind of diversity must be a challenge for academics and learning designers.

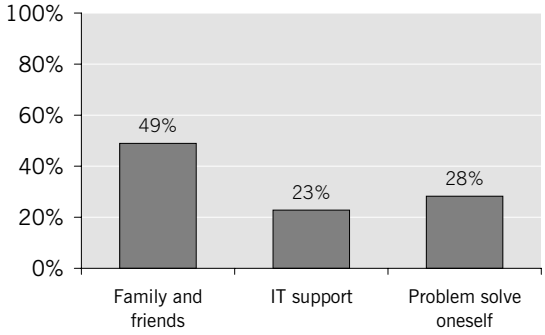
If we look at the strategies students employ when they have a problem doing something on a computer (Figure 4.31) we can see that most students (49%) ask family or friends for help while the smallest group (23%) asks for IT support.

Figure 4.30: Students' aptitude: comparison of years of experience, attendance at ICT training and reported ability using a computer (reported as % of total sample)



	No training	Training	No training	Training	No training	Training
	<2 years' experience		3–6 years' experience		>7 years' experience	
Poor self-efficacy	2%	1%	1%	0%	0%	0%
Average self-efficacy	5%	5%	6%	7%	4%	5%
Good self-efficacy	2%	3%	6%	9%	10%	12%
Excellent self-efficacy	0%	1%	2%	3%	8%	7%

Figure 4.31: Overview of strategies students use when having a problem on a computer



When considering whether students have sufficient knowledge about computers to use them for learning, the majority of staff disagree. They feel, to varying degrees, that students do not have the required knowledge, experience and abilities to use computers for learning. In general, staff at individual institutions are split equally in their views of student aptitude. In one case – UWC – only 10% of staff feel that their students have the required aptitude (Table 4.23). In this case students and staff are in accord, as students at UWC are also less confident about their own abilities when compared to students from other institutions.

4.3.3.2 Staff views of students' ICT aptitude

Concerned that students might be likely to have rose-tinted views of their own aptitude and unable to test them directly, we thought that asking staff would provide a useful additional perspective on student aptitude. And indeed, staff and student views are divergent.

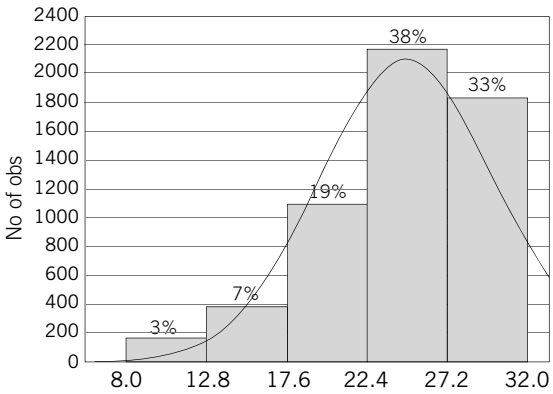
Table 4.23: Staff opinions about students' aptitude

Institution	Agree	Disagree	Grand total
CTech	46%	54%	89
PenTech	58%	42%	45
UCT	44%	56%	133
UWC	10%	90%	92
SU	49%	51%	75
(n)	**171**	**263**	**434**

Table 4.24: Questions comprising index for disposition

The use of computers is likely to result in more valuable learning experiences.
The use of computers is likely to improve communication amongst students.
The use of computers is likely to improve communication between students and teachers.
Computers can give valuable support to my courses.
Computers will help me do routine tasks (like enrolments and obtaining results) more quickly.
I am a person who likes to try out new ways to carry out my learning.
I can picture myself encouraging fellow students to use computers for learning.
I am a person who has a high general level of interest in new technological developments.

Figure 4.32: Index of students' disposition towards using computers generally and specifically for learning



Individual disposition: N=5652, Mean=24.646, StdDv=5.1549, Max=32, Min=8

The discrepancy in student and academics' perceptions also suggests a difference in the skills students think they need and that academics think they need. Closer alignment of institutional computer training and academic courses might usefully address this disjuncture.

Rather than not use ICTs in their teaching because they do not feel students have the required skill, the opportunity for academics is to draw on the high confidence students have with regard to their own abilities.

4.3.3.3 Students' disposition in relation to ICTs

We find that students are overwhelmingly positive about the benefits of computers for learning. We asked students whether or not they agreed with eight statements focusing on their general interest in and attitude to using computers, both generally in their course and for learning (see Table 4.24).

An index of this construct indicates that students are very positive about and interested in using computers for learning. Within a range of 8 to 32 (where a score of 8 represents strong disagreement and a score of 32 represents strong agreement), the majority of students (72%) had a response of greater than 22.

For most students, disposition is a positive driving force and an enabling resource.

Qualitative responses indicate that students find computers fun and motivating:

[it is] more fun to use a computer when learning, [it] motivates learning
(SU, Economic & Management Sciences, 2nd year undergrad., female, 21–25, African)

[I like the] inquisitive nature and experience of computers.
(SU, Arts, postgrad., male, 21–25, English)

A computer for learning is very valuable because it improves the learners' knowledge in so many ways.
(CTech, Applied Science, preliminary 1st year, male, <20)

However, despite students' overwhelmingly positive attitude towards computers, the qualitative data revealed some negative aspects:

but i do not like using them [computers] because i don't understand them. I only use comps when i have to.
(UCT, Commerce, 1st year undergrad., year, female, <20, Sepedi)

its [computers] useful for learning but also useful for procrastinating when you should be doing work.
(UCT, Business, 1st year undergrad., male, <20, English)

I don't like the way that we are so dependent on our computer lab and faculty website to know what is going on in our course and to find material we need to learn.
(UCT, Health Science, 3rd year undergrad., 21–25, Afrikaans)

This data reveals that students have access to a crucial resource, viz. a positive attitude to and an overwhelming interest in using computers for learning. This affective dimension is crucial for learning in general as well as when mediated by a new medium (Wallace and Sinclair 1995; Lou 2004; Dettmer 2006). Access to this resource is therefore an enabling factor for students in the Western Cape.

Having analysed the quantitative data with regard to disposition and aptitude, we are interested to find out what the qualitative data reveals. Table 4.25 provides details of the issues that arise with regard to personal agency.

Whilst the construct of personal agency is not as frequently mentioned as that of technological access, comments nevertheless encompass 34% of the total qualitative responses. Of the indicators, training and ability are the most frequently mentioned (21%), with disposition (6%) being the least mentioned. Thus issues related to aptitude are highlighted more than those relating to disposition.

4.3.3.4 How differences in personal agency affect various social groups of students differently

Socio-economic groups

With regard to socio-economic backgrounds, we see no difference in students' disposition. All students have a positive attitude to and interest in computers.

There are, however, strong differences in students' aptitude across different socio-economic groups. An index of students' self-reported aptitude from low socio-economic groups shows that they rate their aptitude lower (38%) than students from high socio-economic groups (16%), and students from high socio-economic groups rate their aptitude higher (56%) than students from low socio-economic groups (31%). This difference is demonstrated visually in the stacked-column graph (Figure 4.33), which compares categories of aptitude across the three socio-economic groups.

Gender

Overall there is no gender difference in terms of disposition. However, when examining males' and females' responses to the question about whether or not they have a high level of interest in new technological developments, a much higher percentage of males (82%) compared to females (64%) agree.

With regard to aptitude and gender, we find differences in self-rating of knowledge and skills, with 26% of male students rating their ability as excellent compared to 15% of female students (Figure 4.35). Furthermore, we find that

Table 4.25: Overview of qualitative responses about personal agency

Construct	**Indicator** (% freq. of total comments)	**Descriptor** (% freq. within category, i.e. is this a % of total comments or of personal agency comments?)	**General code**
personal agency (34%)	aptitude (31%)	experience (3%)	experience, years
		training & ability (21%) (general)	skill, expert, experience, course, train, troubleshooting, literacy, know, keeping up, new method
		training and ability (positive) (15%)	simple, ability, able, competent, confidence
		training and ability (negative) (3%)	hard, inability, unable, threatened, ignorance, shy unconfident
	disposition (6%)	interest positive (6%)	interest, curiosity, explore, experiment, enrich, learn
		interest negative (–)	waste of time, not interested, do not like

The frequency of codes in the table was calculated in relation to the total number of responses. There were 3085 qualitative responses from students so a percentage of 34% for our construct of personal agency means that 34% of students mention something about personal agency in their qualitative responses. In most answers students mentioned more than one indicator, hence it was possible for a person's response to occur or be counted in more than one category. Percentages in the indicators and descriptors column refer to the number of students who mentioned that concept and therefore do not add up to 100%. The column labelled "general code" indicates the codes that comprised each indicator.

17% more males in the high socio-economic group rate themselves as excellent than do males in the low socio-economic group.

A review of the literature in order to compare our findings with others yields a striking consensus on this issue. Our findings add to the unanimous findings that in both schools and universities, even in developed countries, males consistently report a higher level of expertise, knowledge and skills than women do.[5] For example McCoy et al. observe in US colleges that when the technological environment is institutionally equalised for male and female students, many traditional findings of gender differences are not evident but that male students are more likely to rate themselves as highly skilled at

Figure 4.33: Comparison of aptitude of students from different socio-economic groups

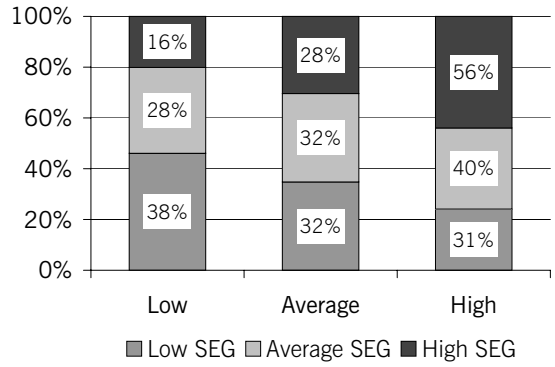


Figure 4.34: Comparison of male/female interest in technology

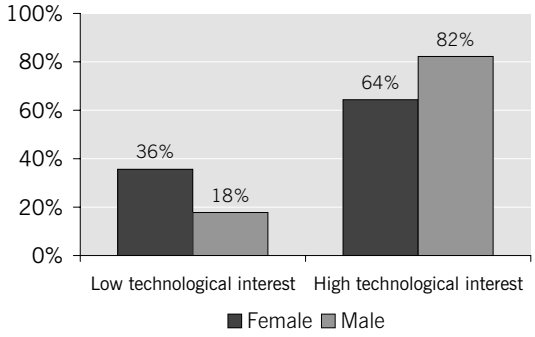


Figure 4.35: Comparison of gender self-efficacy in terms of using computers

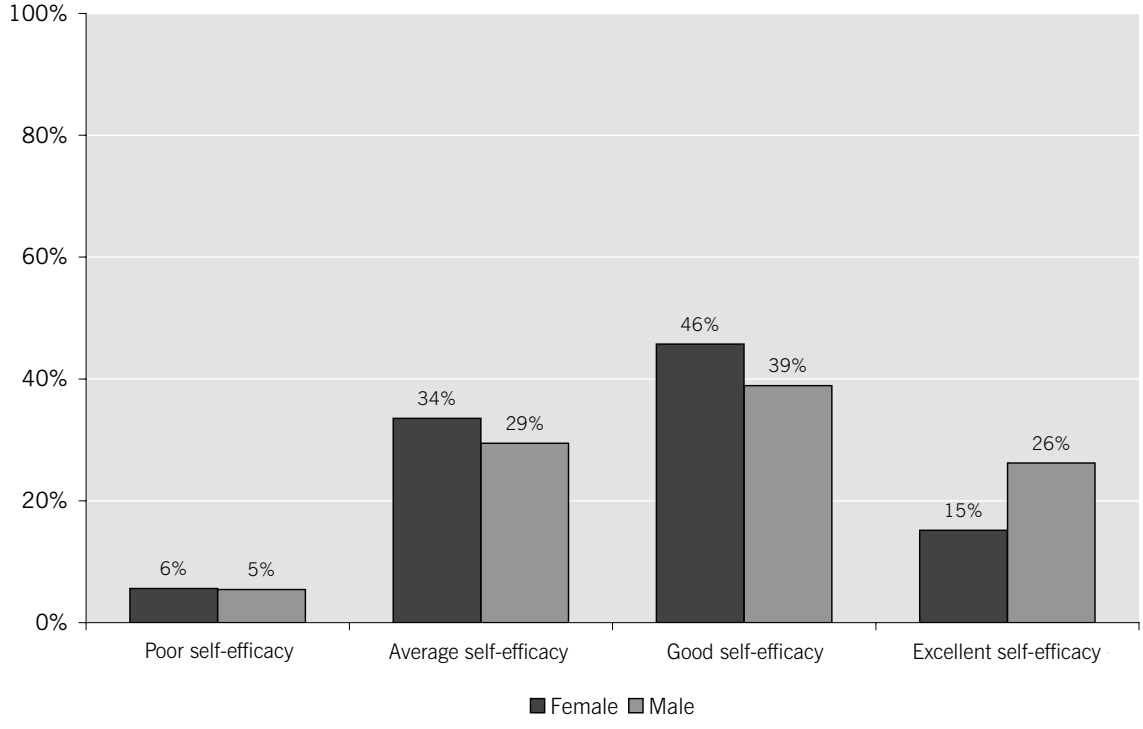


Figure 4.36: Comparison of gender experience using computers

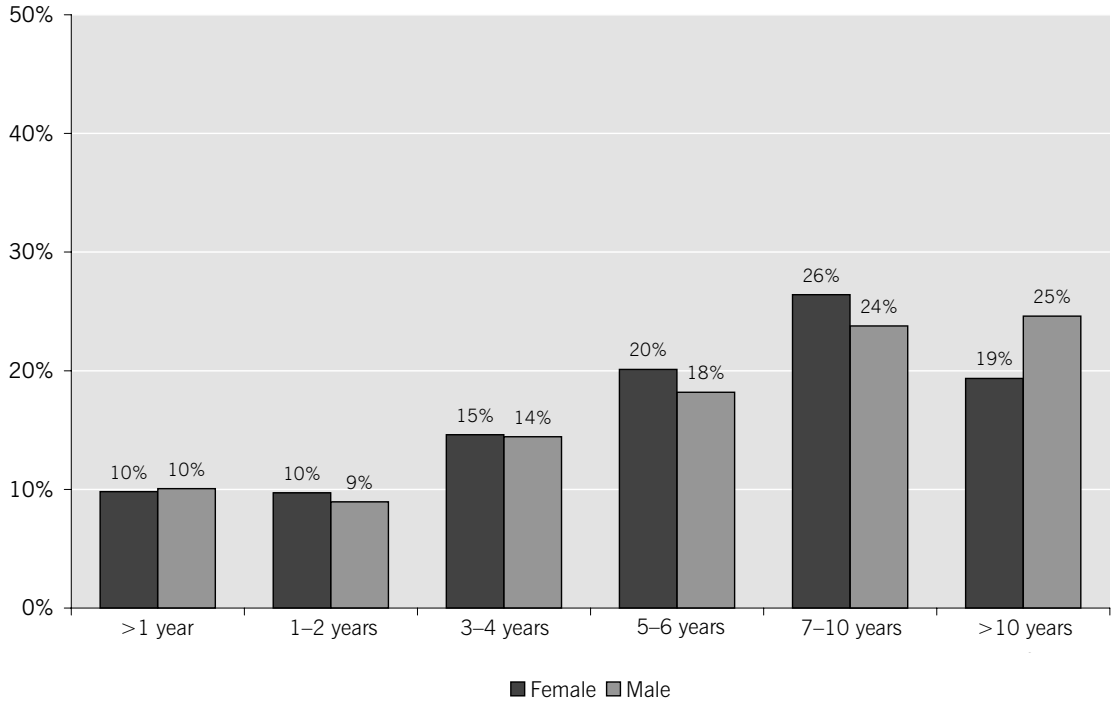


Figure 4.37: Comparison of disposition amongst students from different age groups

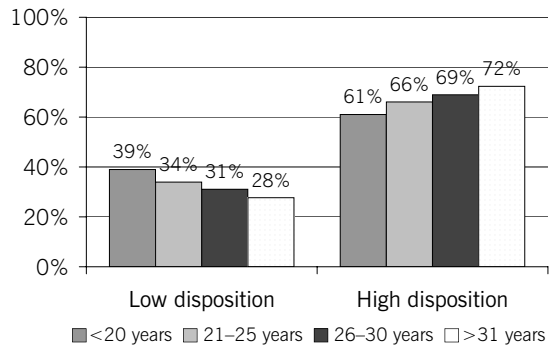
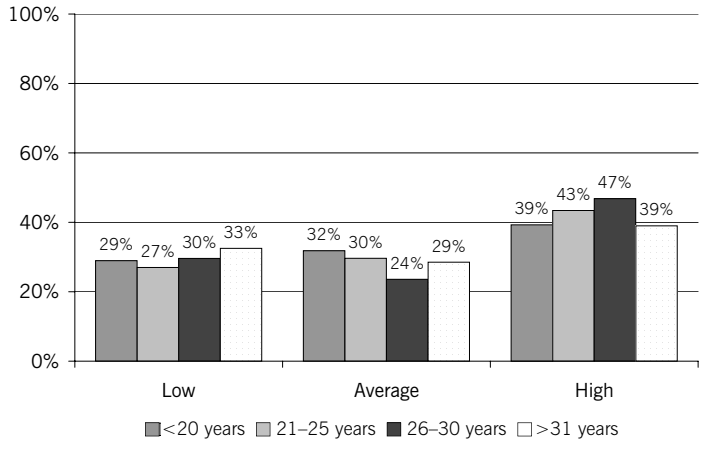


Figure 4.38: Comparison of aptitude amongst students from different age groups



computers than females (McCoy 2004, p.253). Elsewhere in the world, in Scotland and Romania males have higher self-efficacy ratings for their computer skills (Durndell, Haag and Laithwaite 2000).

In addition, as has been observed amongst university students in the UK (Stephens and Creaser 2002), more male students have greater than ten years' experience using a computer (25% compared to 19% of female students).

Age

With regard to age, there is no noticeable difference in either disposition or aptitude (Figure 4.37 and 4.38).

Figure 4.39: Comparison of aptitude amongst students of different nationalities

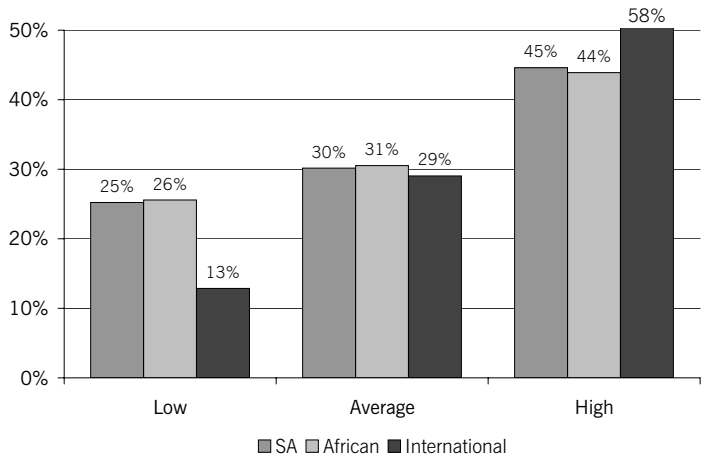


Figure 4.40: Comparison of aptitude of students who speak English as a first and second language

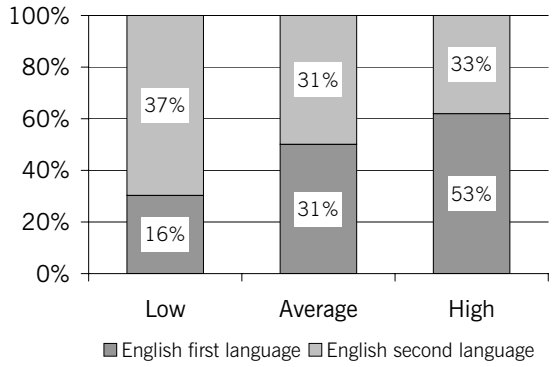
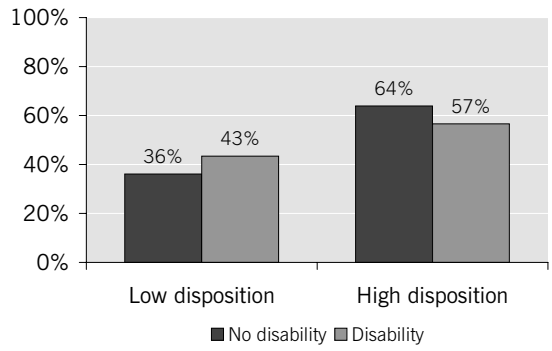


Figure 4.41: Comparison of disposition amongst students with and without a disability



Nationality

In terms of nationality, more international students (58%) rate themselves as having high aptitude than South African (45%) and African students (44%) do (Figure 4.39).

In addition, we see a higher aptitude reported by international students. We wonder whether this is because international students generally have to be well resourced in order to attend university away from their homes and are therefore at an advantage. It would be useful to analyse whether differences exist depending on where such students are from.

Language

As for language, there is no difference in disposition. However, there is a difference in aptitude for students who speak English as a first or second language. Of English first language speakers, 53% are in the high aptitude category compared to only 33% of those who do not speak English as a home language (Figure 4.40).

Students who speak English as a second language rate their aptitude lower than their counterparts who speak English as a first language. They also have less access to supportive social resources and a slightly lower perception of the adequacy of online content. Issues of language, access and use warrant further attention. Differences in the adoption of ICTs amongst different language groups are not unique to South Africa and have been studied elsewhere (Lizie, Stewart and Avila 2004) although in our context some researchers assert that there are correlations between language and class (Wasserman 2002). Whatever the cause, we believe this issue warrants further exploration, given the language divides we observe in terms of access to a variety of resources.

Disability

Figure 4.41 shows that students with a disability have a higher percentage of below mean disposition (43%) than students without a disability (36%).

Figure 4.42 demonstrates that very few students with disabilities report a high aptitude (14%); indeed most students in this group report a low aptitude (55%).

Whilst the group of students who report having a disability or illness that impacts on their use of ICTs is small, they are particularly disadvantaged in terms of off-campus access and aptitude. This is not surprising given their different infrastructural requirements, which require additional investment both personally and institutionally (Brewer

Figure 4.42: Comparison of aptitude amongst students who do and do not have a disability

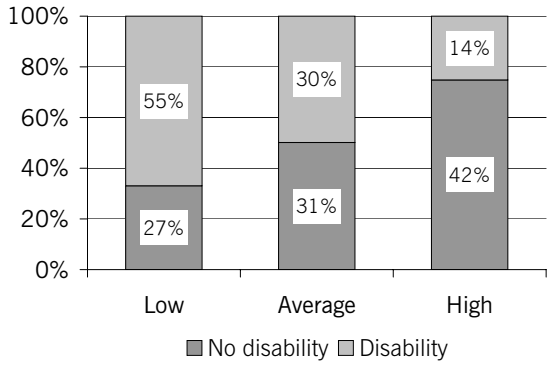
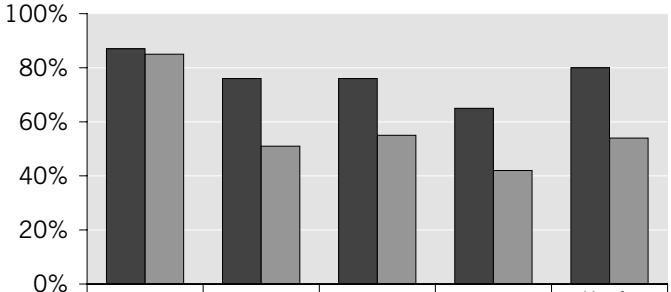


Figure 4.43: Interest and support from student social networks



	Important for education	Competent users	Use in daily lives	Use for recreation	Use for communicating
Friends	87%	76%	76%	65%	80%
Family	85%	51%	55%	42%	54%

2002). This social grouping is often noted as being marginalised in terms of ICT access, perhaps more so than others because they are a minority in society (Department of Communication 2005).

In conclusion, most students in the region have access to resources of personal agency – they are overwhelmingly positive about the role of computers in learning and have a high opinion of their own self-efficacy. While their skills would need to be tested by other research methods, our findings do suggest that students are entering higher education interested in and confident about using ICTs. However, there is diversity in terms of aptitude with some students with very little experience in using a computer and poor confidence who have not attended any training at their institution, whilst others have in excess of ten years' experience and are highly confident about using computers. This diversity in aptitude is a challenge that educators face in educational technology interventions.

4.3.4 Contextual resources students have access to

For students we focus on social resources as the main contextual factor. We define these resources as interest and support received from a community social network. Whilst the integration of technology into the institution is also an important contextual resource, our pilot study indicated that most students were unaware of the existence and implications of broader policy and intentions at an institutional level. However, we did incorporate questions about the adequacy of institutional computer support under technological resources.

4.3.4.1 Students' access to supportive networks

Our findings indicate that close family and friends of students are, overall, very positive about technology. It seems that technology is becoming a normal part of the broader life of student communities. Although our question about supportive networks did require students to generalise, their answers do capture the sense that technology is receiving interest and support from their social networks (Figure 4.43).

It is of note that students' peers and families place almost equal value on the use of computers for educational purposes. This kind of pervasively positive attitude is likely to encourage use. However, students report that their peers

Figure 4.44: Student social networks – friends: comparison of different socio-economic groups

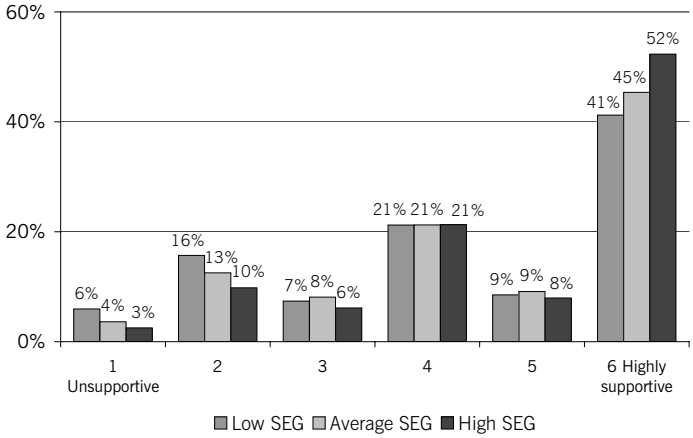


Figure 4.45: Student social networks – family: comparison of different socio-economic groups

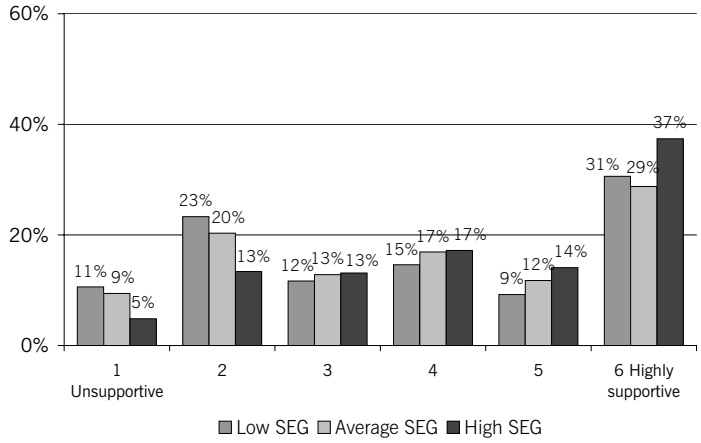


Figure 4.46: Gender differences in problem-solving strategies

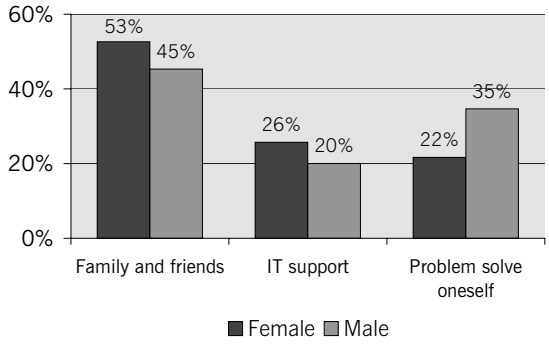
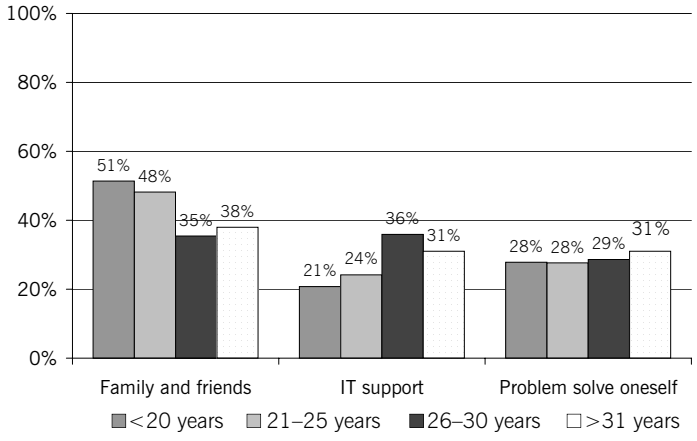


Figure 4.47: Age differences in problem-solving strategies



are more likely to actually be using computers themselves than their families are. This suggests that peers rather than families are more likely to be of assistance.

4.3.4.2 How differences in access to supportive networks affect various social groups of students differently

With regard socio-economic background, it can be seen in Figure 4.44 and Figure 4.45 that students from high socio-economic groups seem to have access to more supportive student community (52%) and family networks (37%) than students from low socio-economic groups (38% and 28% respectively).

It can also be seen, in Figure 4.45, that students from low and average socio-economic groups report lower access to supportive family networks.

With regard to gender, we find that both males and females have equal access to social networks but that these are accessed differently. More females (53%) solve computer-related problems by asking their families than do male students (45%), and more males (35%) than females (22%) report that they solve problems themselves (Figure 4.46).

We are intrigued by the findings regarding gender and problem solving, and have been unable to find similar findings in the literature. The only similar result is amongst UK youth, where it was found that girls were more likely to ask for help than boys (Livingstone, Bober and Helsper 2005). These findings may well be related to the differences in confidence with regard to ICTs expressed by men and women, as the "more confident" males may be more likely

Figure 4.48: Comparison of contextual support amongst students from different age groups

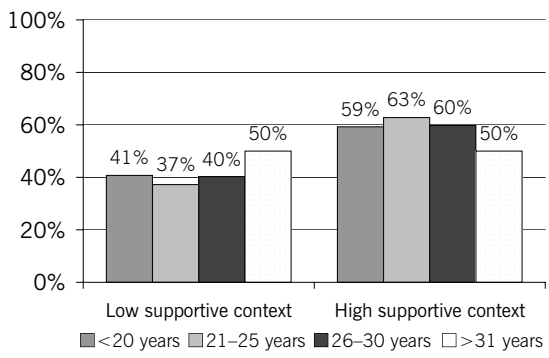
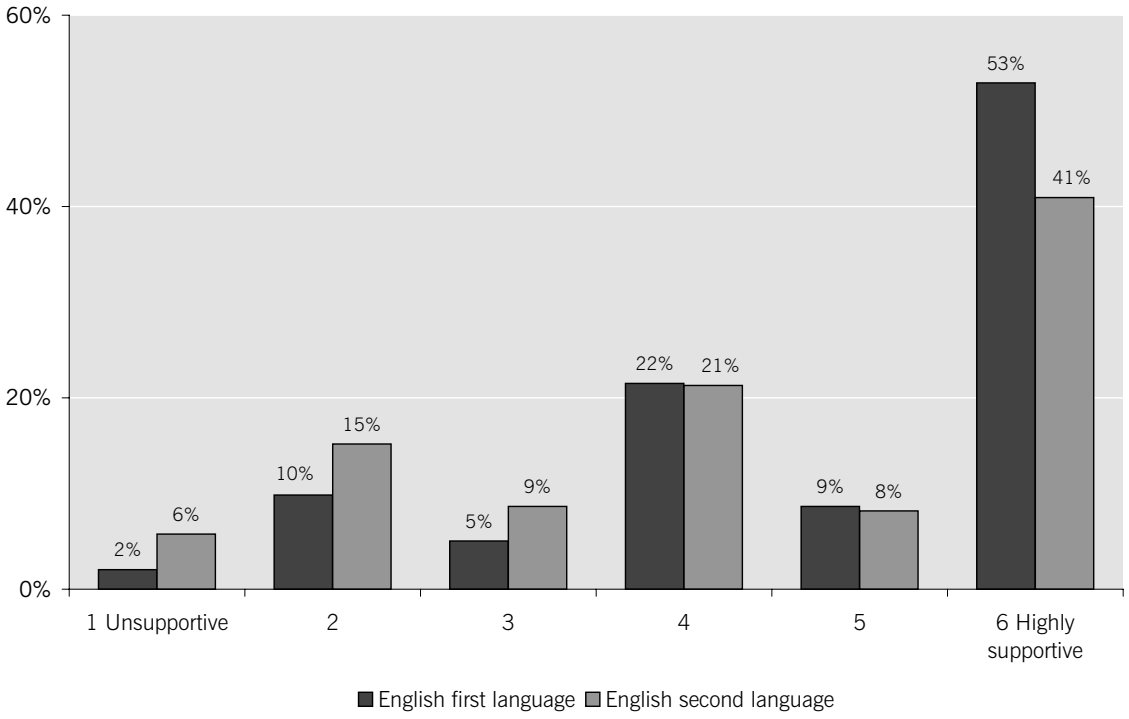


Figure 4.49: Student social networks – friends: comparison of students who speak English as a first and second language



or able to rely on their own problem-solving skills and less on institutional support.

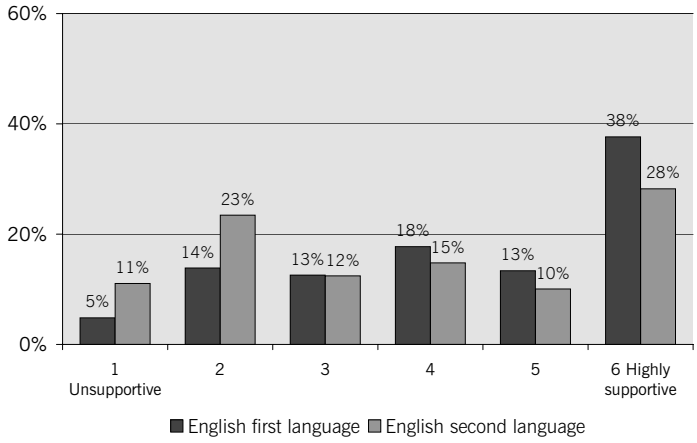
As for age, a comparison of different age groups shows that students older than 25 years ask friends and family for support less often than younger students and use IT support as their main problem solving strategy (Figure 4.47).

When examining the index for contextual resources and comparing those responses that are below the mean to those above the mean, more older students (in the age group above 31 years) have below mean support from their friends and family (50%) (Figure 4.48).

Language also shows some differences. Students who speak English as a first language seem to have a more highly supportive student community (53%) and family networks (38%) than students who speak English as a second language (41% and 28% respectively) (Figure 4.49 and 4.50).

Figure 4.50 also demonstrates that students who speak English as a second language have a higher percentage of unsupportive family networks. Of English second language

Figure 4.50: Student social networks – family: comparison of students who speak English as a first and second language



speakers, 46% fall within the low part of the scale (i.e. <3) compared to 32% of English speakers. So we can conclude that, like low socio-economic groups, English second language students have less access to contextual resources

Figure 4.51: Student social networks – friends: comparison of students of different nationalities

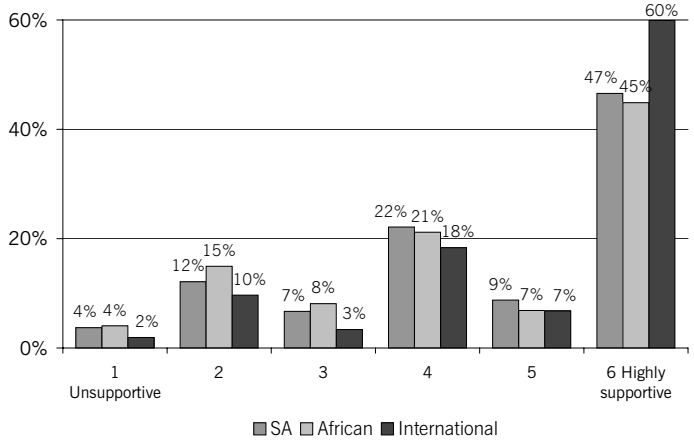


Figure 4.52: Student social networks – family: comparison of students of different nationalities

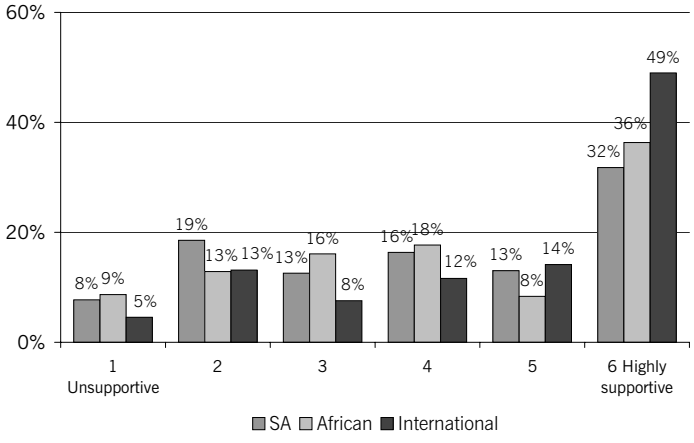
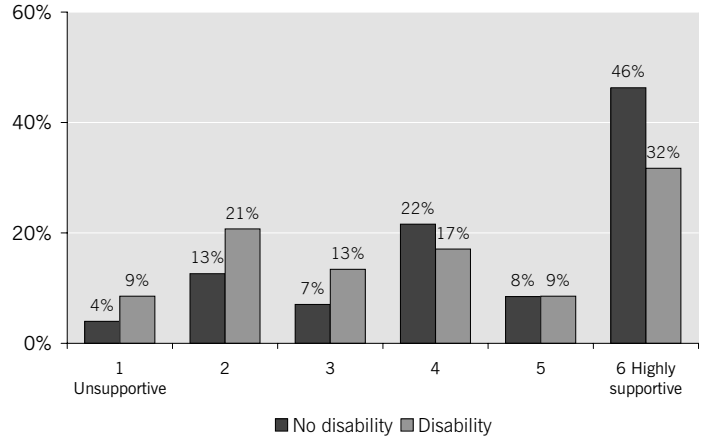


Figure 4.53: Student social networks – friends: comparison of students with and without a disability



than do English first language students (Figure 4.49 and Figure 4.50).

International students have more supportive social networks in terms of friends and family compared to African and South African students. Figure 4.51 and Figure 4.52 show that international students have access to more highly supportive student communities (60%) and family networks (49%) than students from Africa and South Africa.

Students with a disability have less supportive social networks in terms of friends compared to students without a disability. Figure 4.53 and Figure 4.54 show that students with a disability have access to a less supportive student community (45%) compared with students without a disability (32%). However, this difference is less marked for the families of students with a disability.

This is not surprising given their different infrastructural requirements which involve additional investment both personally and institutionally (Brewer 2002). It raises questions about the nature of support for students with different disabilities and the extent to which higher education recognises this in terms of general and technical support.

4.3.4.3 Qualitative responses about contextual resources

The main indicator of contextual resources mentioned in the open-ended questions was that of support, with 29% of the total qualitative responses referring to such issues. It is of interest that students consider a wide range of people to be part of their support networks. While the quantitative data collected information only on friends and family, the open-ended responses reveal that this group extends to administrative staff, tutors and lecturers, as well as other students.

Adequate support is something that was more frequently mentioned than inadequate support, suggesting how enabling this is for students.

Table 4.26 provides an overview of the qualitative responses grouped according to our constructs and indicators.

The comments themselves highlight how enterprising students are, finding multiple resources on which to draw when needed. The role of peer support is emphasised:

It helps working in groups so that everyone helps each other (SU, Health Science, 4th year undergrad., female, 21–25, Afrikaans)

In addition, the value of lab administrators who can assist students is made explicit:

Table 4.26: Overview of qualitative responses about context

Construct	Indicator (% freq. of total comments)	Descriptor (% freq. within category)	General code
contextual resources	support (29%)	people (19%)	people, colleagues, personnel, staff, management, admin, tutor, monitor, lecturer, friends, student, family
		positive (11%)	help, support, assist, problem, service, friendly
		negative (5%)	unfriendly, unhelpful

The frequency of codes was calculated in relation to the total number of responses. There were 3085 qualitative responses from students so a percentage of 29 % for our indicator of support means that 29% of students mention something about support in their qualitative responses. In most answers students mentioned more than one indicator, hence it was possible for a person's response to occur or be counted in more than one category. Percentages in the indicators and descriptors column refer to the number of students who mentioned that concept and therefore do not add up to 100%. The column labelled "general code" indicates the codes that comprised each indicator.

XX Lab is wonderful – don't know what i would've done had i had to stay in YY lab where the queues are impossible and access there is slow. The admin guy [at XX lab] is very helpful.
(UCT, Humanities, 3rd year undergrad., female, 21–25, English)

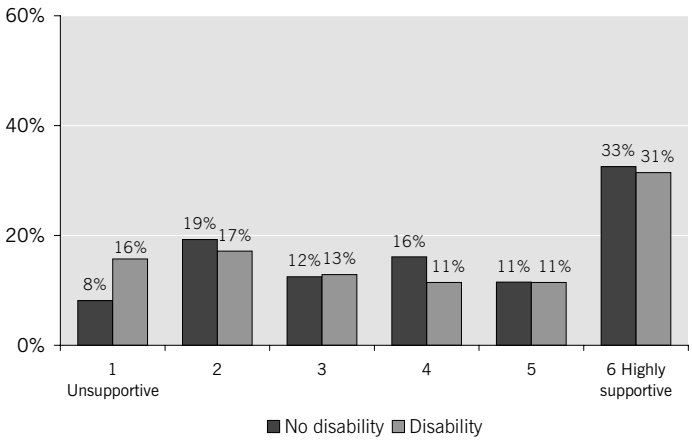
4.3.4.4 Conclusion to contextual resources

Overall, students have good access to supportive contextual resources. As one might expect, friends are more supportive in terms of interest and actual use than families are. Whilst we realise that these questions asked students to generalise about a group of people, we feel that it is useful to have a general idea of how supportive student networks are. Although overall the data suggests that all students have good access to supportive contextual resources, we note some strong differences in terms of social demographics. There is less support reported by students from lower socio-economic backgrounds, students who speak English as a second language and students with disabilities. International students report more support than do South African and students from other African countries.

4.3.5 Digital content students have access to

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 have defined this as the availability of suitable digital material online. Our research indicators focus on relevance, local production and language. We explore whether students believe they have access to content that is relevant, locally produced and in the required language.

Figure 4.54: Student social networks – family: comparison of students with and without a disability



We were particularly interested to know whether the lack of appropriate content would be a constraining factor for learning. Yet despite our presumptions that lack of local content (particular with regard to language) would be an issue, most students feel that online content is relevant to their courses and to South Africa (91% and 83% respectively). Fewer students (70%) agree that they could find locally produced online content. It is interesting that the more specific the questions (i.e. content relevant to South Africa and produced locally) the more students responded that they "didn't know" in the answers (an increase from 5% to 17%) (Figure 4.55).

Figure 4.55: Availability of digital content

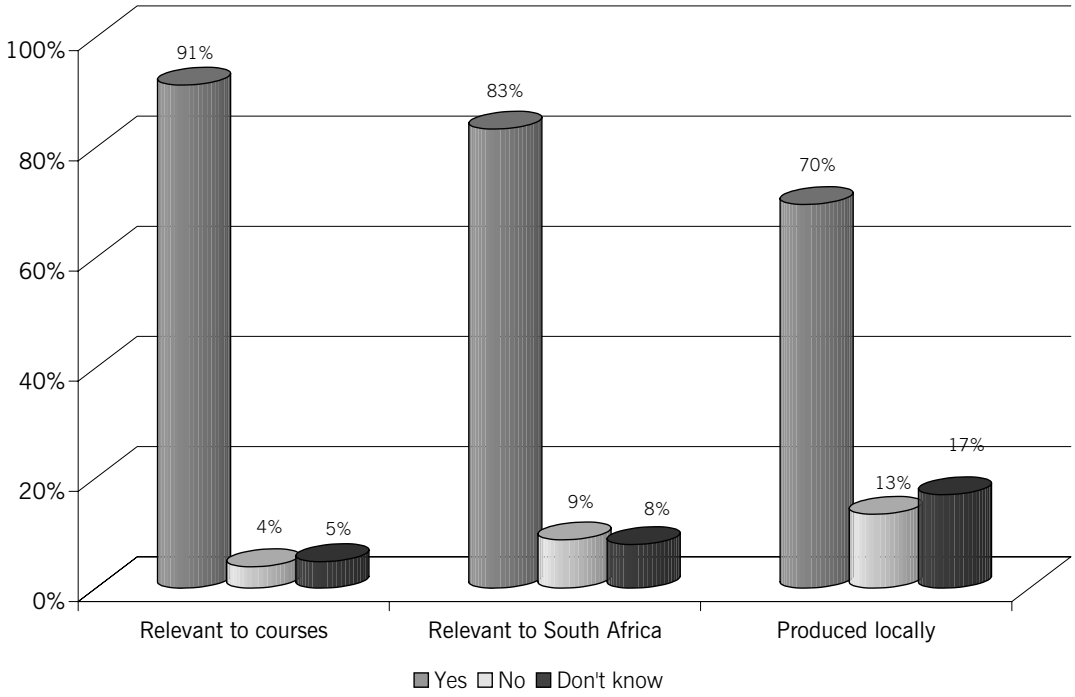
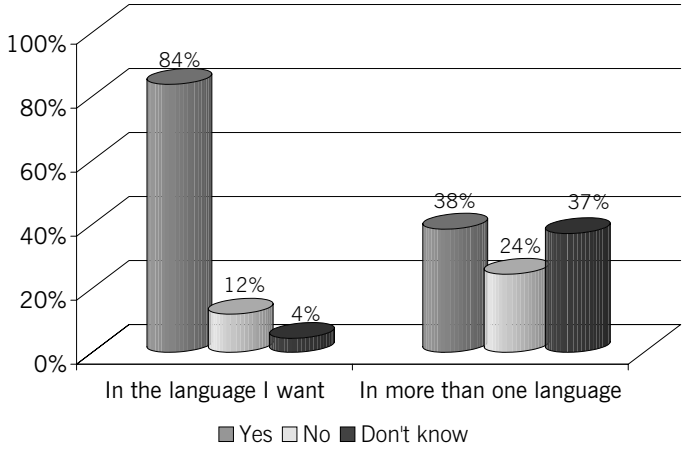


Figure 4.56: Availability of digital content with regard to language



Students also feel that online content is in the language they want (84%). The indication by 37% of students that they "didn't know" if online content was available in other languages suggests that they have not sought out multilingual content. This issue of language is one that warrants further exploration, given that fewer than half the students surveyed speak English as a home language (Figure 4.56).

We are mindful that our findings may have less to do with students' perception of the amount of and adequacy of online content available in local languages, and may be more likely to be about the fact that they regard English as the *lingua franca* of academia (Wasserman 2002) with indigenous languages regarded as having a lesser status (Osborn 2004). In addition, the divides that we see in terms of access to resources other than digital content and between people who speak English as a home language and those who do not suggests that language is indeed an issue for students. This issue warrants further exploration.

4.3.5.1 How differences in access to digital content affect various social groups of students differently

There are no differences in terms of students' perceptions of the adequacy of online content across different socio-economic, gender, age, nationality and disability groups.

However, students who speak English as a first language have a higher perception of adequacy regarding online content. This difference is not large – indeed only a few percent.

When examining this closer, far fewer students who speak English as a second language (70%) indicate that digital content is in the language they want compared to 92% of English home language speakers (Figure 5.57).

Fewer English second language speakers answer that they do not know whether there is content available in multiple languages compared to English home language speakers (44%). More English second language speakers (32%) indicate that online content is not available in multiple languages compared to English first home language speakers (22%) (Figure 4.58).

Content barely features in the qualitative responses; it is only referred to in 5% of the responses. There was some intimation that certain aspects were an issue for students.

Some students mentioned the limitations with regard to language:

Most news and information in the campus are limited to Afrikaans speaking students, but affects every one in the campus
(SU, Agriculture & Forestry Sciences, postgrad., male, 26–30, Xitsonga)

a problem is strange keyboard settings that don't allow languages like Afrikaans without alt+ codes
(SU, Humanities, 1st year undergrad., male, <20, Afrikaans)

We did not ask questions about information literacy as we expected positive self-reporting. It is therefore of note that some students mentioned the problems of critical literacy when it came to web searching:

I find that know how to manipulate internet search engines to get the hits I need and get access to vast amounts of info across searches … it's a problem when 90% of that info turns out to be useless garbage
(SU Science, 1st year undergrad., male, <20, Afrikaans)

A frustration is not finding what I want, or getting too much information or when the content is not available on time
(SU, Economics & Management Sciences, 1st year undergrad., male, <20, Afrikaans)

Some students consider problems with online content to be a result of their own lack of skills or competency in terms of internet searching:

I get frustrated easily when searching the net for internet information sometimes this makes me give up!
(UCT, Health Sciences, 2nd year undergrad., male, <20, English)

Figure 4.57: Digital content in the language I want: comparison of English first and second language speakers

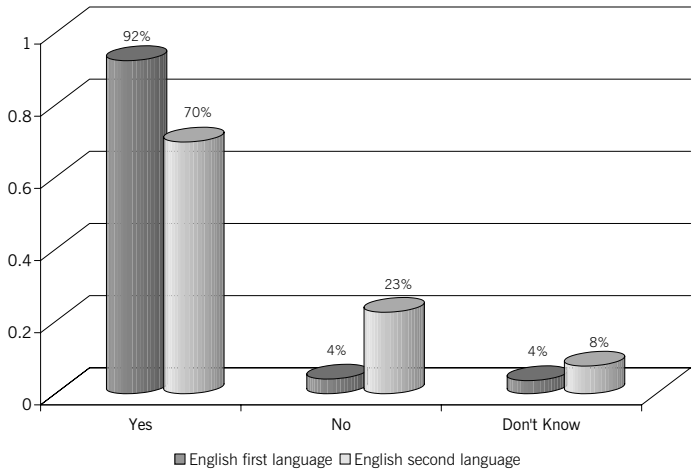
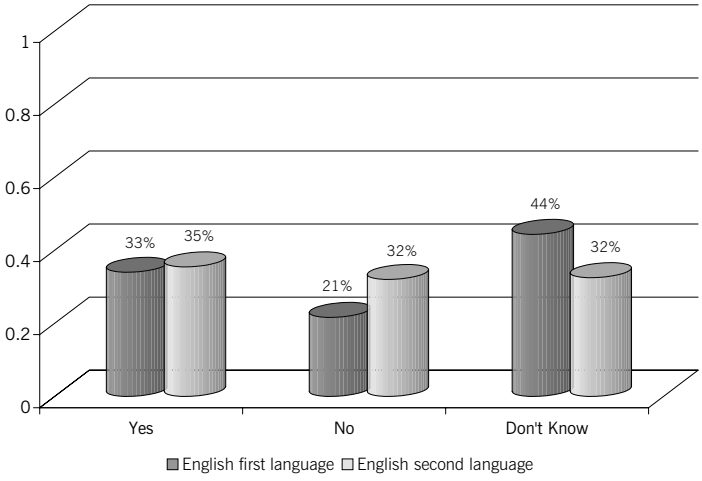


Figure 4.58: Digital content in multiple languages: comparison of English first and second language speakers



It is hard to research if you do not have the exact key word perhaps ask lecturers to provide them
(CTech, Education, preliminary, 1st year, female, <20, English)

4.3.5.2 Concluding comments

Even though students will be amongst the tiny elite in Africa speaking English, (Boldi, Codenotti et al. 2002 suggest that this is only 0.007% of the whole African population), we are surprised that they so unanimously express satisfaction with online content.[6] Overall, students are satisfied with

the adequacy of online content irrespective of age, socio-economic group and language. This perception of adequacy certainly warrants further investigation.

4.4 Access: staff

4.4.1 Staff access to technological resources

4.4.1.1 Physical access

As was explained in Chapter 2, the use of personal computers amongst staff in the region began in the late 1980s. In our pilot survey of staff we asked staff whether or not they had a computer on their desk. Feedback indicated this was a superfluous question as presence of computers at work was now a given. Therefore, instead of exploring location of work access for staff we focused on the adequacy of the computer for the teaching requirements of staff. It seemed that the hardware and software appeared to be more of an issue for staff than the presence or absence of a computer.

As with students, we were interested in the frequency of staff use on campus as this gives us some idea about how embedded the computer is in the daily work lives of staff. Table 4.27 shows that 91% of staff use a computer daily and 77% use the Internet daily.

Given the institutional differences (outlined in Chapter 2), one needs to consider staff access in individual institutions. The figures in bold show the lowest daily uses of a computer. Staff at UWC and Stellenbosch University are the least-frequent daily users of a computer (85% and 84% respectively), whilst staff at CTech and PenTech are the least frequent daily users of the Internet (57% and 61% respectively) (Table 4.28). A possible explanation is that use of the Internet is associated with research-related activities which are less dominant at technikons (Centre for Interdisciplinary Studies 1997)[7].

Table 4.27: Frequency of on campus use of computers and the Internet

	Use of a computer on campus		Use of the Internet on campus	
	Count	Percentage of total	Count	Percentage of total
Never or monthly	7	1%	31	6%
Weekly	41	8%	81	16%
Daily	463	91%	384	77%
(n)	**511**		**496**	

Of staff in the region, 94% have a computer at home. This varies slightly across institutions, where 100% of staff at Stellenbosch University indicate they have a computer at home compared to 83% at CTech (Table 4.29). Despite this range, this does mean that the vast majority of academic staff in the Western Cape have access to computers both at work and at home.

Overall, 83% of staff with computers at home also have access to the Internet from home. The variation of Internet access between staff from different institutions is quite marked. Again 100% of staff from Stellenbosch University have Internet access but this is in contrast to staff from the technikons, where as few as 51% from one of them report having Internet access at home.

The almost complete access to computers for all staff respondents across the region is particularly apparent in the visual representation (Figure 4.59). The asymmetrical image for Internet access shows that staff at three of the institutions have lesser access, these three being the two technikons and UCT.

Although we did not ask about on/off campus integration in the quantitative investigation, the open-ended questions reveal this to be a relevant consideration.

Thus staff need for seamless portability was mentioned as a concern:

Too many firewalls, limitations at all points ESPECIALLY for access to email off campus and out of campus
(CTech, Business Informatics, professor, >5 years, male, >50 English, British)

Staff mention the strategies they have developed to enable them to move smoothly between work and home:

The fact that I have bought a laptop makes taking work home more practical (putting large files onto disks is time consuming and unreliable).
(UCT, Centre for Higher Education Development, lecturer, >5 years, female,41–50, English,)

I am using my laptop after hours and jet flash to transfer data between office and home.
(UCT, Health Science, ass. professor, >5 years, male, English, 41–50,)

Table 4.28: Frequency of on campus use of computers and the Internet by institution

Institution	Use of a computer on campus			Use of the Internet on campus		
	Never or monthly	Weekly	Daily	Never or monthly	Weekly	Daily
CTech	0%	4%	96%	20%	23%	**57%**
PenTech	0%	2%	98%	7%	32%	**61%**
UCT	2%	5%	93%	3%	11%	85%
UWC	4%	12%	**85%**	4%	12%	84%
SU	0%	16%	**84%**	0%	16%	84%
Total	**1%**	**8%**	**91%**	**6%**	**16%**	**77%**

Table 4.29: Off-campus access to computers and the Internet at home

Institution	Computer at home			Internet at home		
	No	Yes	(n)	No	Yes	(n)
CTech	17%	83%	95	33%	66%	84
PenTech	6%	94%	49	49%	51%	45
UCT	2%	98%	161	17%	83%	159
UWC	4%	96%	113	4%	96%	113
SU	0%	100%	92	0%	100%	92
(n)	**27**	**483**		**81**	**412**	

The fact that I could afford a computer myself – otherwise I would have been stuck because of work load I have to work 15/16 hours a day.
(SU, no details)

not synchronised with the PC at work; modem is way way way too slow; can't access hard drive of my PC at work; carrying stuff back and forth
(SU, no details)

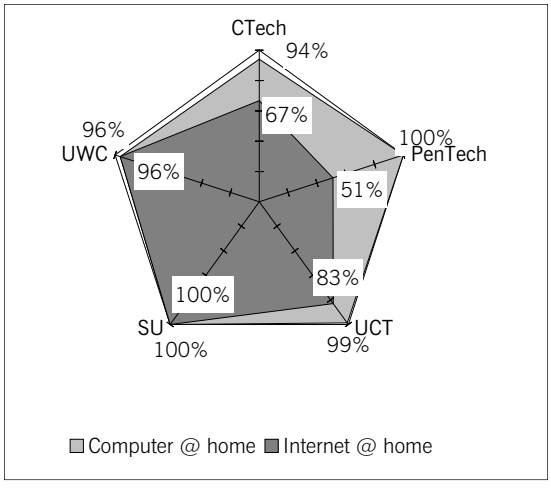
ISDN bandwidth at own cost, good hardware and software at home
(SU, Economic & Management Sciences, professor, >5 years, male, >50, Afrikaans)

The qualitative responses also show how important issues like technological resources are for staff, as 61% of the total open-ended responses refer to issues relating to physical and infrastructural matters.

Table 4.30 provides an overview of the qualitative responses in relation to technological resources.

The frequency of references to technological resources is a stark reminder that having the basics in place is not yet taken for granted in the local context.

Figure 4.59: Staff home access to computers



4.4.1.2 Practical access

In terms of practical access to the home computer, 60% of staff in the region are the primary users of their computers, 20% share the computer equally, and 20% are not primary

The frequency of codes was calculated in relation to the total number of responses. There were 412 responses from staff so a percentage of 61% for our construct of physical access means that 251 staff mentioned something about physical access in their qualitative responses. This is then examined to see what indicators these related to. In most answers staff mentioned more than one indicator, hence it was possible for a person's response to occur or be counted in more than one category. Percentages in the indicators and descriptors column refer to the number of staff who mentioned that concept and therefore do not add up to 100%. The column labelled "general code" indicates the codes that comprised each indicator.

Table 4.30: Overview of staff qualitative responses about technological access

Resource (% freq. of total comments)	**Category** (% freq. of total comments)	**Code descriptor** (% freq. within category)	**General code** (% freq. within category:
access	access (23%)		
physical: computers & infrastructure (61%)	computers (43%)	hardware general (49%)	hardware, peripheral
		computer (36%)	computer, PC, Mac
		additional (7%)	printer, CD, scanner
		laptop (5%)	
		software general (20%)	software, programs, packages
		learning management system(5%)	Blackboard, KEWL, WebCT
		Powerpoint (5%)	*PowerPoint*
	infrastructure (27%)	internet (53%)	Internet, online
		network (41%)	connection, infrastructure, intranet, network, server, system
		mail (10%)	
		connection type (10%)	24/7, after hours, ADSL, ISDN, wireless, broadband, instant, modem, dial-up

users. This suggests that the picture is not quite as rosy as suggested in Figure 4.60 as access at home does not mean sole access.

Academics' concerns are borne out in the open-ended responses, where 14% make reference to issues of time at home both positively and negatively.

time without interruption, faster line than at work for download
(PT, Health Sciences, senior lecturer, >5 years, female, 41–50 years, English)

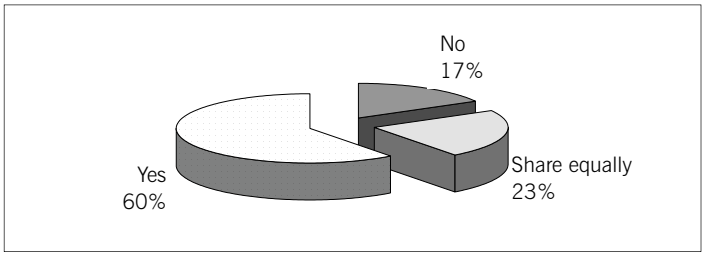
No time to develop teaching material after hours at home
(UWC, Education, professor, >5 years, female, >50 years, English)

I choose to not be connected at home (i do need some downtime or offline time and this is how i manage technology)
(SU, Information Science, lecturer, 3 -4 years, female, 26–30 years, Afrikaans and English)

In conclusion, unlike some professionals, academic staff do not work only in the office. Their commitments require flexibility in working schedules and their days are not structured around the traditional 9am – 5pm. Their workplace is increasingly virtual and their commitment to being able to work off campus is manifest in the extent to which they have invested in computers, inevitably at their own expense. This is true despite the resource intensiveness or historical wealth of the institutions in which they work.

An implication of the increasing virtuality of academics' work is that integration between on-campus and off-campus systems, and ease of data movement become critical considerations for the smooth functioning of their working lives. This kind of integration is constrained by cost, as academics have to shoulder home-based work costs themselves. Related to this is the challenge of limited

Figure 4.60: Staff sharing of computers at home



institutional bandwidth, which some academics solve by privately purchasing broadband lines, also at their own cost. Clearly, institutions will need to be more cognisant of the need for home/office portability in future.

4.4.1.3 Adequacy of access for staff teaching needs

Over two-thirds of staff in the region think that their on-campus access is adequate for their teaching needs, as shown in Figure 4.61.

Inevitably there is variance across the institutions, as is clear in Table 4.31. The bold highlights the highest percentages.

There is great variety in reporting regarding adequacy for teaching requirements. One institution in particular – UWC – reports greater inadequacies in terms of computers, infrastructure and support than the other institutions do. At another institution – UCT – a third of staff report inadequacy of hardware and software for their teaching requirements. On the other hand, a large percentage (90%) of staff at Stellenbosch University report that campus technology is adequate for their teaching needs.

In terms of adequacy of access off campus, staff are divided about whether Internet access at home is adequate for their teaching requirements (58% disagreeing). This disagreement is evenly distributed across all institutions. Staff are also divided about whether the hardware and software composition of their computers at home is adequate for their teaching requirements (with 49% disagreeing).

Staff concerns about availability and adequacy in general are significant in the open-ended responses, where 63% of the responses are on this issue.

Figure 4.61: Staff overall adequacy of on-campus hardware and software, Internet access and support

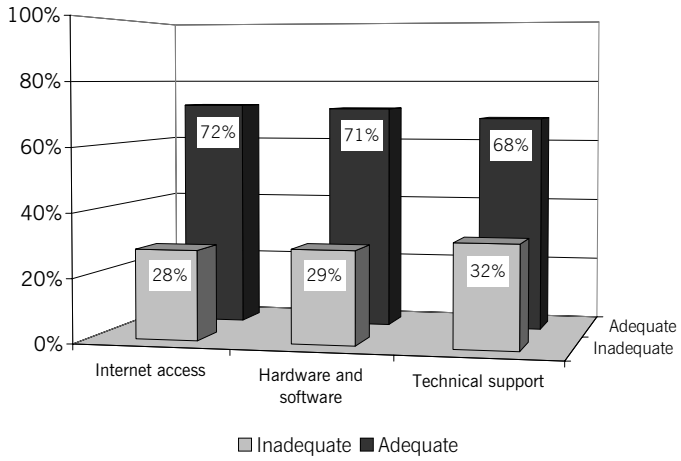


Figure 4.62: Overall adequacy of off-campus hardware and software, Internet access and support

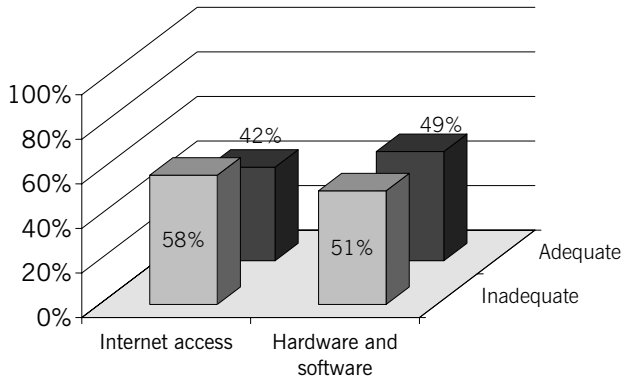


Table 4.31: Staff rating of institutional adequacy of on-campus hardware and software, Internet access and support

	CTech	PenTech	UCT	UWC	SU	Total	(n)
Hardware & software							489
Inadequate	20%	25%	35%	**50%**	8%	30%	
Adequate	80%	75%	64%	49%	**91%**	70%	
Internet access							486
Inadequate	18%	19%	36%	**47%**	8%	29%	
Adequate	82%	80%	63%	52%	**91%**	70%	
Support							481
Inadequate	31%	24%	38%	**39%**	17%	32%	
Adequate	68%	75%	61%	60%	**82%**	67%	
(n)	86	46	155	108	91		

The frequency of codes was calculated in relation to the total number of responses. There were 412 responses from staff so a percentage of 63% for our construct of availability and adequacy means that 259 staff mention something about availability and adequacy in their qualitative responses. This is then examined to see what indicators these related to. In most answers staff mentioned more than one indicator, hence it was possible for a person's response to occur or be counted in more than one category. Percentages in the indicators and descriptors column refer to the number of staff who mentioned that concept and therefore do not add up to 100%. The column labelled "general code" indicates the codes that comprised each indicator.

Table 4.32: Overview of qualitative responses regarding availability and adequacy

Resource (% freq. of total comments)	**Category** (% freq. of total comments)	**Code descriptor** (% freq. within category)	**General code** (% freq. within category + = positive and – = negative)
availability & adequacy (63%)	availability (39%)	available (9%)	avail+, accessible+, reliable+, stable+, predictable+, continuous+,
		unavailable (83%)	don't–, no–, unreliable–, failure–, lack–, unstable–, unpredictable–, waiting–, interrupt–, downtime–, erratic–
	adequacy (17%)	adequate (36%)	convenient+, new+, excellent+, adequate+, good+, reasonable+, consistent+, sufficient+, better+, better+, high, having, efficient, friendly
		inadequate (63%)	old–, inadequate–, poor–, unreasonable–, inconsistent–, limit, worse–
	cost (7%)		free (1%), bill, cost, expense, finance, funding, money, pay, purchase (99%)
	speed (20%)		speed unspecified (24%), fast+, quick (11%), slow–, delay (64%)

Table 4.32 provides an overview of the qualitative responses grouped according to our constructs and indicators.

Inadequate facilities are a big concern for academics, as exemplified in these typical comments:

No laptops available for powerpoint data projection limited & time -consuming to set up lack of adequate facilities for the use of powerpoint presentations in all venues
(CTech, Business Informatics, lecturer, <1 year, male, 26–30, English)

Limited venues where one can have computer screens projected without lots of set up, and very few where students cLab booking system lacks flexibility
(UCT, Engineering & Built Environment, professor, >5 years, female, 41–50, English)

The shortage of electronic classrooms and also computers and network points in lecture halls make it difficult to use computers to the extent it can be used for lecturing and teaching. Access to computers (and printing facilities) on campus (for students) make it very difficult to expect students to do work online or have most teaching materials online (for students to print if they so wish).
(UWC, Natural Sciences, >5 years, female, Afrikaans)

These comments go beyond computer hardware and software and connectivity as highlighted in the survey questions, highlighting the lack of infrastructure and support in teaching venues as well as emphasising inadequate facilities for students.

4.4.1.4 Access for specific groups of staff

We had hoped to examine demographic differences for staff across socio-economic, nationality, language and disability groups as we did for students; this was not possible due to sample sizes. Of the staff who responded to the demographic information only 40 indicated a nationality other than South African (making the groups of staff from other African and international countries too small to analyse). Only two spoke an African language as their home language with the rest either being English-speaking, bilingually English and Afrikaans, or Afrikaans-speaking; thus language comparisons would have been based on a comparison between only English and Afrikaans; and only ten people indicated they had a disability. Thus we considered demographic differences in gender, age and position level only.

At first glance gender use appears to be equivalent. Table 4.33 indicates that male staff are slightly more frequent users of computers on campus than female staff – this, however, is not very marked.

More subtle differences become apparent upon closer reading. Table 4.34 shows that male academics are more frequent users of the Internet on campus than females (with 80% compared to 73% using the Internet daily).

Off campus, it is of note that 10% more male academics have primary use of a computer at home than do female academics (Table 4.35).

It is of interest that this male advantage is echoed amongst students where (as reported earlier) more female students (48%) than male students (43%) in our study report being secondary users of home computers.

Indications are thus that closer analysis of data suggests that males remain in a stronger position with regard to computers even in an elite situation amongst professionals in higher education settings.

Some interesting differences amongst academic groups also can be observed with regard to the use of the Internet.

Table 4.33: Frequency of staff computer use on campus in terms of gender

Gender	Never	Monthly	Weekly	Daily
Female	0%	1%	11%	88%
Male	0%	1%	6%	93%
Total	**0%**	**1%**	**8%**	**91%**

Table 4.34: Frequency of staff use of the Internet on campus in terms of gender

Gender	Never	Monthly	Weekly	Daily
Female	1%	5%	21%	73%
Male	1%	6%	13%	80%
Total	**1%**	**5%**	**17%**	**77%**

Table 4.35: Primary use of a home computer in terms of gender

Gender	Secondary user	Primary user	Share equally
Female	20%	53%	27%
Male	16%	64%	20%
Total	**17%**	**60%**	**23%**

Table 4.36: Differences in frequency of staff use of the Internet on campus in terms of academic position

Position	Never	Monthly	Weekly	Daily
Associate lecturer	6%	8%	19%	67%
Lecturer	1%	6%	19%	74%
Senior lecturer	0%	7%	19%	74%
Associate professor	0%	2%	15%	83%
Professor	0%	6%	4%	90%
Non-academic	0%	3%	14%	84%
Total	**1%**	**6%**	**16%**	**77%**

Table 4.37: Staff Internet access at home in terms of position

Position	No	Yes
Associate lecturer	19%	81%
Lecturer	12%	88%
Senior lecturer	9%	91%
Associate professor	0%	100%
Professor	6%	94%
Non-academic	8%	92%
Total	**10%**	**90%**

Table 4.36 demonstrates that the lower the academic level, the less frequent the use of the Internet on campus (only 67% of associate lecturers use the Internet daily). There is a gradual increase in Internet use on campus the more senior the staff member. This finding may counter the belief that older academics are more likely to be technophobic and that younger academics are more techno savvy. A divergent interpretation is that Internet use is most closely correlated with research requirements and activities, and that the more senior the academic the more likely he or she is to be engaged in research.

There are some differences in off-campus Internet access with regard to position (Table 4.37). Staff at associate lecturer and lecturer level have less home Internet access. There is also a difference with regard to Internet access at home and age. Younger staff members (under 30) have less Internet access than older staff do, perhaps because they are less able to afford it (Figure 4.38).

There are also some interesting findings regarding age differences. Younger academics (under 25) and older academics (over 50) both use the Internet less frequently than their counterparts (Table 4.38). The main users are aged between 26 and 50 years old.

Table 4.38: Differences in the frequency of staff use of the Internet on campus in terms of age

Age	Never	Monthly	Weekly	Daily
<25 years	3%	8%	18%	73%
26–30 years	0%	4%	16%	80%
31–40 years	0%	2%	13%	86%
41–50 years	0%	4%	15%	81%
>50 years	2%	11%	21%	66%
Total	**1%**	**5%**	**16%**	**78%**

Table 4.39: Staff Internet access at home in terms of age

Age	No	Yes
<25 years	16%	84%
26–30 years	10%	90%
31–40 years	9%	91%
41–50 years	9%	91%
>50 years	7%	93%
Total	9%	91%

Table 4.40: Differences in frequency of staff use of the Internet on campus with regard to age and position levels

Age/position	Never	Monthly	Weekly	Daily
Young junior	2%	6%	18%	74%
Older junior	4%	10%	24%	62%
Young senior	0%	0%	33%	67%
Older senior	0%	8%	8%	84%
Total	**2%**	**8%**	**18%**	**71%**

Table 4.41: Primary use of home computer in terms of age and position

Age/position	No	Yes	Share equally
Young junior	17%	64%	19%
Older junior	8%	56%	36%
Young senior	50%	0%	50%
Older senior	41%	50%	9%
Total	**21%**	**56%**	**23%**

That same age group is the most likely to access the Internet at home as seen in Table 4.39. Whilst this does not reflect frequency of use as in the previous table, it does suggest that more older staff choose (or can afford) to have Internet access at home than do younger staff.

Some further exploration of this is found in Table 4.40 where Internet use is examined in relation to age and position. It appears that older academics in junior positions (lecturer and below) are the least frequent users of the Internet on campus. This is something which warrants further exploration as we do not know what in particular characterises this group.

There are also some interesting differences in the primary use of home computers amongst academics of different age groups in different positions. For example, as Table 4.41 demonstrates, senior academics are less likely to be primary users compared to junior academics (40% of older senior academics are secondary users compared to 16% and 7% of junior academics).

4.4.1.5 Concluding comments regarding staff access to technological resources

The data we have analysed in this section provides some pointers regarding positive and negative experiences in terms of access, suggesting those elements which might constrain and enable use.

Staff use in the Western Cape is enabled by very good access to computers both on and off campus, with 94% of staff having a computer at home and 83% having access to the Internet from home. They are generally very frequent users, with 91% using a computer daily and 77% using the Internet daily.

This positive picture is undermined by institutional differences, cost burdens and the challenges of on/off campus integration.

Thus while 100% of staff from one university have Internet access from home, only 51% of staff from one of the technikons do. Also, staff are not sole users at home; indeed, only 60% of staff in the region are the primary users of their computers at home.

The cost of home ownership of computers and connectivity is borne by individuals not institutions, despite the fact that their work is increasingly virtual. This virtuality is by no means seamless, as indicated by the number of unsolicited comments about integration issues. Clearly, portability and integration are new issues which will need to become part of

ICT planning processes, given that research and teaching are now taking place in and from multiple locations.

These concerns are supported by the lack of consensus regarding availability and adequacy of access. Disagreement and agreement in the quantitative data was roughly even, and 61% of the responses from the qualitative data related to these matters which indicates the importance of these issues.

Finally, it is of note that while at first glance gender use appears to be equivalent, closer analysis reveals that male academics are more frequent users of the Internet on campus than females, and that more male academics have primary use of a computer at home than do female academics.

4.4.2 Staff access to resources of personal agency

As explained earlier, resources of personal agency refer to aptitude and disposition. A person's interest in and attitude to using computers (generally and specifically for learning) is termed their disposition. Resources of personal agency also include ability, skills and experience in using a computer – we term this their aptitude. In order to be able to use computers, it can be argued that staff need access to resources of personal agency as much as they need access to technological resources.

4.4.2.1 Staff aptitude

Aptitude resources of personal agency refer to experience, ability and training in using a computer.

As seen in Figure 4.63, staff report a great deal of experience. More than half of the respondents report that they have been using a computer for more than ten years (78%).

Staff, like students, also rate their own abilities highly. Overall, 74% of respondents rate their computer abilities as good to excellent, with only a small percentage from the two technikons rating their computer experience as poor (9% and 4% respectively) (Table 4.42).

With regard to training, 49% of the respondents have attended training on using a computer at their institution. Unfortunately we were not more specific in the survey so this requires further investigation. We would need to ascertain whether they were referring to general ICT training on how to use particular programs or to more focused staff development activities on using ICT for teaching and learning (Table 4.43).

Figure 4.63: Staff-reported experience using a computer

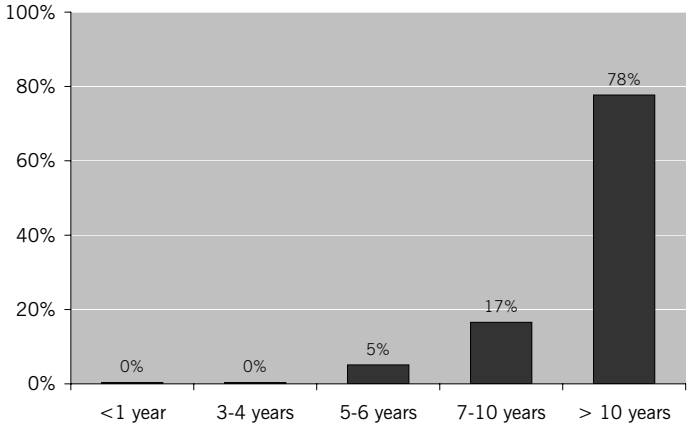


Table 4.42: Staff rating of their own ability: institutional comparison

Institution	Poor	Average	Good	Excellent
CTech	9%	27%	32%	32%
PenTech	4%	18%	43%	35%
UCT	2%	30%	43%	26%
SU	0%	17%	46%	37%
UWC	2%	18%	39%	41%
n = 506	**3%**	**24%**	**41%**	**33%**

Table 4.43: Staff training

Question: Have you ever attended training on using a computer at your institution?		
Yes	242	49%
No	258	51%
(n)	500	

Table 4.44: Staff methods of addressing problems

Type of support used	Percentage of total
Colleagues	3%
IT support	38%
Problem solve oneself	48%
Ask family	3%
Ask friends	7%
(n)	271

The frequency of codes was calculated in relation to the total number of responses. There were 412 responses from staff so a percentage of 28% for our construct of ability means that 94 staff mention something about ability in their qualitative responses. This is then examined to see what indicators these related to. In most answers staff mentioned more than one indicator, hence it was possible for a person's response to occur or be counted in more than one category. Percentages in the indicators and descriptors column refer to the number of staff who mentioned that concept and therefore do not add up to 100%. The column labelled "general code" indicates the codes that comprised each indicator.

Table 4.45: Staff qualitative responses about personal agency

Resource (% freq. of total comments)	**Category** (% freq. of total comments)	**General code** (% freq. within category + = positive and – = negative)
Ability (28%)	Knowledge (36%)	keeping up, know, new method
	Skills (65%)	basic, confidence, expert, familiar, ignorance, novice, practice, skill, talent, troubleshooting, experience, train (33%) easy+, simple+, ability+, able+, competent+ (69%) hard–, difficult–, inability–, unable–, ignorance–, threatened– (13%)

Given that only half of the staff have attended training, it is interesting to see how they address problems. We find that when respondents have a problem doing something on a computer they tend to problem solve themselves (48%) or ask for assistance from institutional IT support (38%).

Remarkably few staff ask their friends and colleagues for help indicating either a lack of confidence in colleagues' computer abilities or a working atmosphere not characterised by peer support. We couldn't find any research in the literature to explain this but it suggests that academic staff are particularly independent in their use of computers.

Additional findings regarding aptitude emerge from the qualitative responses. An analysis of the number of responses by construct show that 28% of the total comments relate to aptitude. The importance of ability can be seen in the range of terms used, including a number of references to "knowing", "expertise" and "skills" as summarised in Table 4.45.

Table 4.45 provides an overview of the qualitative responses grouped according to our constructs and indicators.

When examining the issues in light of the positive and negative descriptors, issues relating to enabling aspects of skill (e.g. "easy", "ability", "competent", etc.) are mentioned most frequently (69% of overall comments), whereas when referring to their computer experience or the experiences using computers for teaching, the comments are more negative (18% positive:55% negative and 16% positive:52% negative respectively).

However, when talking about their experience using a computer for teaching or about personal computer skills and abilities, they note fewer issues that are helpful. Having the ability is the most enabling factor. However, this is overshadowed by constraints of unavailability and inadequacy of access.

Confidence that problems have solutions, enough technical knowledge to know where to look or who to ask.…
(UCT, Centre for Higher Education Development, lecturer, 3–4 years, male, 41–50, English, South African)

Lack of knowledge about potential uses lack of time to read up learn about use of computers in education – too busy
(UCT, Maths & Applied Maths, Science, lecturer, >5 years, male, >50, English)

I'm a very fast typist and i know how to use the internet effectively and have good systems for filing documents electronically
(UWC, no details)

I simply do not find the time to master computers as our educational tool due to heavy teaching & admin leads and calls for increased research outputs.
(CTech, FET, Education, senior lecturer, >5 years, male, 41–50, Afrikaans)

I am keen to develop some courses accessible to my students using Web-CT or the equivalent. However, I need to be encouraged by ICT leaders on campus to foster this web-based

Table 4.46: Questions about staff disposition towards computers

	Agree	Disagree	(n)
The use of computers is likely to result in more valuable learning experiences	86%	14%	472
The use of computers is likely to improve communication amongst students	85%	15%	462
The use of computers is likely to improve communication between students and teachers	87%	13%	470
Computers can give valuable support to my courses	90%	10%	476
Computers will help me do routine tasks more quickly	90%	10%	479
I am a person who likes to try out new ways to carry out my teaching	90%	10%	480
I can picture myself encouraging colleagues to use computers for learning	81%	19%	472
I am a person who has a high general level of interest in new technological developments	70%	30%	489

learning. I would need to be "held-by-the-hand" in developing course work for the web.

(UWC, Library & Information Science, Arts, lecturer, 1–2 years, female, 41– 50, English, South African)

The impression provided from these findings is that of experienced staff in Western Cape higher education institutions with a positive attitude towards the use of computers. More than half have availed themselves of some training, and most have great confidence in their abilities. With regard to resources of personal agency, staff report having high levels of individual aptitude.

4.4.2.2 Staff disposition

We asked staff the same eight questions we asked students. These ranged from general questions about technology and learning to specific ones about the role of educational technology for specific tasks.

Table 4.46 demonstrates that respondents are in strong agreement about the value of using computers for learning, and their likelihood of improving communication amongst students and between students and staff. The majority of respondents – 90% – also agree that computers could provide valuable support to courses and help in doing routine administrative tasks more quickly.

The majority – 81% – of respondents could see themselves encouraging their colleagues to use computers for teaching. However, fewer (70%) see themselves as having a high general level of interest in new technology.

An index of this construct demonstrates that, overall, staff are very positive about and interested in using computers for learning. Within a range of 8 to 32 (where a score of 8 represents "strong disagreement" and a score of 32 represents "strong agreement"), the majority of staff (78%) have a response of greater than 22. The normal curve line shows how positively skewed staff are in their disposition (Table 4.64).

We therefore note that staff are enabled by access to an important resource of personal agency – that of a positive disposition.

4.4.2.3 How differences in personal agency affect specific staff groups

An analysis of gender provides interesting results because at the broadest level, there are barely any differences in disposition overall (Figure 4.65) in terms of the combined index.

However, an examination of one particular component of the disposition index, viz. technological interest, reveals that male academics express a higher degree of interest than female academics do. Indeed, 10% more men agree that they have a high level of technological interest (Table 4.47). This is not affected by age, but does show disciplinary differences with the highest percentage of positive respondents being males from Engineering (89%), in contrast with 59% of males from Humanities.

Our findings in relation to the "interest" indicator support generally held beliefs about males' and females' engagement

Figure 4.64: Staff disposition towards computers

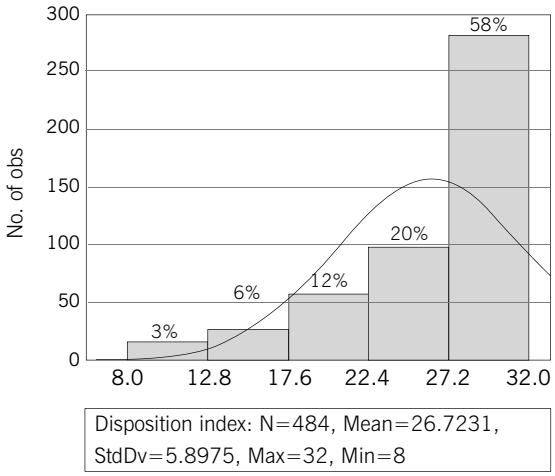


Figure 4.65: Comparison of index of disposition across gender groups

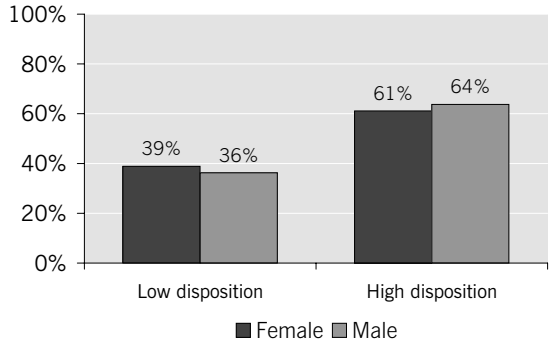


Figure 4.66: Comparison of years of experience using a computer and gender

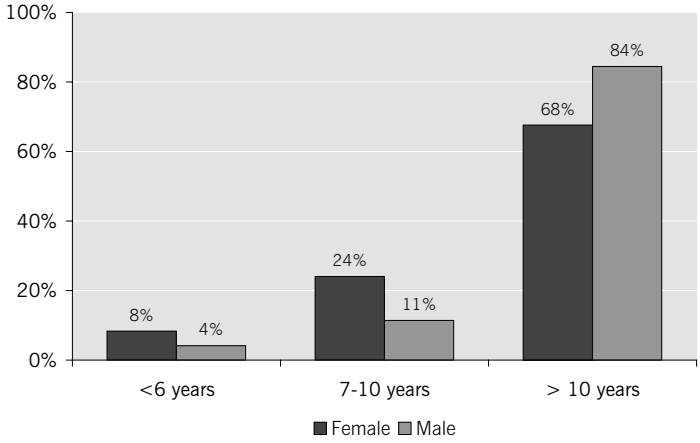


Table 4.47: Technological interest in terms of gender

Gender	Agree	Disagree	Grand total
Female	64%	36%	187
Male	74%	26%	290
Grand total	335	142	477

with technology. There may perhaps be an age dimension, especially given that we found that (older) academics do indeed have differential and gendered interests in computers.

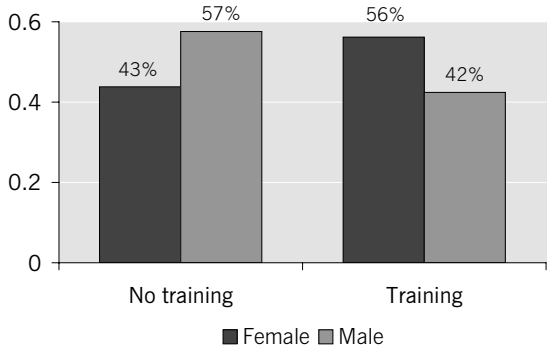
Fewer women (68%) than men (84%) have more than 10 years' experience using a computer (Figure 4.66). While this echoes findings amongst students internationally[8] we were unable to ascertain whether this is an international trend amongst academics.

Women also attend more training than men (Figure 4.67). We find that 16% more female academic staff attend institutional training (Figure 4.67). Furthermore, this is higher (64%) for older than for younger women (52%). This is not a finding that we saw replicated in the international literature nor was it echoed amongst students in this study.

Men also rate their ability more highly than women, as demonstrated in Figure 4.68 where 38% of men rate their ability as excellent compared to 23% of women.

Despite overall similarities in the findings regarding disposition, gendered differences are to be seen at a more granular level. Male academics express more interest in the use of computers, they report more years of experience using computers and they rate their own abilities more highly than women do. They also report less use of institutional training.

Figure 4.67: Comparison of attendance at training and gender



We also analysed the staff data in terms of age and position. When examining the index of disposition we see that younger staff (below 30 years old) have a slightly higher disposition towards computers than older staff do (Table 4.48). This is the same irrespective of position (Table 4.49). In other words, younger staff at both junior and senior levels have a higher (above mean) disposition towards using computers than older staff at both junior and senior levels.

In terms of the numbers of years' experience using a computer, notably fewer staff in the younger (under 30) age group have more than ten years' experience than older staff. However, the difference is not marked.

4.4.3 Staff access to contextual resources

Contextual resources for staff comprise two resource groupings: social and institutional.

Social resources in the form of community networks provide both practical assistance and emotional support. By drawing on these networks, people can receive information and guidance from formal technical advisors, colleagues, friends or family. We therefore define social resources as interest and support received from a community social network.

The need for formal external frameworks is especially important for academic staff who are more likely to be pressured by policy and governance frameworks. We therefore examined a second contextual resource grouping: institutional resources. This applied only to staff. It related to the integration of technology into and at the level of the institution. Our research indicators here are extent (of integration), institutional policy, institutional support and institutional intentions.

4.4.3.1 Staff access to social networks

We investigated social networks, specifically colleagues, by asking academics what they thought their colleagues and families thought about computers. It was not feasible to ask colleagues and families directly. These findings are still relevant as research suggests that individuals are more likely to use computers if they believe that their broader communities value them (Warschauer 2003b).

Whilst a third of respondents did not know what their colleagues' use of computers was like, just over half agree that their colleagues think computers are important for educational purposes (55%), are competent users (50%), use computers in their daily lives (54%) and use computers for communicating with each other (57%) (Table 4.50).

Figure 4.68: Comparison of self-efficacy and gender

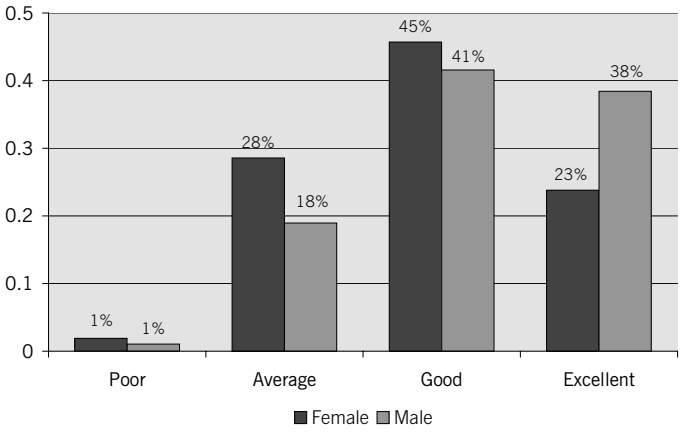


Table 4.48: Disposition of academic staff in terms of age

Age	Below mean	Above mean
<25 years	42%	58%
26–30 years	31%	69%
41–50 years	46%	54%
>50 years	53%	47%
Total	45%	55%

Table 4.49: Disposition of academic staff in terms of age and position

Age/position	Below mean	Above mean
Young junior	36%	64%
Older junior	53%	47%
Young senior	33%	67%
Older senior	46%	54%
Total	45%	55%

Table 4.50: Interest and support from staff social networks

	Colleagues agree	Family agree
Think its important to use computers for educational purposes	55%	60%
Are competent computer users	50%	57%
Use computers in their daily lives	54%	57%
Use computers for recreational purposes	33%	52%
Use computers for communicating with each other	57%	57%

They are more unsure about their colleagues' use of computers for recreation (54% did not know) although when they do have an opinion they think their colleagues do use computers recreationally (33%) (Table 4.50). There is higher agreement from respondents at the technikons with regard to their colleagues' use of computers.

Respondents have a better idea of what their families' use of computers is like as only between 13% and 17% indicate they do not know. The majority of respondents agree that their families think computers are important for educational purposes (60%), are competent users (57%), use computers in their daily lives (57%), use computers for recreation (52%) and use computers for communicating with each other (57%) (Table 4.50).

However, there is still a high frequency of disagreement in terms of their families' use and opinions of computers, as 22%–32% of staff disagree that their families use computers for the purposes listed in Table 4.50.

In summary, many respondents do not know what their colleagues think of computers and how often they use them. But when they do know, the majority believe that their colleagues think computers are important for education, that they are competent users who use computers daily, and that they use them as a means of communicating with each other.

By contrast, respondents are more sure about what their families are doing in relation to computers. Over half believe that their family thinks computers are important for education, that they are competent users who use computers daily and that they use them as a means of communicating with each other. A full quarter of respondents, however, do not believe this is the situation.

4.4.3.2 Staff access to supportive institutional contexts

As part of our investigation into institutional contexts we were curious to know whether the broader academic community has a shared understanding of ICTs in education as expressed in a shared name or shared terminology.

Our findings show that there is no consensus regarding the language used for teaching with technology in the Western Cape.

Respondents use a variety of terms to refer to the use of technology in teaching and learning (Table 4.51). Overall the most frequent terms are e-learning (22%) (which is particularly highly used at CTech), and computer-based learning (22%) (which is the dominant term at UCT). However, many respondents use terms other than those listed.

All of these findings indicate that there is not yet a common vocabulary amongst academics when referring to the use of technology in teaching.

We also wondered whether staff use was driven by institutional policy. We did not ask that question directly; rather we asked whether staff were aware of framing institutional policies at respective institutions.

Over a third of respondents do not know if their institution has a strategy for the use of computers in teaching and learning (Table 4.52). Of those who know, just under a third (32%) say that there is indeed a policy and about a quarter (26%) know that their institution has a policy in progress. In 2004 when the survey was conducted

Table 4.51: Common terms used to describe teaching with technology at each institution

	CTech	PenTech	UCT	UWC	SU	Total
e-Learning	**40%**	**37%**	7%	11%	**33%**	22%
Computer-based learning	12%	22%	**29%**	**27%**	16%	22%
Other	25%	12%	19%	1%	0%	13%
Web-based learning	3%	2%	9%	19%	19%	11%
Resource-based learning	8%	12%	9%	12%	13%	10%
Educational technology	7%	8%	10%	4%	3%	7%
Online learning	0%	0%	8%	16%	8%	7%
Information and communication technologies	3%	0%	7%	4%	9%	5%
Flexible learning	1%	6%	1%	4%	0%	2%
(n)	95	49	144	91	79	458

Table 4.52: Knowledge of institutional educational technology strategy

	CTech	PenTech	UCT	UWC	SU	Total
Yes	38%	29%	11%	29%	65%	**32%**
No	6%	13%	13%	8%	0%	**8%**
In progress	28%	27%	23%	39%	13%	**26%**
Don't know	29%	31%	52%	25%	22%	**34%**
(n)	87	48	158	106	91	**490**

Table 4.53: Readiness to change across institutions

Institution	Poor	Average	Good	Excellent	Don't know	(n)
CTech	11%	47%	35%	1%	5%	91
PenTech	14%	27%	43%	6%	10%	49
UCT	34%	21%	33%	0%	12%	160
UWC	26%	8%	53%	7%	7%	106
SU	18%	1%	69%	9%	3%	91
Total	**23%**	**20%**	**45%**	**4%**	**8%**	**497**

- CTech did not have a policy but had made a decision that e-learning was to be part of core business
- PTech did not have a policy related to educational technology
- UCT had a policy that had just been approved by senate
- UWC had an information technology policy (which mentioned e-learning) and a specific e-learning policy in progress
- Stellenbosch University had an e-learning policy in place.

Table 4.52 shows that the majority of staff at Stellenbosch University (65%) are aware of their institutional policy, whilst the remainder do not know or think it is in progress. Staff in the technikons are split about whether or not their institution has a policy, whether it is in progress or they do not know. The majority of staff at UWC (39%) think their policy is in progress whilst most staff at UCT (52%) do not know.

Asked about the readiness amongst people to change when it came to using technology for teaching at their institution, most think it is good (45%) or average (20%). A very small percentage think that institutional readiness is excellent (Table 4.53).

Responses about readiness also differ across institutions. A third of the respondents from one institution – UCT (34%) – and a quarter of another – UWC (26%) – think it is poor whereas the majority of Stellenbosch University's respondents think it is good (69%). This opinion could be aligned with the situation of the institutional policies regarding e-learning. Stellenbosch University has an established policy whilst the UCT and UWC policies were not yet fully established as the time of the investigation.

We were interested in perceptions of use as well as reported use (as in the next chapter of this report). Respondents across the board think the actual use of computers for teaching and learning at their institution is generally average (21%) to good (42%) (Table 4.54). Again there is a variation across the institutions with the majority of Stellenbosch University's respondents reporting that they think the use of computers is good (70%) whereas a large number of UCT's respondents think it is poor (37%).

Staff were asked about support from senior leadership and about institutional vision (Table 4.55 and 4.56). Just under half of the respondents think it is good (47%). Again this varies a great deal, from 70% at Stellenbosch University to as low as 34% at UCT.

In terms of technical support only slightly over half the respondents think that support is good to excellent (52%). Stellenbosch University, where respondents believe that they have senior leadership support and vision, is the most positive, with 77% indicating support is good–excellent. In contrast at UCT, respondents believe least in senior

Table 4.54: Institutional use of computers for teaching and learning

Institution	Poor	Average	Good	Excellent	Don't Know	(n)
CTech	19%	36%	31%	2%	11%	89
PenTech	13%	28%	51%	6%	2%	47
UCT	37%	23%	29%	1%	11%	160
UWC	0%	33%	33%	0%	33%	6*
SU	18%	1%	70%	8%	3%	91
Total	**25%**	**21%**	**42%**	**3%**	**9%**	**393**

** There were no responses to this question from UWC staff who answered the questionnaire online, which suggests that there was an error in the online form which wasn't noticed until the analysis stage.*

Table 4.55: Support from leaders at each institution

Institution	Poor	Average	Good	Excellent	Don't know	(n)
CTech	15%	26%	41%	7%	11%	91
PenTech	16%	16%	47%	16%	4%	49
UCT	39%	17%	34%	1%	9%	161
UWC	26%	8%	52%	7%	8%	106
SU	18%	1%	70%	8%	3%	91
Total	**26%**	**14%**	**47%**	**6%**	**8%**	**498**

Table 4.56: Academics' perceptions of institutional vision for use of computers for teaching and learning

Institution	Poor	Average	Good	Excellent	Don't Know	(n)
CTech	11%	22%	48%	7%	12%	91
PenTech	8%	14%	47%	24%	6%	49
UCT	36%	13%	30%	1%	19%	159
UWC	26%	8%	52%	7%	8%	106
SU	18%	1%	70%	8%	3%	91
Total	**23%**	**11%**	**47%**	**7%**	**11%**	**496**

leadership support and vision, as 41% indicate support is poor.

The qualitative data in Table 4.58 reveals a prevalent concern with institutional support.

While the intention of this study was not to focus on institutional differences, there are times when the data points to such differences that they need to be noted. In the open-ended responses relating to contextual resources, three institutions (two technikons and the one historically white university) were much more negative in their responses than the other two universities. Further examination reveals that staff at the technikons and one university made significantly more comments about the unavailability of the Internet and networks than those at the other two universities. In two of these cases, the institutions have adopted e-learning as a core part of their business. One wonders whether these observations are related to different levels of use and to greater expectations and demands.

Some individual comments capture the flavour of frustration that a table cannot do justice to:

Poor support from IT technicians located in the faculty – unresponsive.
(PenTech, no details)

Table 4.57 Adequacy of institutional technical support

Institution	Poor	Average	Good	Excellent	Don't know	(n)
CTech	19%	37%	36%	6%	2%	89
PenTech	10%	31%	39%	18%	2%	49
UCT	**41%**	**16%**	**33%**	4%	5%	158
UWC	27%	7%	51%	8%	8%	106
SU	18%	2%	**69%**	**8%**	3%	91
Total	**27%**	**17%**	**45%**	**7%**	**4%**	**493**

Table 4.58: Staff qualitative responses about contextual issues

Resource (% freq. of total comments)	**Category** (% freq. of total comments)	**Code descriptor** (% freq. within category)	**General code** (% freq. within category + = positive and – = negative)
contextual (27%)	support (19%)	networks (22%)	colleagues, management, people, personnel, staff
		assistance (77%)	general: service, support assist+, help (14%), problem (55%)

The frequency of codes was calculated in relation to the total number of responses. There were 412 responses from staff so a percentage of 27% for our construct of context means that 111 of staff mention something about context in their qualitative responses. This is then examined to see what indicators these related to. In most answers staff mentioned more than one indicator, hence it was possible for a person's response to occur or be counted in more than one category. Percentages in the indicators and descriptors column refer to the number of staff who mentioned that concept and therefore do not add up to 100%. The column labelled "general code" indicates the codes that comprised each indicator.

Hotseat are helpful, but they have a stupid tape message that says use e-mail precisely when e-mail is down. They really should have a message service.
(UCT, Science, professor, >5 years, male, >50, English, South African)

Hopeless IT support so that everything comes to a standstill for extended periods when problems arise. Very few classrooms with equipment for using PowerPoint, *etc.*
(UCT, Law, professor, >5 years, female, 41–50, English, South African)

I often have to help my colleagues, most of whom are less experienced than me, which can be quite time-consuming.
(SU, no details)

Inadequate support for myself and, more importantly, for students means that I do not make as much use of online learning as I could. I don't have time to troubleshoot students' problems and they find the technical support inadequate to help them.
(UCT, Science, associate professor, >5 years, female, 31–40, English, South African)

At the same time, the enabling role of contextual resources could be seen in comments such as these:

Having a departmental environment in which e-issues are part and parcel of all major work and participation in listserves which bring [amongst the garbage] very useful current material for teaching to my screen.
(UCT, Humanities, senior lecturer, >5 years, female, 41–50, English, South African)

At the same time, the lack of a supportive contextual framework is also acknowledged to be a constraining factor:

[There is] no real encouragement to use computers as part of teaching & learning.
(CTech, Education, lecturer, 1–2 years, female, 31–40, English)

There are also concerns about quality and time:

The institutional focus thus far has been on roll-out: getting as many subjects as possible on WebCT. Issues of educational quality have yet to be addressed in a systematic way.
(CTech, non-academic, >5 years, female, 31–40 English, South African)

There are always grand plans for using computers and very little thought is given to content in terms of quality and the huge amounts of additional time and resources of skill this requires. Terms such as "e-campus" are used too glibly without an understanding of the implications in terms of labour.
(SU, Science, senior lecturer, >5 years, male, 31–40, South African)

4.4.3.3 How access to contextual resources affects various social groups of staff differently

An examination of contextual resources reveals no differences in either gender, age or academic position level. The differences with regard to contextual resources are most marked at an institutional level rather than within the institutions themselves.

4.4.3.4 Concluding comments about staff access to contextual resources

The sense gained from these findings is that staff generally do not have access to good institutional resources and that their use is not being enabled or driven by formal institutional factors or policies. Certainly across the region there is no shared language about the use of computers in education.

Only one institution – Stellenbosch – has a situation where two-thirds of the staff know that there is an institutional policy in place; for the rest very few know about such policies. That same institution is the only one where two-thirds of the staff think that the institutions' readiness to change is good. In no cases do more than 10% of staff think it is excellent. The fact that this same institution is the only one where institutional vision and institutional support are well rated is an indication that one institution out of the five in the Western Cape has succeeded in internalising its stated policy intention regarding the use of ICTs for teaching and learning.

4.4.4 Staff access to digital content

Given the paucity of locally produced content, and the lack of online content produced in Africa, we were particularly interested to know about staff access to suitable and appropriate online resources.

Respondents are remarkably positive about being able to find Internet content that is relevant to both their courses and to the South African context. The vast majority of respondents answer that they are able to do so, with the fewest being 88% and the most being 93%. Slightly fewer report being able to find content produced locally (77%) although more respondents indicate that they do not know (10%) if they can or not.

The majority of staff agree that computer resources are available in the language they want (92%) and when asked whether they can find resources in more than one language the majority (63%) say they can, whilst 20% say that they do not know. Respondents from the two more bilingual universities indicates that they are able to find resources in multiple languages (93–99%) whereas fewer technikon respondents indicates they are able to find multiple language resources (20–23%).

The mention of online content in the qualitative data was minimal, with only 4% of comments being relevant and generally mentioned in the context of use (4%). Issues of relevance, locality and language were not highlighted in any way.

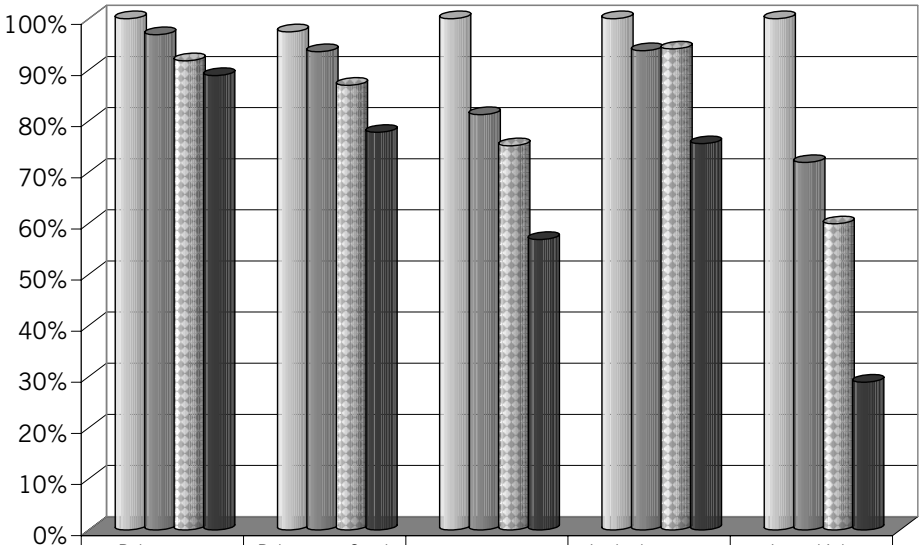
4.4.4.1 How differences in access to digital content affect various social groups of staff

An examination of online resources reveals no differences in either gender, age or position level. However, when we explored staff's responses to the questions on digital content (Figure 4.69) by language group we can see that more staff who are bilingual (Afrikaans and English) or those who speak Afrikaans as a home language indicate they agreed with statements about the availability of digital content. Only 57% of staff who speak other languages indicate they

Table 4.59: Availability of digital content

	Valid responses	Yes	Don't know
I am able to find content on the Internet			
relevant to courses	495	93%	3%
relevant to South Africa	493	87%	6%
produced locally	494	77%	10%
The computer resources I have used for studying are			
in language I want	455	92%	3%
in more than one language	491	63%	19%

Figure 4.69: Comparison of staff from different language groups who answered "yes" in relation to questions about digital content



	Relevant to courses	Relevant to South Africa	Produced locally	In the language I want	In multiple languages
Afrikaans	100%	97%	100%	100%	100%
Afrikaans and English	97%	94%	81%	94%	72%
English	92%	87%	75%	94%	60%
Other	89%	78%	57%	76%	29%

could find content produced locally (the remainder were split between "don't know" and "no"). Staff who speak English or Afrikaans are in agreement that digital content is available in the language they want whilst staff who speak another language are less in agreement (76%). Staff who speak English as a home language indicate less knowledge of multilingual resources (only 61% indicate they could find resources in more than one language whilst 29% indicate they didn't know). And only 29% of staff who speak other languages indicate they could find resources in more than one language (with 50% indicating they could not) which suggests that they had tried but not succeeded.

4.5 Comparing student and staff access to resources

In the educational environment individuals do not engage with resources in a decontextualised fashion nor do they participate in that experience in isolation. In higher education, students and academics bring their own resources into the teaching and learning relationship. These are inevitably different but there need to be overlap and mutual connections especially when the engagement with one another is mediated by ICTs. Given the kinds of resources necessary for using ICTs in education, it is relevant to consider how students' and academics' access to resources are similar or different. It is therefore useful to compare the resources staff and students have access to.

In terms of technological access, staff are much better equipped than students overall, both on and off campus. This is to be expected given that staff have desktop computers and network access that enable them to use a computer and the Internet whenever they need to on campus. The majority of staff also have home computers and Internet access, although they share with students their divided perception of their adequacy for teaching and learning requirements. Staff are also much more critical of the inadequacies of student technological access than students themselves are.

The qualitative data emphasises the extent of the differences between staff and students. Staff describe inadequacies at a more advanced technological level than students do. Staff are concerned about such issues as portability and the need

for seamless transfer of data between work and home. They have high expectations of off-campus access as they see this as an extension of their work. While students express an interest in newer technology, they are still using stiffy disks as a standard means of moving their data. They are also having to prove very resourceful in terms of off-campus access, using extended networks – from parents, to friends, to parents of friends – in order to get the access they need.

There are similarities and differences in terms of resources of personal agency. Staff have been using computers for greater lengths of time. Yet the lack of experience does not affect student confidence in their own abilities. Both students and staff have a high level of self-rating in terms of skills and experience. However, staff are critical about student knowledge being sufficient for their learning requirements.

Both staff and students have a high disposition towards use of computers generally and for teaching and learning, although student disposition is on average higher than that of academic staff. Students certainly have a higher expectation of staff in terms of their use of computers and provision of support.

Both students and staff do have generally supportive social networks. Many staff are unsure about colleagues' attitudes and use of computers. Students' families and friends value, support and use computers themselves, a consideration which suggests this is a factor that encourages student use. There is an indication in the qualitative responses that students and staff do draw on friends and colleagues for support and encouragement. Once again, staff are more critical of support both for themselves and for students than students are for themselves.

Despite their diverse language backgrounds, access to suitable digital content is not an issue for either staff or students, who both consider online resources to be adequate.

Endnotes

1 Note, however, that student and staff data on use is strongly linked and so is presented together.

2 We describe in detail how this framework was developed in Czerniewicz and Brown (2005).

3 As a reminder, this index was calculated based on a cumulative score of three items: 1. Occupation of primary breadwinner; 2. Highest education level of primary breadwinner; 3. If they were the first person in their immediate family to go to university. The range of the index was 3–16. The index was then divided into three groupings: low socio-economic (SE) group (score <7.5 – 20% of student group); average SE group (score >=7.5 and <12.5 – 39% of student group); and high SE group (score >=12.5 – 40% of student group).

4 We were interested in these gender subtleties and examined our findings in relation to international studies. We reported on this in a paper, *"Gendered access to and uses of information and communication technologies (ICTs) in South Africa: higher education experiences in the Western Cape"*.

5 Interestingly we found no other studies where women reported dissatisfaction with online resources, although we did find several organisations and researchers sharing our concerns. Thus in a report on six African countries Huyer and Sikoska (2003) note that very little online content relevant to gender is available but observe that women did not notice this gap.

6 The report notes on p.49, "The substantial differences between the technikons and universities in terms of the average number of research projects per individual (0.65 and 1.25 respectively), the average time spent on research (31% and 41% respectively) and average expenditure per project (R12 700 and R24 000 respectively). In terms of these 'indicators', university respondents 'outperform' their technikon counterparts, reaffirming the big differences in research traditions and research cultures between these types of higher education institutions."

7 Research from Europe and North America has found fairly consistently that women have less experience at the start of their university education than males do (Derbyshire 2003). Also, in the UK, female students consistently rate their experience as lower than males (Baines in Derbyshire 2003).

Chapter 5

Computer use

5.1 Conceptual framework of use

This research into the use of ICTs is one of an increasing number of studies in a domain defined as "the study of the application of digital technologies techniques and to the use of ICTs in learning and education" (Levy, Ford, Foster, Madden, Miller, Nunes, McPherson and Webber 2003). Approaches to such studies vary substantially. Our approach falls close to research which foregrounds the ways in which people use technologies in their teaching and learning practices, rather than the nature of the technologies themselves. Such studies are, for example, being undertaken in literacy studies (Snyder 1998; Warschauer 2002; Warschauer 2003a; 2003b; 2003c) and social informatics (Kling 2000; Lamb and Johnston 2004). The focus is therefore not on the specifications of the ICTs but the ways they are interwoven in practices which exist in specific contexts and for particular purposes.

This approach means that, unlike many other related studies in the broader domain studying ICT use (Collis, Peters and Pals 2001; Norris, Sullivan and Poirot 2003) our main interest is not to quantify use of a particular software or functionality. Rather than a view of computers as a collection of features, our approach is to consider computers and users as "functional ensembles" (Sawyer and Crowston 2004), allowing us to link media forms with the event for which they are being used.

Studies which prioritise the measurement of the extent of use (Godin 2000; Yanosky, Harris and Zastrocky 2004) can be valuable for tracking mainstreaming into education or broader society. While we hope that our findings might provide such pointers, our interest is primarily in the relationship between computer use, teaching strategies and learning experiences.

In a developing country where physical access to computers is limited, finding out whether or not they are being used at all for teaching and learning purposes is a necessary starting point. At the same time, we assume that computer usage occurs in gradations, rather than simply on/off. We also assume that computers may be used in different frequencies and ways in particular contexts.

Unlike others we do not compare use of computers with other technologies (Mason 1998; Collis, Peters et al. 2001; Cantoni, Cellario and Porta 2004). Rather, we ask in which context a particular technology is or might be appropriate for a specified purpose. By trying to understand why computers are used in certain ways in certain situations and not others, we hope to provide a nuanced explanation of use. For example, it has been argued that specific disciplinary areas are more likely to use, need to use, or to value certain teaching strategies (Neumann 2001). We wonder whether computers are used in those disciplinary settings in interconnected ways. We are therefore interested to find out what particular kinds of computer-related strategies are being used in conjunction with disciplinary-related teaching and learning strategies.

With regard to the parameters, we note that studies of institutional context which consider macro issues (see Ehrmann 2001; Yanosky, Harris et al. 2004) do not usefully inform our work, given its pedagogical focus. Whilst others which categorise types and levels of courses (Mason 1998; Bonk, Cummings, Hara, Fischler and Lee 2000) have been useful in contextualising the extent and nature of ICT use, they do not focus specifically on teaching and learning interactions. We therefore recognise that our study is bounded by the curriculum. The macro level of the course and the micro level of pedagogical interactions frame the investigation.

5.1.1 Understanding computers as integral to pedagogical activity

Understanding computer use at the level of pedagogical activity will give us the most insight into its relationship with teaching and learning. Pedagogy is about the various forms of interaction between three agents: teacher, student/s and knowledge domain. These agents comprise three elements in a triangle of interaction (Garrison and Anderson 2002). Pedagogy is about process, content, context as well as the mediation of artefacts such as technology. Discussing the relationship between technology and pedagogy means considering teaching and learning events, that is activities at the intersection of teaching approaches and learning experiences. It also means considering the nature of the content under discussion and the knowledge being created and disseminated (Lusted 1986; Bernstein 2001; Loveless, DeVoogd and Bohlin 2001).

Choices of technology and choices of teaching and learning activities are closely related. In order be able to describe the relationship between pedagogy and technology we looked for a framework that could

- describe teaching and learning activities
- link them to purpose, allowing them to be contextualised
- define types of computer-based forms
- link those types to particular teaching and learning activities.

This is a challenge which has been taken up by researchers who have developed theories focusing on one of those elements (Johnson and Aragon 2003). A comprehensive holistic approach is offered by activity theorists, who provide a way of describing the whole learning environment, including linking social, cultural and historical influences, and an examination of the relationships between people and new technologies (Ravenscroft 2001; Issroff and Scanlon 2002; Mwanza and Engestrom 2003). However, activity theory does not offer an explicit way of describing particular kinds of computer use in relation to specified teaching and learning activities.

The only model we found which explicitly links specific types of computer use to pedagogy is the conversational framework developed by Laurillard (2002) and used and extended by others (Britain and Liber 2004; Conole, Dyke, Oliver and Seale 2004). This is the one framework that classifies different types of computer media in relation to key teaching and learning events in a way that makes it possible to link them to specific teaching strategies and learning experiences.

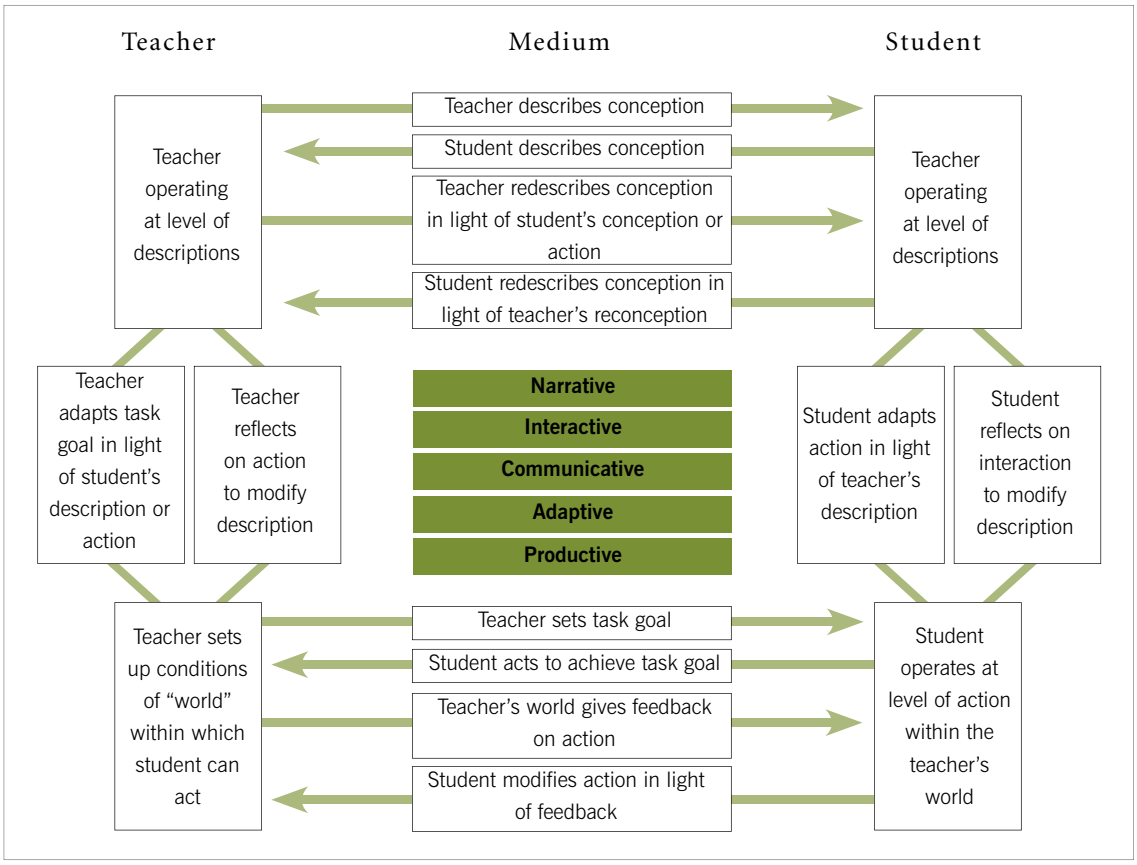
5.1.2 The conversational framework

The conversational framework (Figure 5.1) provides a way of describing teaching and learning in terms of key events and interactions. These events are not phased, linear or progressive; nor are any of the events "better" than any other. Rather, they are likely to occur in different configurations at different times as required. Associated with these key events are specific teaching strategies which support that event, and specific learning experiences that also form part of that event.

The framework then links five media forms with the key teaching and learning events. Laurillard sees a media form as comprising both computer-based and non-computer-based activities. These incorporate physical resources, e.g. textbook or Web page, as well as interpersonal resources such as lectures and discussion forums. It is important to note that the process of classifying the different media forms does not seek to rank, judge or evaluate the use of an individual media form. Rather, it is a way of linking and relating media forms to learning and teaching interactions. We found Laurillard's framework the most useful for examining the relationship between computers, teaching strategies and learning experiences, and have used this as the analytical framework for our study. However, whilst the framework extends to both computer and non-computer-based activities, we primarily focus on the former in this study.

While providing a valuable set of analytical tools, the categories are not meant to be used simplistically. Certainly no one media form adequately supports the entire learning process. Together they describe the most dominant learning experiences and teaching strategies currently employed in

Figure 5.1: The conversational framework



Source: Adapted from Laurillard (2002)

higher education. Effective and appropriate pedagogical practice is therefore likely to be achieved through a variety of media forms balanced for their pedagogic value rather than through reliance on any computer activity. Furthermore, one would not expect media forms to be equally distributed either within or across courses. The proportion of time allocated to each media form will vary as required by curriculum, pedagogical and disciplinary needs.

5.2 Students' and staff use

Having used the conversational framework as a model for describing key teaching and learning events, it therefore follows that we discuss staff and students' experiences together in this section. As with the conversational framework we believe that the roles of students and teachers in the learning process are intertwined. Whilst their experiences may be different they essentially participate together in the same teaching and learning event. Our methodology echoes this view; our survey questions for staff and students regarding use were essentially the same.

For example, students were asked 18 questions about how often *they used* a computer to undertake different activities related to four teaching and learning events: discovery, dialogue, practice and creation. They were also asked five questions about how often lecturers used both computer- and non-computer-based media for the event of acquisition. We did not ask students about their personal use of the computer for the event of acquisition as we view the use of computers in this event as forming part of teaching activity.

Staff were asked the same 18 questions about how often *they asked students* to use a computer to undertake different activities related to the same four teaching and learning events: discovery, dialogue, practice and creation. They were also asked five questions about their *own practice* using both computer- and non-computer-based media for the event of acquisition. Our assumption with regard to the use of technology was that as educators, academic staff would

Table 5.1: Conceptual framework: teaching and learning events, teaching strategies, learning experiences and educational media

Teaching & learning event	Teaching strategy	Learning experience	Related media form	Examples of non-computer-based activity	Example of computer-based activity
Acquisition	Show, demonstrate, describe, explain	Attending, apprehending, listening	Narrative Linear presentational *Usually same "text" acquired simultaneously by many people*	TV, video, film, lectures, books, other print publications	Lecture notes online, streaming videos of lectures, DVD, multimedia including digital video, audio clips and animations
Discovery	Create, set up, find or guide through discovery spaces and resources	Investigating, exploring, browsing, searching	Interactive Non-linear presentational *Searchable, filterable, etc. but no feedback*	Libraries, galleries, museums	CD-based, DVD, or Web resources including hypertext, enhanced hypermedia, multimedia resources. Also information gateways
Dialogue	Set up, frame, moderate, lead, facilitate discussions	Discussing, collaborating, reflecting, arguing, analysing, sharing	Communicative Conversation with other students, lecturer or self	Seminars, tutorials, conferences	Email, discussion forums, blogs
Practice	Model	Experimenting, practising, repeating, feedback	Adaptive Feedback, learner control	Laboratory, field trip, simulation, role play	Drill and practice, tutorial programmes, simulations, virtual environments
Creation	Facilitating	Articulating, experimenting, making, synthesising	Productive Learner control	Essay, object, animation, model	Simple existing tools, as well as especially created programmable software

Source: Adapted from Laurillard's *Rethinking university teaching* (2002)

be responsible for the design of the learning experience. This was why we asked them about what they required (or requested) of students in terms of computer use.

In this section, we begin by examining how students and staff are using computers for general computer-based tasks. We then look at the extent to which computers are being used for teaching. Upon establishing the basis of student and staff use, we then draw implicitly on our theoretical framework and examine which teaching and learning events are most supported by computers. We examine the different types of activities for which computers are used

in each teaching and learning event and the extent of this use. Specifically, we look at the differences in use between what staff and students report, how computers are used differently across different years and levels of study and what differences may occur in computer use across different disciplinary areas.

5.2.1.1 Extent of student use of a computer for general tasks

When we examine how often students use a computer to undertake general tasks, we see that most say they are regular users. The highest reported daily use is for study (45%) and to access information (45%).

The purposes for using computers cover all four possibilities in quite a similar fashion, especially when considering weekly use. Daily use of computers for recreation is the lowest, a point which counters those who are concerned that institutional resources might be being sidetracked for leisure activities.

Interestingly, comments from the qualitative data make the unsolicited argument that recreational use makes a contribution to learning and general well-being.

I will encourage people to make use of computers for learning research and playing games in computers. This will help them to develop much skills for using of computer.
(UWC, Natural Science, 3rd year undergrad, male, 21–25 years, isiXhosa)

Please use the mouse without the bells and fix all the computers in room 3:12. All computers should have a mouse. We must be able to play games so that we can release stress of the studies.
(CTech, Business, 1st year preliminary, male, <20 years, isiXhosa)

There are others, however, who regard recreational activities, specifically games, as counterproductive. They express frustration, saying they need to use computers for other purposes.

It would great if we could eradicate games on the network. I don't know how but it is hopeful thinking.
(CTech, Business, 2nd year undergrad, male, 21–25 years, English)

Yes more computers available for students & to restrict students who use the computers for playing games while others need it to work.
(CTech, Management, 3rd year undergrad, male, 21–25 years, Angolan)

Table 5.2: How often students use a computer

	Never	Monthly	Weekly	Daily
To communicate with people	9%	15%	38%	38%
For study	4%	12%	39%	45%
For recreation	13%	20%	36%	32%
To access information	1%	13%	41%	45%

n = 6147

In addition, comments from the open-ended questions make the case for extending the use of computers to support student studies. Thus:

Lecturers should make more use of computers for lecturing purposes. Lecturers should put their lectures on a local info network to make it avail to students over and over again.
(UWC, Dentistry, 1st year undergrad, female, <20 years, English)

and

i see computers as being just a part of a whole set of information acquiring tools to obtain and integrate data/info relevant to one's field of study. Ancillary thereto, computers are vital for putting the knowledge acquired, as well as the experimental.
(SU, Chemistry, postgrad, male, 41–50 years, Afrikaans)

Our findings regarding the general use of computers show that the most frequent use is for purposes related to studying, rather than for recreation.

5.2.1.2 Extent of staff use of a computer for general tasks

When asked how often they used computers to undertake various activities, staff respondents report most often using

Table 5.3: How often staff use a computer

	Never	Monthly	Weekly	Daily
To communicate with people	7%	5%	38%	50%
To teach	8%	10%	49%	33%
For recreation	17%	17%	50%	16%
To do research	8%	11%	55%	26%
For work-related administration	6%	7%	41%	46%

n = 507

a computer daily to communicate and for work-related administration (50% and 46% respectively). This is followed by teaching (33%) and research (26%), tailed by recreation (16%).

These finding did differ across institutions (Table 5.3). Respondents from CTech and PenTech use computers more often than their university counterparts for communication (daily 89% and 76% respectively), teaching (daily 58% and 55%), and work-related administration (daily 83% and 74% respectively), whereas at the universities the majority of respondents use them weekly for these activities. Use of computers for research is more regular at PenTech (38% daily), although the majority of respondents use computers at least weekly for research. Also, more UCT respondents use a computer daily for work-related administration (47% daily) than the other two universities do.

When we examine how often staff use a computer to undertake general tasks, we see that most say they are regular or frequent users, with the highest frequency of use being for teaching and to access information.

5.2.2 The extent of computer use

Before ascertaining how computers are being used as part of teaching and learning events in higher education, we first examined the question of take-up in the region.

The answer to the question as to whether computers are being used as part of teaching and learning in the region is unequivocally "yes" (97% of staff and 98% of students).

As Table 5.5. demonstrates, only 3.33% of staff and 2.15% of students indicated in all their responses that they *never* or *rarely* used a computer to undertake *any* of the computer-based learning activities listed in the survey (see questions B6 to B18 in the survey in appendix 1).

We therefore conclude that despite the difficulties being experienced in terms of access in higher education in our region – and noted in this report and elsewhere (Brown and Czerniewicz 2004) – academic staff and students report that computers are indeed being used for teaching and learning.

In addition, it is evident that there have been real changes with regard to teaching and learning. This is notable when considered against the backdrop of the descriptions of computer usage in higher education in the first and second decades of use (as explained in section 2.2). In the early days computers were used almost entirely to support administration, and indeed this continues to be a frequent practice. Teaching and learning usage was occasional and fragmented. Our findings show that overall there is significant and widespread use of some kind for teaching and learning in the Western Cape.[2]

Although from now on we focus on computer use for teaching and learning, it is interesting to consider computer use generally in relation to overall use for teaching and learning. Academics use computers most frequently for work-related administration and to communicate; in contrast, students use them most frequently to study and to access information. Overall we see that students generally

Table 5.4: Daily use of computers by staff for general tasks across institutions

	To communicate with people	To teach	For recreation	To do research	For work-related administration
CTech	89%	58%	12%	24%	83%
PenTech	76%	55%	17%	38%	74%
UCT	55%	31%	15%	32%	47%
UWC	17%	17%	17%	17%	17%
SU	23%	22%	19%	22%	24%
n = 496	246	129	163	225	76

Table 5.5: Number of academics and students who make infrequent (never or rare) use of a computer for all of the 18 teaching and learning activities listed in the survey[1]

	Valid n	Never	Rarely	Both	%
Staff	480	6	10	16	3.33%
Students	5826	48	77	125	2.15%

report using computers more frequently than staff (Figure 5.2). For example, 45% of students say they use a computer daily for study and to access information whereas 33% of staff say they use it daily for teaching and only 26% daily for research. It is interesting that the reported use of computers for recreation is lowest for both staff and students; presumably this has to do with the nature of the context and the kinds of respondents we had.

Another observation of note is that even though staff do not report using computers frequently for their own practice, they expect their students to do so. For example, only 26% of staff say they use computers daily for research (Figure 5.2), yet 90% ask students to use a computer to find information (Figure 5.3), and 53%[3] of staff ask students to do so frequently. This disjuncture might be explained by a distinction between the two processes. Asking students to use a computer for information-seeking activities is part of the teaching process for an academic and not part of their research process, hence the high rate of request.

Table 5.6 shows minimum use of all media forms by students.

However, despite overall similarities of staff and student use of computers for teaching and learning, there is some indication that students report using computers even when not required to do so. For example, 75% of students report using some form of communicative media occasionally or more frequently in their courses (Table 5.6), yet only 55% report being asked to use communicative media as part of their courses (Figure 5.3).

5.2.3 The breadth of computer use

In addition to the extent of use, we were also interested in the breadth of use of computers across a range of teaching and learning events in the region. We therefore examined how many students were required to use a computer across the teaching and learning events. Overall, 27% of students said they were required to use a computer for all four teaching and learning events of discovery, communication, practice and creation – this indicates that they had a breadth of use of computers (Table 5.7). The majority of students (51%) were required to use a computer for at least two or more events, and 18% for one event only. Only 4% were not required to use a computer for any event at all. This indicates that the majority of students are required to use a computer for more than one teaching and learning event, although only a quarter of students are required to use a computer across the whole range of events.

Figure 5.2: Comparison of students' and academics' daily use of computers to undertake general activities

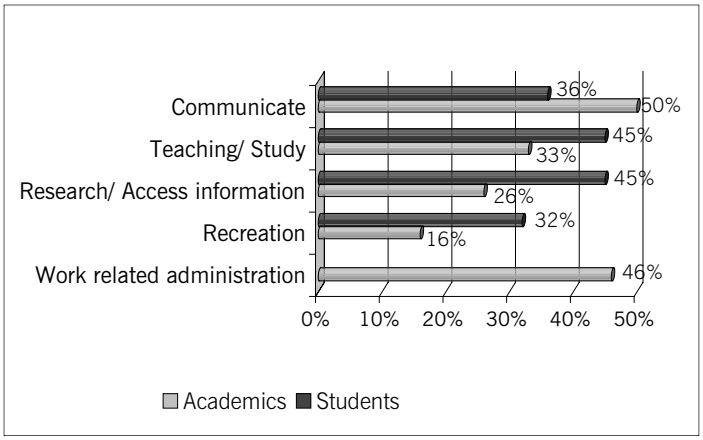


Table 5.6: Percentage of students who never or rarely use a particular media form; conversely, how many use a particular media form at least occasionally as part of their course

Media form	Valid n	Responded "never" or "rarely" to all activities	At least one activity used occasionally or more frequently[4]
Interactive	5553	3%	97%
Communicative	3671	25%	75%
Adaptive	3466	20%	80%
Productive	6576	0%	100%

Table 5.7: Number of teaching and learning events for which students report being asked to use a computer

Requirement	Count	Percent
Not required	215	3.8%
Required for one event	1050	18.6%
Required for two events	2911	51.7%
Required for all	1444	25.6%
(n)	5620	

Note that when answering the questions about use of computers for teaching and learning, students and staff were asked to think about their overall experience studying or teaching courses in their institution. So this data reflects their overall experience at an institution rather than their experience of a particular course in a particular year.

Table 5.8: Frequency of student use compared to extent to which academic staff require students to use ICTs for learning.

Requirement	Infrequent	Average	Frequent	
Not required	88%	12%	0%	1%
Required for one event	62%	38%	0%	19%
Required for two events	5%	88%	7%	54%
Required for all	0%	40%	60%	27%
(n)	818	2524	1068	5428

This raises the question of how staff's requirements for students to use computers affect students' frequency of use. Table 5.8 demonstrates that when students are not required to use computers at all by staff, they exhibit more infrequent use themselves (88%) and conversely when students are required to use a computer for all teaching and learning events, they use a computer more frequently themselves (60%).

However, 38% of students had an average frequency of use, even when only asked to use a computer for one teaching and learning event. This corroborates our earlier suggestion that students do use a computer more frequently than asked to. However, our findings also indicate that staff requirements are a driving force behind student frequency of use.

Table 5.9: Variation of students' use of computers

Requirement	Count	Percent
Unvaried	1206	21%
Varied	1404	25%
Varied across two	3053	54%
(n)	5663	

Table 5.10: Relationship between staff requirements and student variation of use

	Unvaried	Varied	Across two
Required for all events	0%	86%	14%
Required for two events	5%	5%	90%
Required for one event	88%	0%	12%
Not required	100%	0%	0%

Table 5.9 summarises the variety of use across the teaching and learning events. It shows that overall, 21% of students do not have much variety of use, as they use a computer for only one teaching or learning event. The majority (54%) use a computer for two teaching and learning events, and 25% are highly varied, using a computer across all three or more teaching and learning events.

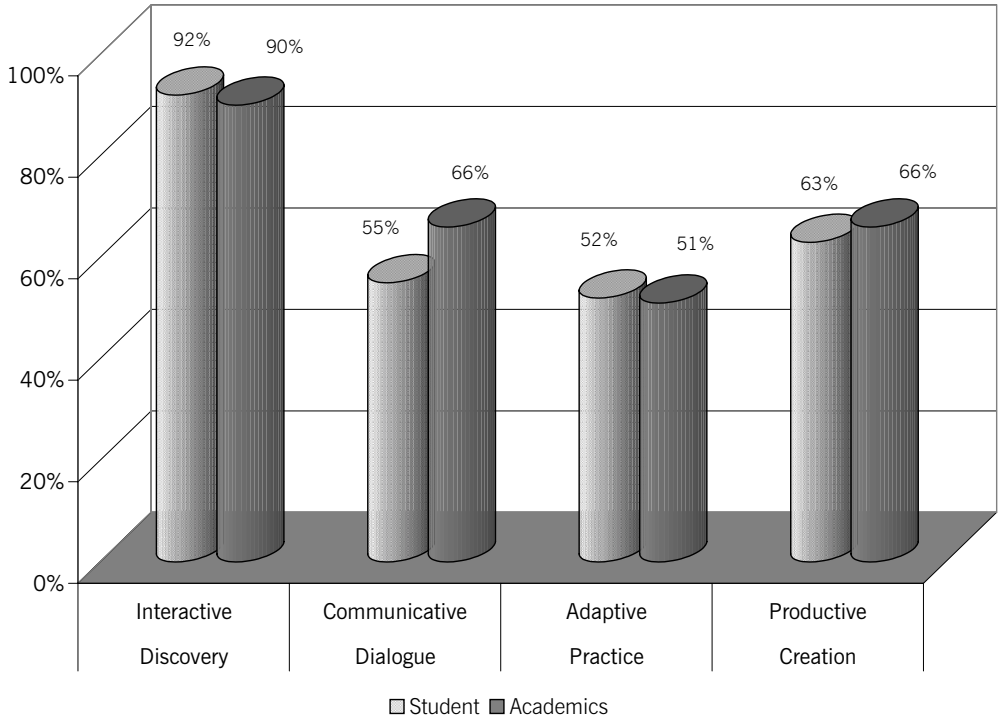
Table 5.10 shows an interesting association between staff requirement for use and student variation of use. When staff require use of computers across teaching and learning events there is a far greater variation of use by students (86%). This is as opposed to when staff do not require use of a computer or only require it for one event when there is unvaried use (between 88% and 100%).

There are some key observations regarding take-up of computer use in higher education in the Western Cape. Firstly, take-up does not appear to be driven only by lecturer requirements within courses, although indications are that this does encourage higher frequency of use. Take-up also seems to occur as students use computers as part of their own learning activities. However, variation of use does seem to be strongly related to lecturer requirements. Secondly, it seems that staff use computers less often themselves than they expect students to use them. These results are tantalising, and further research on what drives students to use computers independently for their learning is needed.

5.2.4 Teaching and learning events most often used in conjunction with computers

In this section we examine how computers are used to support the four teaching and learning events described in Table 5.1, namely discovery, dialogue, practice and creation. The event of acquisition was not examined in terms of overall use as it only pertains to academic staff and not to

Figure 5.3: Comparison between academics' reported use of computers for specific teaching/learning events and students' reporting of what academics ask them to do in terms of those events.[6]



staff and students. However, a detailed description of this event is provided in section 5.2.5.

Computers are most frequently used by staff and students to support the event of discovery (Figure 5.3). The types of media forms which support this event are multimedia resources such as CD-ROM or DVD, and Web resources which include hypertext, enhanced hypermedia[5] and information gateways. This study found that, overall, 90% of staff and 92% of students report that they use computer-based interactive media for teaching or learning. This is consistent across all disciplines.

The next most frequently reported use of computers is for the teaching and learning event of creation (Figure 5.3). Computer affordances offer the potential for user control and intervention, enabling users to make, create and change material online. We found that 63% of students and 66% of staff report using computers as part of an activity to create something.

Using computers for dialogue has been argued to be one of the most significant offerings of the networked computer terrain (Baillie and Percoco 2001), and indeed accounts for the shift from the term IT (information technology) to the current ICT (information and communication technologies). Yet the use of computer-based communicative media forms is not widespread in our findings. Figure 5.3 shows that only 55% of students are asked to use a computer for communicating as part of their courses, and the frequency of use for specific activities is surprisingly low.

Computers are often touted as being unique in offering opportunities for practice, self-paced learning, feedback, drill and practice, and automated feedback (Cantoni, Cellario et al. 2004). Yet computers in our region are not being exploited very extensively for the event, with only 51% of staff and 52% students reporting use of computers for this kind of event.

In conclusion, we can see that computers are used most frequently for the event of discovery and creation. These events are closely associated with online content and with activities such as the writing of assignments, as explained later. There is overall a less frequent use of computers in association with dialogue and practice.

Table 5.11: Use of narrative media forms for the event of acquisition

Think about your experience studying at [your institution]				**Think about your experience teaching at [your institution]**			
Students: How often have your lecturers explained or demonstrated a concept using				**Staff:** How often have you explained or demonstrated a concept using			
	Infrequently	**Occasionally**	**Frequently**		**Infrequently**	**Occasionally**	**Frequently**
PowerPoint or another type of presentation software?	37%	24%	39%	*PowerPoint* or another type of presentation software?	30%	13%	57%
audio and/or video clips?	58%	27%	15%	audio and/or video clips?	36%	15%	49%
Multimedia, e.g. animation?	69%	20%	11%	Multimedia, e.g. animation?	44%	11%	45%
images or slides?	34%	23%	43%	images or slides?	27%	13%	60%
text?	20%	17%	63%	text?	20%	7%	73%

5.2.5 The teaching event of acquisition: use of narrative media forms as reported by staff and students.

Teaching & learning event
Acquisition
Teaching strategy
Show, demonstrate, describe, explain
Learning experience
Attending, apprehending, listening
Related media form
Narrative, Linear presentational, *Usually same "text" acquired simultaneously by many people*
Examples of non-computer-based activity
TV, video, film, lectures, books, other print publications
Example of computer-based activity
Lecture notes online, streaming videos of lectures, DVD, multimedia including digital video, audio clips and animations

We made the assumption that it was predominately staff who used the associated narrative media forms to support the event of student acquisition of content. Narrative media forms are used to support the explaining, describing and showing of content. This was the one event and the one media form where the activities we explored could have involved both computer- and non-computer-related activities and media forms. We also asked both staff and students to report on staff use of narrative media forms.

Table 5.11 demonstrates that from both student and staff perspectives there is not a dominance of use of computers for the event of acquisition in our region. This is indicated by the low frequency of use of computer-based media particularly the low frequency of use of presentation software (students 39% frequency, staff 57% frequency) and multimedia (students 11% frequency, staff 45% frequency). Such use may well be constrained by limitations in classroom facilities with data projectors not always available, a supposition supported by our analysis of staff qualitative responses where lack of adequate classroom facilities was mentioned by many staff as a constraint on use (see Chapter 4, section 4.4.1.3). The activities of explaining concepts using text and images and slides are still the most frequently used for the event of acquisition.

There is a noticeable discrepancy between staff and student reported use of narrative media forms to support student acquisition (Table 5.11). Overall, staff report a higher frequency of use of media forms for the event of acquisition, i.e. staff believe that they frequently use some kind of media to show, demonstrate, describe or explain a concept, whereas students do not agree. This discrepancy is more pronounced when examining the use of computer-based media. While 45% of staff said they frequently use multimedia to explain or demonstrate a concept, only 11%

of students report that staff do so frequently. The highest discrepancies relate to the use of audiovisual material and multimedia.

There may be several reasons for this discrepancy. One possibility relates to sample size, as the 515 staff who responded to the survey were reflecting on their own practice, whereas the 6577 students who responded to the survey were reflecting on the practice of their lecturers overall. Whilst efforts were made to sample staff and students from the same course, this did not occur in the majority of cases. Another possibility may be a different interpretation of the questions. For example, the two groups may view these different media differently – what academic staff think is multimedia, students may not regard as such. Finally, it is possible that staff are over-reporting the frequency of their use.

We examined the use of narrative media forms across different levels (i.e. undergraduate and postgraduate) and years of study.

An interesting anomaly, in our findings, is that students above third-year level report that lecturers use presentation software and images more often than first- and second-year students report them doing (Figure 5.4 and Figure 5.5). We need to establish whether academics are using narrative media to explain and model more with students who are not beginners, and if so, why this would be the case.

5.2.5.1 The use of narrative media forms to support the event of acquisition in different disciplinary groupings

Overall, Health Sciences have the highest frequency of use of narrative media for the event of acquisition compared to other disciplines. Aside from the Health Sciences, students in the hard disciplines[8] of Science and Engineering have a higher frequency of use of narrative media forms than the soft disciplines of Humanities and Business. Staff in the pure disciplines of the Sciences and Humanities have the highest frequency of use compared to the disciplines of Engineering and Business.

This is interesting as both students and staff indicate that high use of computer-based narrative media is occurring in the hard pure disciplines (i.e. Science) which have a higher frequency of lab and practical teaching modes (Smeby 1996). We wonder if this suggests that computer-based narrative media is being used more frequently to explain and demonstrate concepts in lab and practical sessions than in lectures. Another possibility is that the nature of knowledge

Figure 5.4: Students from different years report on lecturers' use of presentation software

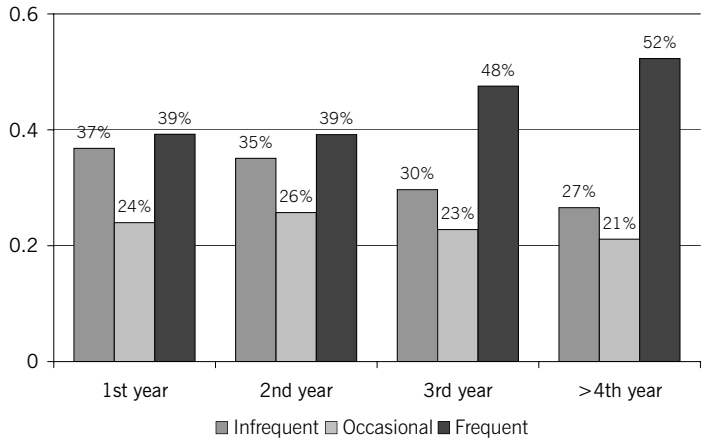
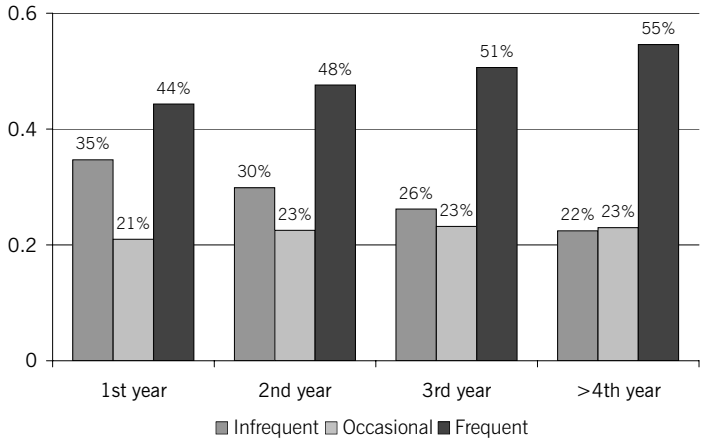


Figure 5.5: Students from different years report on lecturers' use of slides and images



in hard pure disciplines – a tendency towards linear cumulative knowledge that is relatively straightforward and uncontentious, according to Smeby (1996) – makes it more appropriate to use narrative media more frequently.

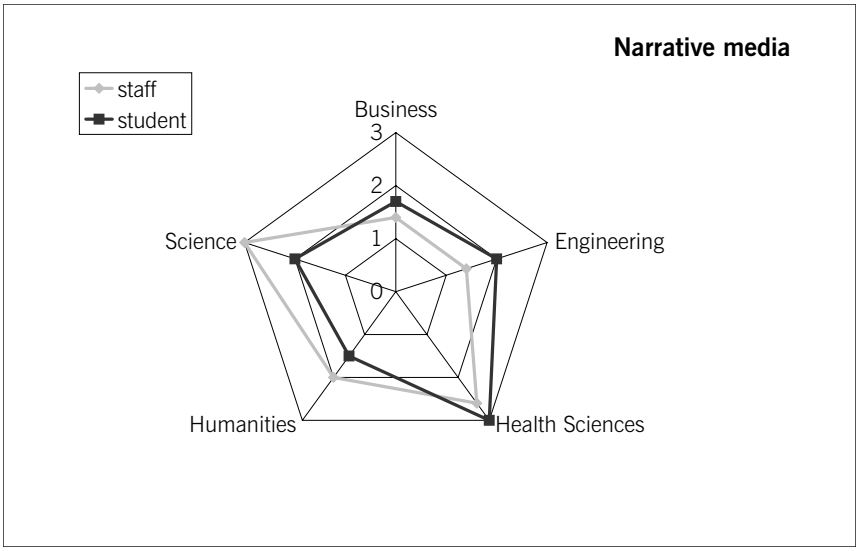
When examining particular uses of narrative media we see that staff from the Health Sciences do not use slides and images and text as frequently as staff in other disciplines who favour computer-based presentational forms such as *PowerPoint*, audio/video clips and multimedia. Staff from Business and Engineering disciplines report lower frequency of use of visual media such as audio/video, multimedia

Figure 5.6 visually depicts the way in which disciplinary groupings are using various media forms.[7] The closer the point to the centre of the web the less frequent the reported use and the further away from the centre the more frequent the use.

This representation enables us to examine

- which disciplinary groupings have a high and low frequency of use of a particular media form compared to each other
- the differences between what students and staff in each disciplinary grouping report in terms of frequency of use.

Figure 5.6: Summary of staff and student indices of use of narrative media across disciplinary groups



animations and images and slides compared to staff from other disciplines.

We were interested that staff from the Sciences report the most frequent use of audio/visual and multimedia activities to explain and demonstrate key concepts, and suggest this is because multimedia resources in the form of video clips and applets are increasingly being made available as part of textbook packages and on the Internet (Freed 2004). We need to establish whether the visual and multidimensional representation of concepts is particularly important in the Sciences. This is an area for closer investigation.

Table 5.12: Details of staff use of narrative media compared across disciplines

Questions	Business	Engineering	Health Sciences	Humanities	Science
Presentation software	2	2	3	2	3
Audio/video	1	1	3	2	3
Multimedia	1	1	2	2	2
Images/slides	1	1	2	2	3
Text	2	2	2	2	3
	1.4	1.4	2.4	2	2.8

** Where 1 equals least frequent and 3 equals most frequent*

5.2.6 The teaching event of discovery: use of interactive media forms as reported by staff and students

Teaching & learning event
Discovery
Teaching strategy
Create, set up, find or guide through discovery spaces and resources
Learning experience
Investigating, exploring, browsing, searching
Related media form
Interactive Non-linear presentational *Searchable, filterable, etc.* *but no feedback*
Examples of non-computer-based activity
Libraries, galleries, museums
Example of computer-based activity
CD-based, DVD or Web resources including hypertext, enhanced hypermedia, multimedia resources. Also information gateways

As mentioned earlier, computers are most frequently used by staff and students to support the event of discovery (Figure 5.2). This study found that, overall, 90% of staff and 92% of students report that they use computer-based

interactive media for teaching or learning. This was the one event where students agreed with staff about the frequency of the use of computers. It is also the only event where the teaching and learning activity of finding information and then finding information using a computer had the same frequency.

One of the most frequent activities involved finding information using the Internet – 60% of staff and 63% of students reported that that they do so frequently.[9] The next most frequent activities were using a computer to find general information about the course and to access lecture notes (43–46% of students did this frequently as did 50–55% of staff). Students reported lower frequency of looking for electronic resources and examples of previous assignments (32% and 35% respectively did this frequently), whilst staff reported asking students to use electronic resources and look for examples of previous assignments more frequently (47% and 53% respectively). This is consistent with a study of undergraduates in the UK that demonstrates that students naturally value convenience above quality of information and that the ubiquitous solution to information seeking appears to be search engines such as *Google* (64%) rather than electronic journals (11%) (Urquhart, Thomas, Armstrong, Fenton, Lonsdale, Spink and Yeoman 2003).

Figure 5.7: Use of audio and or video clips across disciplines

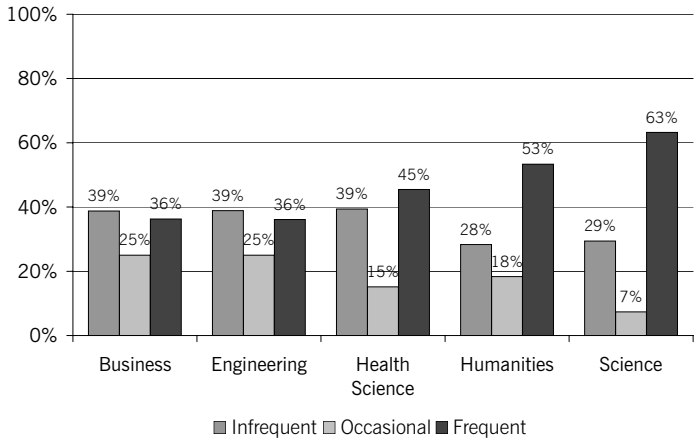


Table 5.13: Use of interactive media forms for the event of discovery

Students Think about your experience studying at [your institution]				**Staff** Think about your experience teaching at [your institution]			
	Yes	**No**			**Yes**	**No**	
Have you ever been asked to *find information* for your subjects?	92%	8%		Have you ever asked your students to *find information* for your subjects?	90%	10%	
Has this ever involved using a computer?	92%	8%		Has this ever involved using a computer?	90%	10%	
Students: If yes, how often do you use a computer to look for				**Staff**: If yes, how often do you ask students to use a computer to look for			
	Infrequently	**Occasionally**	**Frequently**		**Infrequently**	**Occasionally**	**Frequently**
electronic readings?	37%	30%	35%	electronic readings?	26%	21%	53%
lecture notes?	30%	24%	46%	lecture notes?	36%	14%	50%
Internet resources?	11%	26%	63%	Internet resources	17%	23%	60%
general information about the subject?	27%	30%	43%	general information about the subject?	28%	17%	55%
examples of previous assignments?	46%	24%	32%	examples of previous assignments?	41%	12%	47%
Interactive average	**30%**	**27%**	**43%**		**29%**	**17%**	**54%**

Aside from frequency of use, we also examined variation of use. Most students (57%) who used interactive media forms participated in all activities at least rarely or more often, as shown in Table 5.14. This does not measure frequency, but rather whether or not an individual engages with the range of activities for the event of discovery in some way.

The variation of activity indicates that there is a breadth of use. Students use computers to seek information in a variety of ways.

The use of interactive media forms is not the same across the curriculum. Students in preliminary or foundation years report less frequent use of computers for finding electronic readings compared with postgraduate students, who do so frequently. Students in foundation and undergraduate years access lecture notes and examples of assignments more frequently than postgraduate students do (see Figure 5.8). This is not surprising given that first-year students are more likely to be supported. The earlier the level of study the more scaffolding is necessary.

Table 5.14: Variation of student use of interactive media forms for activities with the event of discovery

	Count	Percentage
Unvaried	2346	42%
Varied	3187	58%
(n)	5533	

** Varied = use of more than one activity*

A closer look at undergraduate students reveals that those in their first year are less likely to use a computer as part of a discovery event. Students in later years also use electronic readings and Internet resources more frequently than students in earlier years (Figure 5.8). Our interpretation is that the use of interactive media is closely associated with research activities. It would appear that as foundation and undergraduate students (particularly those in lower years) are not required to undertake much research; they use this media form less often.

Figure 5.8: Breakdown of frequent (weekly/daily) use of interactive media by students overall, at different levels and different years of undergraduate study

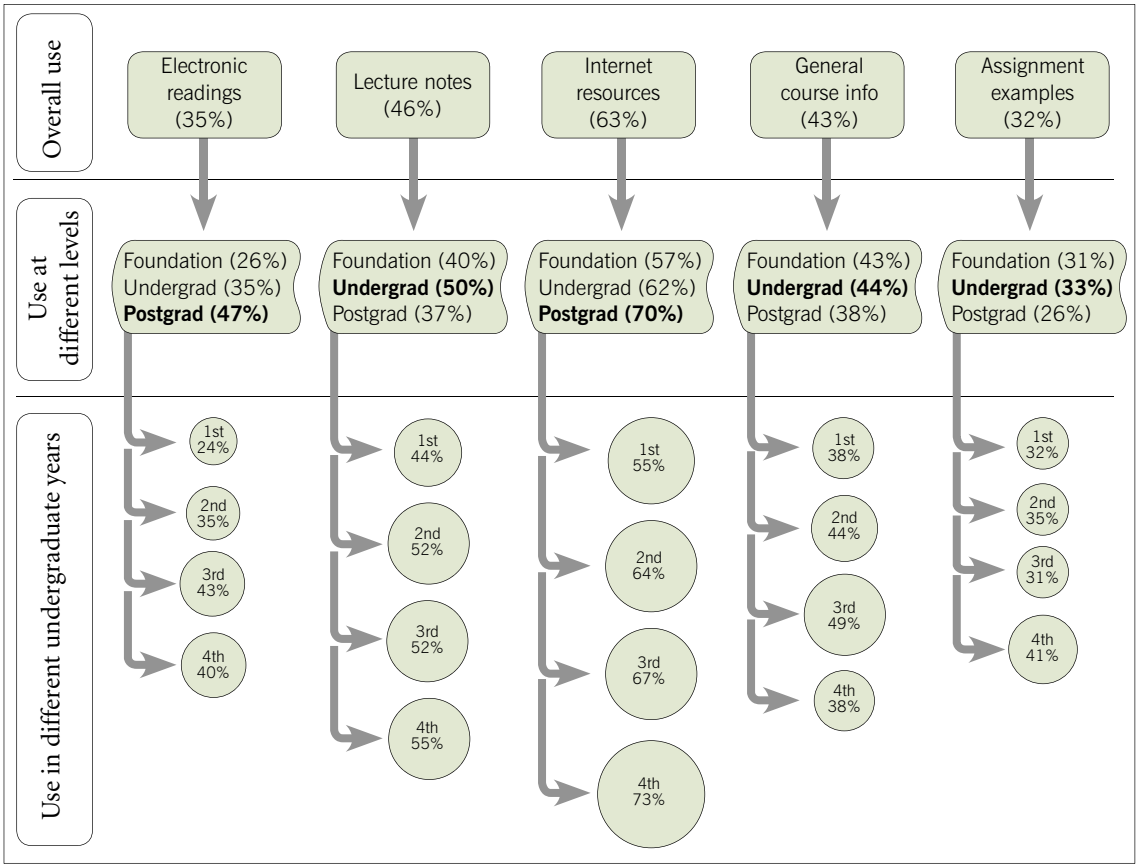


Figure 5.9: Summary of staff and student indices of use of interactive media across disciplinary groups

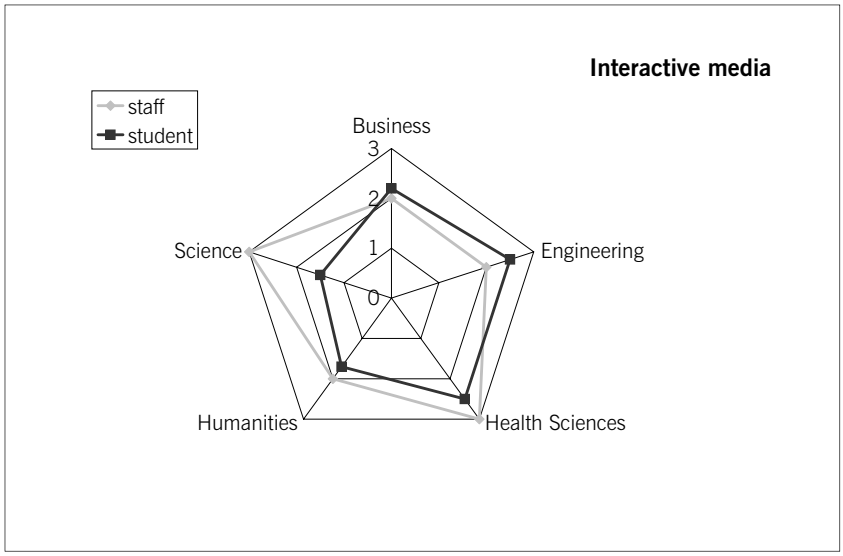


Figure 5.9 visually depicts the way disciplinary groupings are using various media forms. The closer the point to the centre of the web the less frequent the reported use and the further away from the centre the more frequent the use.

This representation enables us to examine

- which disciplines have a high and low frequency of use of a particular media form compared to each other
- the differences between what students and staff in each discipline report in terms of frequency of use.

5.2.6.1 How interactive media forms are used to support the event of discovery in the different disciplinary groupings

When looking at the use of computers for the event of discovery, staff report a higher frequency of use of interactive media in the hard disciplines of Science and Health Sciences compared to the soft disciplines of Humanities and Business, whereas students note more frequent use of interactive media in the applied disciplines of Engineering, Health Sciences and Business compared to the pure disciplines of Science and Humanities (Figure 5.9).

These findings contradict a US study, which found that undergraduates in soft disciplines engaged in more information-seeking behaviour than those in hard disciplines, and that undergraduates in pure disciplines engaged in more information-seeking behaviour than those in applied disciplines (Whitmire 2002).

There is concurrence between staff and students from Humanities and Business disciplines in terms of their frequency of use compared to other disciplines. However, as with narrative media, students from Science disciplines are reporting less frequent use of interactive media compared to students from other disciplines, whilst staff from Engineering disciplines are reporting less frequent use of interactive media compared to staff from other disciplines.

Examining specific uses of interactive media, we see no disciplinary differences in terms of students' use of the Internet. This is one of the activities that is most frequently used by all students across the region. Unlike a UK-based study (Hammond and Bennett 2002), which found that a predominant use of computers in the Humanities was individual study of resource materials, we found that resource materials were important across a wider range of disciplines.

Science students report less frequent use of computers for electronic readings and lecture notes compared to students from other disciplines. This contradicts findings from the UK, which demonstrate that Clinical and Science students make greater use of databases and electronic journals than Humanities and Arts students (Urquhart, Thomas et al. 2003).

We also note that Science and Health Sciences academics report a high frequency of asking students to use a computer to look for examples of previous assignments, and imagine that this reflects common strategies for teaching and learning in those disciplinary areas. We are curious, however, about why these and not other discipline groups specifically adopt this strategy.

It is interesting that we can discern no particular pattern, in terms of Biglan's framework, in the use of interactive media.

In fact, aside from Health Sciences, our findings contradict other studies that demonstrated that Science students make greater use of electronic databases and journals, and that undergraduates in the soft disciplines engage in more information-seeking behaviour than those in hard disciplines. Perhaps it is because this is the media form with which almost all staff and students engage frequently, therefore disciplinary differences are not pronounced. Certainly aside from Science and Health Sciences staff there seems to be very little difference in frequency of interactive media between disciplines.

5.2.7 The teaching event of dialogue: use of communicative media forms as reported by staff and students

Teaching & learning event
Dialogue
Teaching strategy
Set up, frame, moderate, lead, facilitate discussions
Learning experience
Discussing, collaborating, reflecting, arguing, analysing, sharing
Related media form
Communicative Conversation with other students, lecturer or self
Examples of non-computer-based activity
Seminars, tutorials, conferences
Examples of computer-based activity
Email, discussion forums, blogs

Dialogue is the foundation of the pedagogical relationship (Vygotsky 1978) and is the premise upon which Laurillard's conversational framework of teaching and learning in higher education rests. The classroom has even been described as the site of various forms of dialogical interactions (Stables 2003), and, as mentioned earlier, the affordance of computers for dialogue has been argued to be one of the most significant offerings of the networked computer terrain. We were therefore especially interested to know whether and how communicative media are used by students and staff.

The most frequent activity using communicative media to support dialogue was communication between student and lecturer by email (26% of students and 59% of staff did this frequently – see Table 5.17). Staff exhibited less difference in frequency of use in terms of the other activities, whilst students were quite differentiated.Students engaged in email discussion as their next most frequent activity (22%), followed by online discussion (12%), chat (10%) and lastly online audio and video conferencing (5%).

Table 5.18 shows that few students (22%) who used communicative media forms participated in all activities at least rarely or more often. This does not measure frequency; instead it measures whether or not an individual engages with the range of activities for the event of dialogue in some way. It indicates that the variety of use is limited within the event of dialogue. Students use computers for communication in their studies in a limited way.

Responses from students regarding their general use of computers for communication suggest that 36% of students use a computer to communicate daily and 28% do so weekly (Figure 5.2). However, this high use of communicative media does not translate into their learning

Table 5.15: Student ranking of their use of interactive media according to discipline groupings

Question	Business	Engineering	Health Sciences	Humanities	Science
Electronic readings	2	2	3	2	1
Lecture notes	2	2	3	1	1
Internet resources	same	same	same	same	same
General information about the subject	2	3	2	2	2
Examples of previous assignments	3	3	2	2	2
	2.25	**2.5**	**2.5**	**1.75**	**1.5**

** Where 1 equals least frequent and 3 equals most frequent*

Table 5.16: Staff ranking of their use of interactive media according to discipline groupings

Question	Business	Engineering	Health Sciences	Humanities	Science
Electronic readings	2	2	3	2	3
Lecture notes	2	2	3	2	3
Internet resources	2	2	3	2	3
General information about the subject	2	2	3	2	3
Examples of previous assignments	2	2	3	2	3
	2	**2**	**3**	**2**	**3**

** Where 1 equals least frequent and 3 equals most frequent*

Table 5.17: Use of communicative media forms

Students Think about your experience studying at [your institution]				**Staff** Think about your experience teaching at [your institution]			
	Yes	**No**			**Yes**	**No**	
Have you ever been asked to *communicate* as part of your subjects?	65%	35%		Have you ever asked your students to *communicate* as part of your subjects?	81%	19%	
Has this ever involved using a computer?	55%	45%		Has this ever involved using a computer?	66%	33%	
Students: If yes, how often do you use a computer to				**Staff**: If yes, how often do you ask students to use a computer to			
	Infrequently	**Occasionally**	**Frequently**		**Infrequently**	**Occasionally**	**Frequently**
participate in an email discussion, e.g. a listserver or newsgroup?	54%	24%	22%	participate in an email discussion, e.g. a listserver or newsgroup?	45%	18%	37%
participate in online chat as part of the subject?	74%	16%	10%	participate in online chat as part of a subject?	54%	13%	33%
participate in an online discussion forum as part of the subject?	71%	17%	12%	participate in an online discussion forum as part of the subject?	52%	14%	34%
participate in an online audio/video conference?	88%	7%	5%	participate in an online audio/video? conference	57%	10%	33%
communicate with the lecturer by email?	40%	34%	26%	communicate with you by email?	20%	20%	59%
Communicative average	**65%**	**20%**	**15%**		**46%**	**16%**	**38%**

Table 5.18: Variation of student use of communicative media forms for activities with the event of dialogue

	Count	Percentage
Unvaried	3154	78%
Varied	672	22%
(n)	3154	

** Varied = use of more than one activity*

activities. A generous interpretation of this low usage is that these are all contact institutions. However large anonymous undergraduate classes offer little interactivity, nor much opportunity for academics to gain insight into the difficulties experienced by students (Nicol and Boyle 2003). ICTs offer tremendous possibilities in improving communication and a sense of presence in such contexts. Indeed, it has been noted that "ICT has created one specific new form of contact … Online communication allows learners and educators to remain separated by time and space (although some forms of communication assume people congregating at a common time) but to sustain an ongoing dialogue" (Council on Higher Education 2004, p.76).

Our findings also raise questions about the role of communicative media in the informal learning process. The importance of peer support and learning is evident in the problem-solving strategies students use when they have a problem doing something using a computer (37% of students report asking a friend for assistance, compared to 18% who ask for IT support). A growing body of research is currently demonstrating the potential of peer learning as a powerful enabling learning mechanism in computer-mediated contexts. Nicol and Boyle found that university students in Engineering had a strong preference for peer instruction (Nicol and Boyle 2003) and McLuckie and Topping, who looked at the role of online peer-assisted learning, found that it developed greater self-regulation and self efficacy amongst students (McLuckie and Topping 2004). In the light of the credence of peer learning and the significance of dialogue for learning, the possibilities of computers to facilitate such communication are certainly not being exploited.

In Figure 5.10 we see very little difference in terms of use of communicative media across different levels of study, except in communicating with lecturers by email. This activity is undertaken more frequently by postgraduate students (39%) than those at undergraduate (26%) and foundation (25%) levels. When specifically looking at different years of study amongst undergraduates, we see that 38% of students in fourth year and above email lecturers frequently compared to 23% of students in first year. Students in fourth year and above use online chat (5%) and forums (7%) less frequently when compared to students in lower levels (>10%).

The fact that postgraduate students frequently email their lecturers is probably due to the likelihood of more intense and established relationships.

5.2.7.1 How communicative media forms are being used to support dialogue in the different disciplinary groupings

Health Sciences were well and truly the most frequent in their communicative use as reported by both staff and students. The pure disciplines of Humanities was the next most frequent and the applied disciplines of Business and Engineering had the lowest frequency of use. It is interesting that this pattern of use occurred consistently across all activities related to communicative media.

There is concurrence between staff and students from Humanities and Science disciplines in terms of their frequency of use compared to other disciplines. However, staff from Business and Engineering disciplines are reporting less frequent use of communicative media compared to staff from other disciplines.

This is consistent with reported disciplinary differences in classroom teaching practices. Hard fields place greater emphasis on common paradigms and have more tightly structured courses with highly related concepts and principles, whereas soft fields focus on development of critical perspectives, have open structures that are more loosely organised and place importance on the development of students' ability to communicate (Neumann 2001). We would therefore expect Humanities and Business disciplines to have a greater focus on the use of computers for communication.

Whilst the use of online discussion was not very frequent in Humanities, it was very low in Sciences. This is also consistent with Hammond and Bennett's study that found online discussion features less frequently as an activity within the Physical Sciences (Hammond and Bennett 2002).

Other than the unusual dominance of communicative media in an applied pure discipline (Health Sciences), the other disciplinary findings were to be expected. The fact that computer-based communication is used more frequently in the soft pure disciplines (i.e. Humanities) compared to the hard pure and applied pure disciplines of Science and Engineering is predictable. This is consistent with classroom teaching practices, which show that hard fields have more

Figure 5.10: Breakdown of frequent use of communicative media by students overall at different levels and different years of undergraduate study

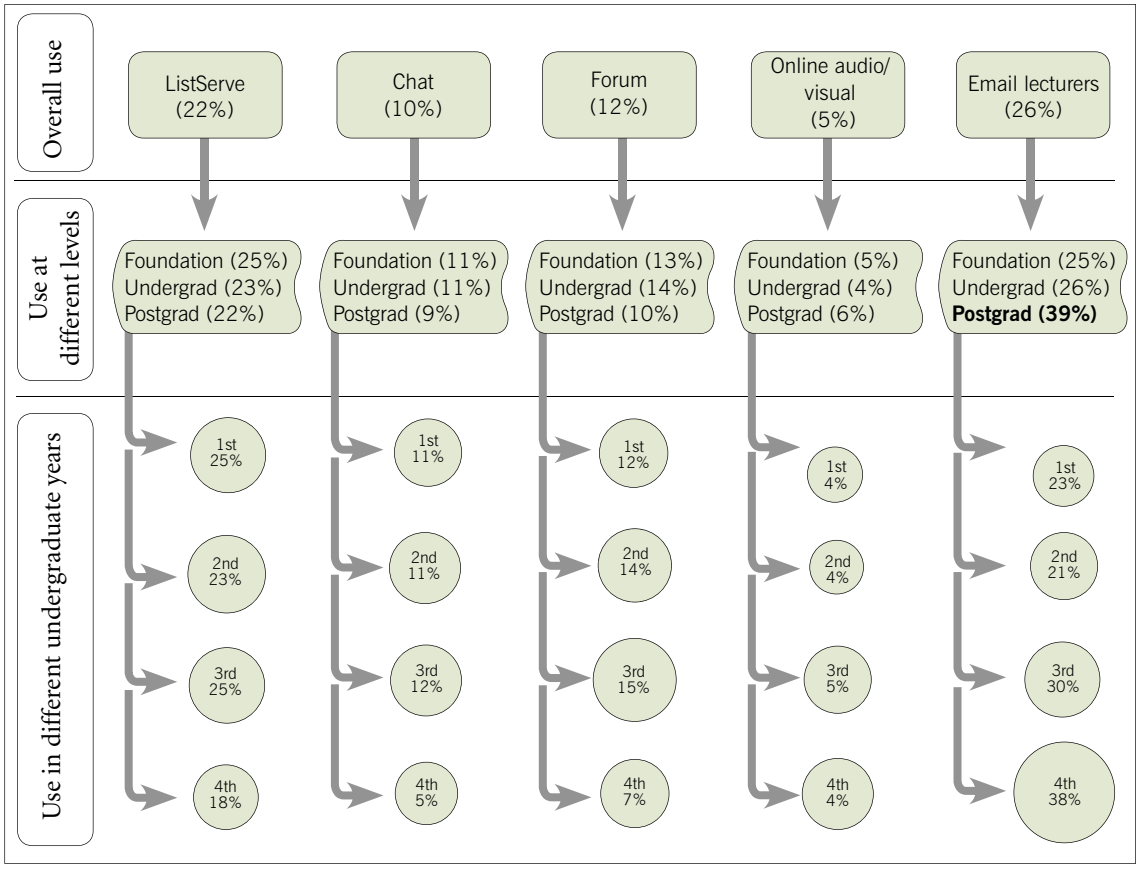


Figure 5.11: Summary of staff and student indices of use of communicative media across disciplinary groups

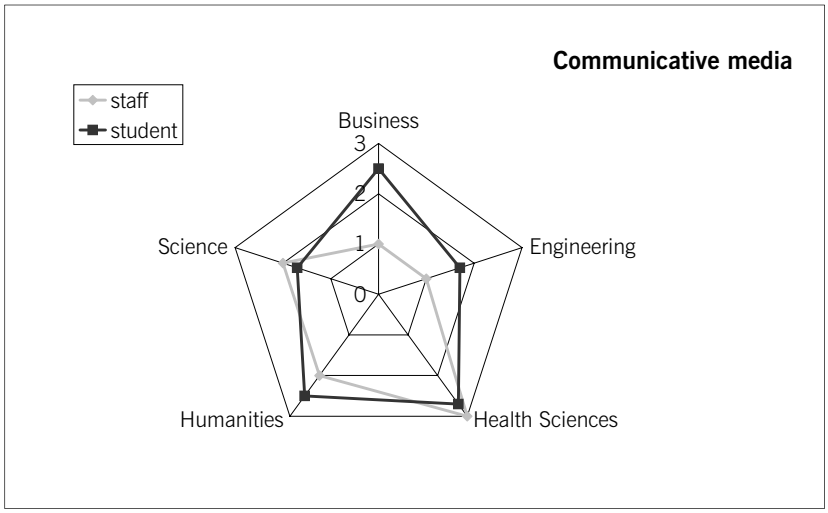


Figure 5.11 below visually depicts the way disciplinary groupings are using various media forms. The closer the point to the centre of the web the less frequent the reported use, and the further away from the centre the more frequent the use.

This representation enables us to examine

- which disciplines have a high and low frequency of use of a particular media form compared to each other
- the differences between what students and staff in each discipline report in terms of frequency of use.

tightly structured courses whereas soft fields focus on developing critical perspectives through communication.

5.2.8 The teaching event of practice: use of adaptive media forms as reported by staff and students

Teaching & learning event
Practice
Teaching strategy
Model
Learning experience
Experimenting, practising, repeating, feedback
Related media form
Adaptive Feedback, learner control
Examples of non-computer-based activity
Laboratory, field trip, simulation, role play
Example of computer-based activity
Drill and practice, tutorial programmes, simulations, virtual environments

Student learning needs to be scaffolded and students need to practise as they learn (Bruner 1966). The affordances offered by computers to enable practice, self-paced learning, feedback, drill and practice, and automated feedback have been highlighted in both this report and the literature (Kennedy, Eizenberg and Kennedy 2000).[10] Yet computers in our region are hardly being exploited for the event of practice. Table 5.19 shows that while 69% of students participated in activities as part of their courses, only 52% used a computer to do so. Whereas 80% of staff asked students to undertake activities in general as part of their courses, only 51% asked students to use a computer to do so.

Table 5.19 shows that students most frequently engaged in activities which provided feedback (28%) and multiple-choice quizzes (26%), whilst staff said they most frequently asked to students to engage in multiple-choice quizzes (28%), and drill and practice activities (32%). The activity which students and staff engaged in the least frequently was use of computer games for learning (13% and 22% respectively).

Table 5.19: Use of adaptive media forms

Students **Think about your experience studying at [your institution]**				**Staff** **Think about your experience teaching at [your institution]**			
	Yes	**No**			**Yes**	**No**	
Have you ever been asked to *participate in activities* for your subjects?	69%	31%		Have you ever asked your students to *participate in activities* for your subjects?	80%	20%	
Has this ever involved using a computer?	52%	48%		Has this ever involved using a computer?	51%	49%	
Students: If yes, how often do you use a computer to look for				**Staff:** If yes, how often do you ask students to use a computer to look for			
	Infrequently	**Occasionally**	**Frequently**		**Infrequently**	**Occasionally**	**Frequently**
a multiple- choice quiz?	49%	23%	28%	a multiple-choice quiz?	56%	16%	28%
a simulation, role play or case study?	42%	32%	26%	a simulation, role play or case study?	55%	18%	27%
a game?	71%	16%	13%	a game?	65%	14%	22%
an interactive task which enables you to drill and practice?	48%	28%	24%	an interactive task which enables them to drill and practice?	51%	17%	32%
a computer activity which provides feedback?	45%	29%	28%	a computer activity which provides feedback?	50%	18%	33%
Adaptive average	**52%**	**25%**	**23%**		**55%**	**17%**	**28%**

Table 5.20: Variation of student use of adaptive media forms for activities with the event of practice

	Count	Percentage
Unvaried	2079	70%
Varied	865	30%
(n)	2944	

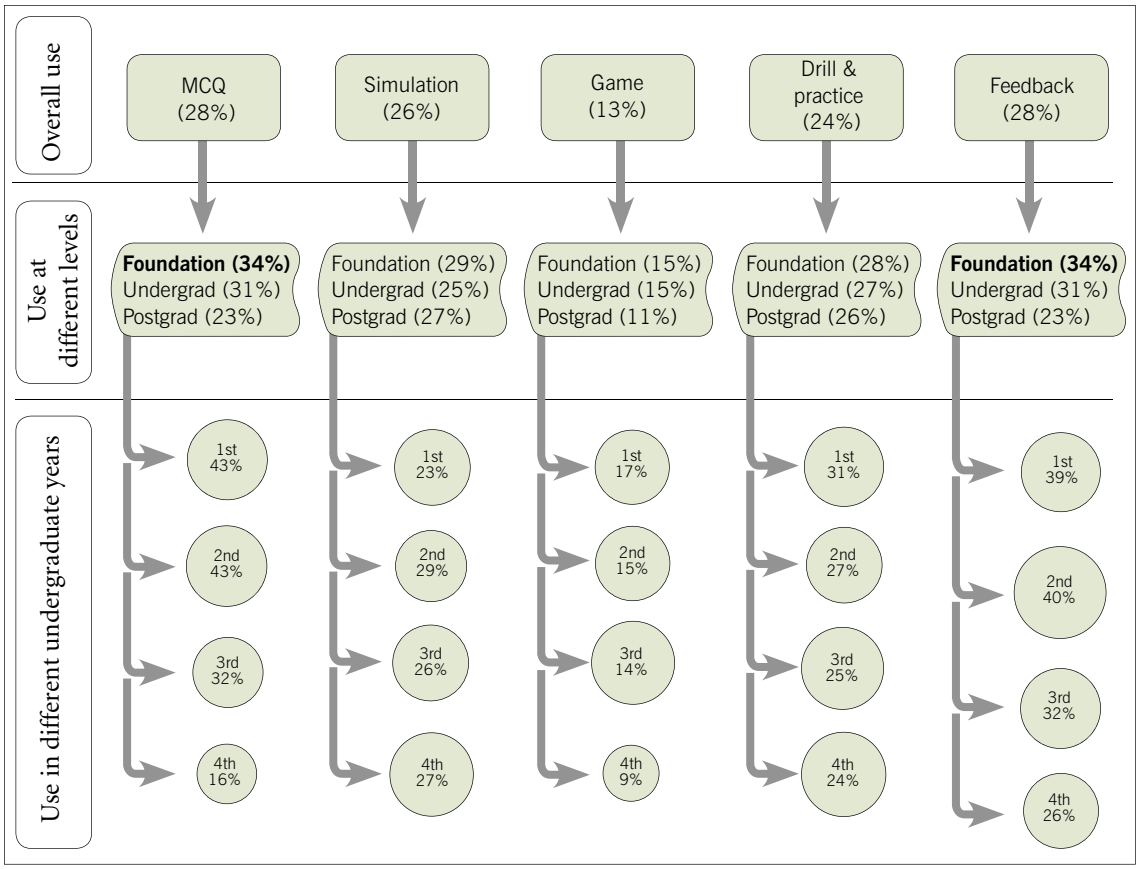
** Varied = use of more than one activity*

The low use of computer games reveals that the possibilities of computer games in educational contexts so assiduously being tried, researched and promoted internationally (Amory, Naicker, Vincent and Adams 1999; Gee 2003, 2004) are hardly being explored in the Western Cape.

Relatively few students (30%) who used adaptive media forms participated in all activities at least rarely or more often. This does not measure frequency; instead it measures whether or not an individual engages with the range of activities for the event of practice in some way.

In Figure 5.12 we can see that the activities of using multiple-choice quizzes (MCQs) and online activities which provide feedback are more frequent among foundation and undergraduate students in particular. For example, 34% of foundation students use MCQs frequently compared to 23% of postgraduate students. First- and second-year undergraduate students in particular make more frequent use of MCQs and computer-based activities with feedback (43% compared to 32% (in third year) and 16% (in fourth year and above). Aside from online activities involving simulations, role plays and case studies (which involve no obvious differences across the curriculum), all adaptive activities show less use in later years of the undergraduate curriculum.

Figure 5.12: Breakdown of frequent use of adaptive media by students overall at different levels and different years of undergraduate study



It is possible that these findings are due to the suitability of scaffolded activities at undergraduate level. It is also possible that adaptive media, which can be time-consuming and expensive to develop, are used at the first- and second-year level where large classes are predominant. Alternatively other reasons may explain the low level of use of computers for practice events. These may include lack of access to appropriate infrastructure, lecturers being unfamiliar with the capabilities built into adaptive media forms, or academics unconvinced of the value of these possibilities.

5.2.8.1 How adaptive media forms are used to support the event of practice in the different disciplinary groupings

In the use of adaptive media students reported frequent use in the applied disciplines of Health Sciences, followed by Business when compared to Science, Engineering and Humanities disciplines. Staff from the hard disciplines of Science and Health Sciences had a higher frequency of use compared to staff from the soft disciplines of Humanities and Business. Staff from Engineering had the least frequent use of this type of media form.

There was no difference between disciplines in terms of use of drill and practice activities. Health Sciences had the most frequent use for all activities, except for using a computer to undertake a game (which students reported doing most frequently in Business disciplines).

In addition to the frequent use in Health Sciences, students from Business and Engineering also make more frequent use of using a computer to undertake a simulation, role play or case study compared to other disciplines. Aside from Health Sciences, students and staff in Business had a high frequency of use of MCQs, whereas students and staff in Engineering had the lowest frequency of use for undertaking MCQs.

These results are particularly interesting when one examines different approaches to assessment between disciplines. Hard disciplines require memorisation (mastery of techniques, factual understanding) and application of course material with a strong practical focus, and soft disciplines are more likely to favour accumulation and shaping of knowledge, and require analysis and synthesis of course content. Knowledge acquisition is emphasised more in pure than applied disciplines with MCQs being favoured as a method of assessment in applied but not pure fields (Neumann 2001).

One would therefore expect these types of adaptive media activities to be more predominant in hard applied disciplines such as Health Sciences, and infrequent in soft disciplines such as Humanities. This is certainly the case in this study, with Health Sciences and Business using MCQs frequently and Humanities less frequently. However, we would have expected a higher use of this type of activity in the Sciences as other studies have demonstrated frequent use of computers to support individual task-based activities such

Figure 5.13 visually depicts the way in which disciplines are using adaptive media forms. The closer the point to the centre of the web the less frequent the reported use and the further away from the centre the more frequent the use.

This representation enables us to examine

- which disciplines have a high and low frequency of use of a particular media form compared to each other
- the differences between what students and staff in each discipline report in terms of frequency of use.

Figure 5.13: Summary of staff and student indices of use of adaptive media across disciplinary groups

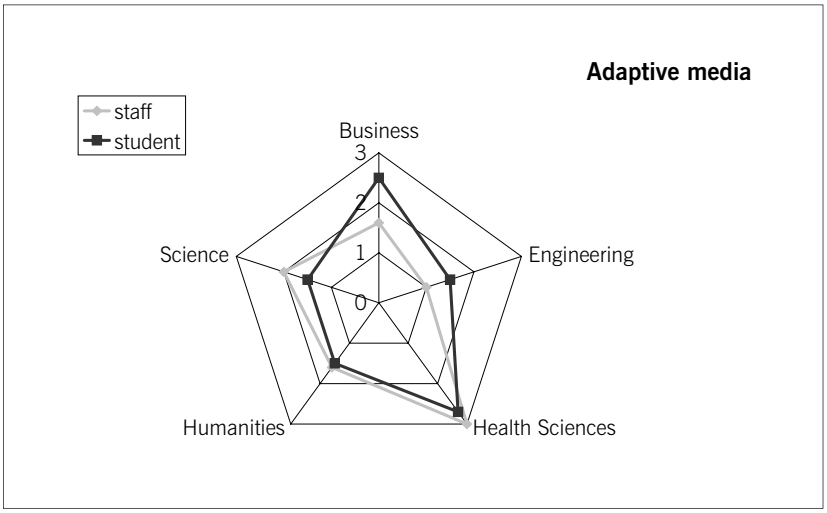


Table 5.21: Student ranking of their use of adaptive media according to disciplinary groupings

Question	Business	Engineering	Health Sciences	Humanities	Science
A multiple-choice quiz	2	1	3	1	1
A simulation, role play or case study	3	3	3	2	2
A game	3	2	2	2	2
An interactive task which enables you to drill and practice	same	same	same	same	same
A computer activity which provides feedback	2	1	3	1	1
	2.5	1.75	2.75	1.5	1.5

** Where 1 equals least frequent and 3 equals most frequent*

Table 5.22: Staff ranking of their use of adaptive media according to discipline groupings

Question	Business	Engineering	Health Sciences	Humanities	Science
A multiple-choice quiz	2	1	3	2	2
A simulation, role play or case study.	1	1	3	1	2
A game	2	1	3	2	2
An interactive task which enables you to drill and practice	1	1	3	1	2
A computer activity which provides feedback	2	2	3	2	2
	1.6	1.2	3	1.6	2

** Where 1 equals least frequent and 3 equals most frequent*

as MCQs in the Physical Sciences (Hammond and Bennett 2002).

On the other hand, the frequent use of a computers to undertake a simulation, role play or case study in Engineering is consistent with the findings of a study that found that technical subjects in Engineering have a high use of simulations, modelling and real software (Baillie and Percoco 2001).

When examining use of adaptive media forms we see patterns emerging along the lines of different approaches to assessment. The applied fields of Health Sciences and Business use MCQs more frequently – this is consistent with non-computer-based teaching and learning strategies (Neumann 2001). However, other studies have shown this type of computer-based activity to be frequent in the Physical Sciences (Hammond and Bennett 2002), which was not the case in our study.

The high frequency of use of computers for simulations, role plays and case studies in the hard applied disciplines (Engineering and Health Sciences) is consistent with hard disciplines' strong practical focus on application of course material. It is also consistent with other studies, which demonstrate the high use of these activities in Engineering (Baillie and Percoco 2001).

It is, however, surprising that the hard pure disciplines (i.e. Science) had a low frequency of use of this media form. Given these disciplines' general focus on memorisation (mastery of techniques, factual understanding), and the way adaptive media lend themselves to practice, self-paced learning, feedback, drill and practice, and automated

feedback, we are interested in why this is the case. Certainly other hard disciplines are using this type of media form frequently for specific activities.

5.2.9 The teaching event of creation: use of productive media forms as reported by staff and students

Teaching & learning event
Creation
Teaching strategy
Facilitating
Learning experience
Articulating, experimenting, making, synthesising
Related media form
Productive Learner control
Examples of non-computer-based activity
Essay, object, animation, model
Example of computer-based activity
Simple existing tools, as well as especially created programmable software

The event of creation was the second most frequently reported use of computers for the teaching and learning (Figure 5.3). This offers possibilities for user control and intervention, where the computer enables users to make, create and change content.

Table 5.23 shows that 72% of students said they were asked to create things and express ideas as part of their course and that 63% were asked to use a computer to do this. This was similar for staff where 81% said they asked students to create things and express ideas as part of their course, whereas only 66% asked students to use a computer to do this.

While these findings are potentially exciting, as they suggest that students are encouraged to make and create as part of the learning process, closer analysis reveals that the most frequent activity reported was use of a computer to write an assignment. We found that the same percentage (78%) of students and staff report frequent use for this purpose. Thus computers may be used as little more than an electronic typewriter, with only small groupings exploiting the more unusual possibilities of learner control and creativity. This concurs with another study of college students in the US that

Table 5.23: Use of productive media forms

Students **Think about your experience studying at [your institution]**				**Staff** **Think about your experience teaching at [your institution]**			
	Yes	**No**			**Yes**	**No**	
Have you ever been asked to *create things & express ideas* for your subjects?	72%	28%		Have you ever asked your students to *create things & express ideas* for your subjects?	81%	19%	
Has this ever involved using a computer?	63%	37%		Has this ever involved using a computer?	66%	34%	
Students: If yes, how often do you use a computer to				**Staff**: If yes, how often do you ask students to use a computer to			
	Infrequently	**Occasionally**	**Frequently**		**Infrequently**	**Occasionally**	**Frequently**
write an assignment?	8%	14%	78%	write an assignment?	10%	12%	78%
create something, e.g develop your own website or make a poster?	49%	24%	27%	create something, e.g. develop their own website or make a poster?	31%	17%	52%
build something using specialised software like CAD, Macromedia, *Excel*?	53%	19%	28%	build something using specialised software using CAD, Macromedia, *Excel*?	32%	17%	51%
Productive average	**37%**	**19%**	**44%**		**24%**	**15%**	**61%**

Table 5.24: Variation of student use of productive media forms for activities with the event of creation

	Count	Percentage
Unvaried	1861	52%
Varied	1680	48%
(n)	3541	

** Varied = use of more than one activity*

showed students used a computer far more frequently for writing documents (on average four hours a week) compared to activities such as creating spreadsheets, presentations and websites (which they spent on average less than two hours a week on) (Kvavik 2005). For example, only 27% of students report frequent use of specialised software to create something. Use of such productive activities differs across the faculties, with this activity being more frequent in Engineering (where 66% of students report frequent use of this activity), and in the Science and Health Sciences disciplines.

More students (47%) who use productive media forms participated in all activities at least rarely or more often. This does not measure frequency; instead it measures whether or not an individual engages with the range of activities for the event of creation in some way. Together with interactive media, this is the only other teaching and learning event where there is variation in use across the event by students.

Figure 5.15 shows that productive (unlike adaptive) activities are more frequently undertaken by students in later stages of the curriculum. The use of computers to write assignments and create things is more frequent amongst postgraduates (89% and 36% respectively) and undergraduate students in fourth year or above. Building things using specialised software is more frequent amongst undergraduates (32%), particularly in fourth year and above (39%).

Figure 5.14: Breakdown of frequent use of productive media by students overall, at different levels and different years of undergraduate study

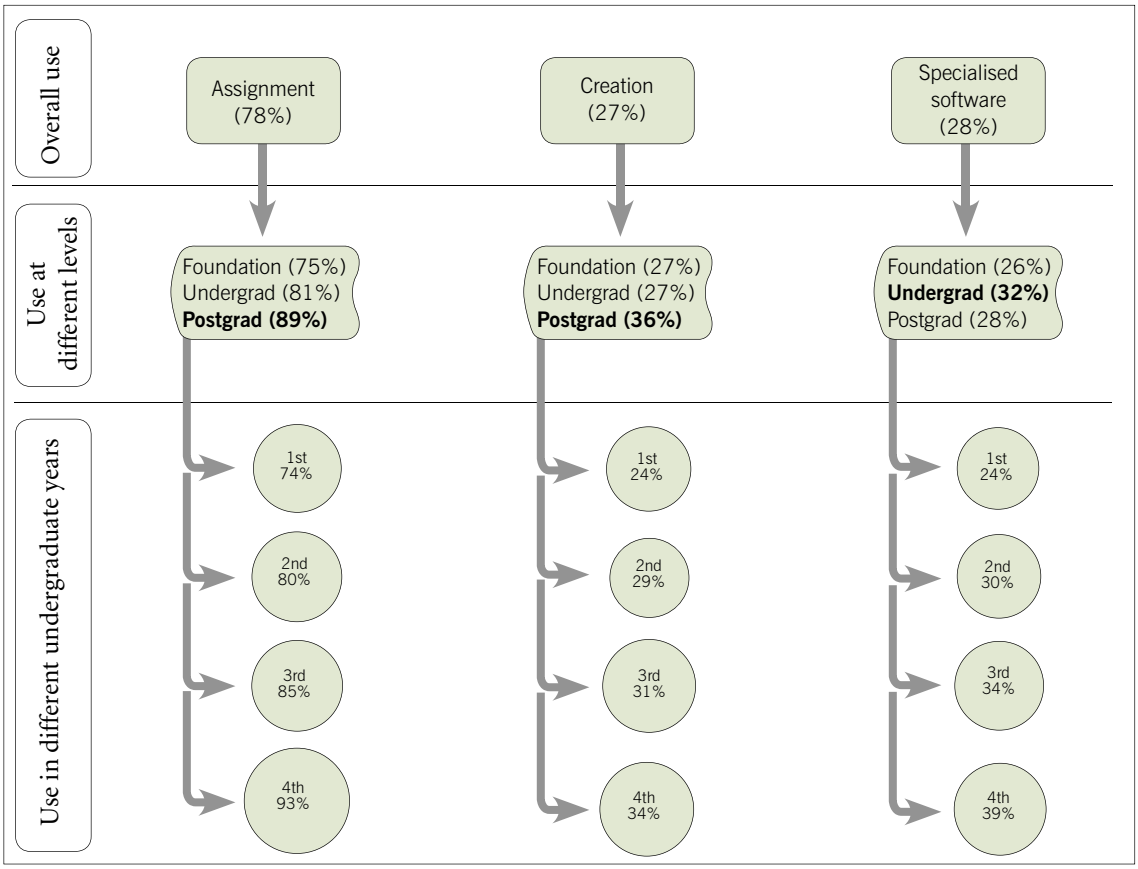
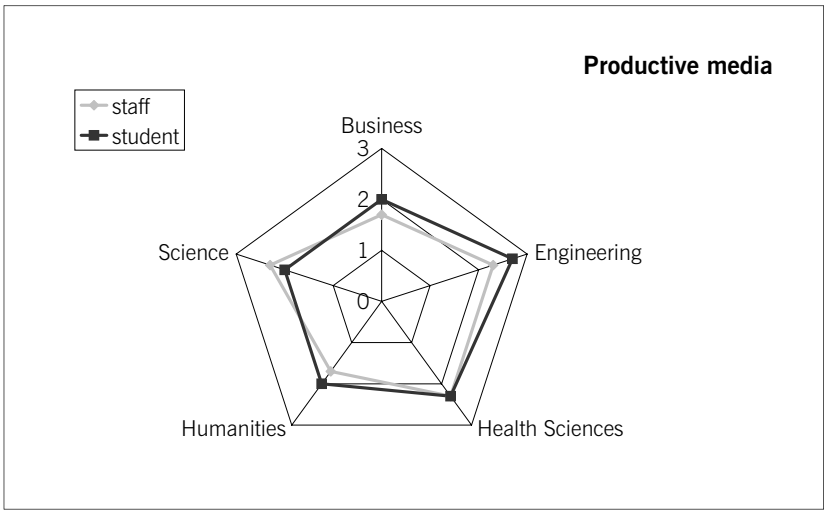


Figure 5.15 visually depicts the way disciplines are using various media forms. The closer the point to the centre of the web the less frequent the reported use and the further away from the centre the more frequent the use.

This representation enables one to examine

- which disciplines have a high and low frequency of use of a particular media form compared to each other
- the differences between what students and staff in each discipline report in terms of frequency of use.

Figure 5.15: Summary of staff and student indices of use of productive media across disciplinary groupings



5.2.9.1 How productive media forms are being used to support the event of creation in the different disciplinary groupings

For this event there was strong concurrence between staff and students in terms of their frequency of use compared to other disciplines. Hard disciplines of Science, Engineering and Health Sciences had a higher frequency of use of computers of productive media (both as reported by staff and students) than the soft disciplines of Humanities and Business.

Humanities has the most frequent use of using a computer to write assignments, Health Sciences and Engineering for using a computer to create something, and Engineering for using a computer to build something using specialised software.

Whilst Engineering academics rarely require the use of computers to support events such as communication or practice, it is unsurprising that they are the ones who most often ask students to use computers to build something, using specialised software.

The literature on differences in approaches to assessment in the hard and soft discipline points towards hard disciplines requiring memorisation and mastery of techniques which favour a strong practical focus (Neumann 2001), such as building and creating things.

The frequent use of productive media in the hard disciplines (i.e. Science, Engineering and Health Sciences) is consistent with favoured approaches to assessment and the practical focus of the hard disciplines. The frequent use by soft pure disciplines (i.e. Humanities) for using a computer to write assignment is also consistent with classroom teaching and learning approaches. Soft pure disciplines focus more on the shaping, analysis and synthesis of course material in the form of essays and discursive pieces, so assessment has a strong focus on writing.

5.2.10 The use of media forms by various social groups of staff and students as part of specific teaching and learning events

Age and position

Some differences in the frequency of use of media forms are apparent with regard to age. Older staff members report less frequent use of most computer-mediated teaching and learning activities. Table 5.27 shows how use decreases by a few percent as the age category increases. For example 38% of the under-25s use a computer frequently, compared to 28% of the over-50s. The details of use reveal that the exceptions are use of the Internet to find information and students emailing the lecturer.

There are also differences in use according to academic staff positions. Academics in more senior positions report use of computers for presentational purposes more frequently than those in junior positions. Table 5.27 shows that 47% of

Table 5.25: Student ranking of their use of adaptive media according to discipline groupings

Question	Business	Engineering	Health Sciences	Humanities	Science
Write an assignment	2	2	2	3	2
Create something, e.g. develop your own website or make a poster	2	3	3	2	2
Build something using specialised software like CAD, Macromedia, *Excel*	2	3	2	1	2
	2.0	2.7	2.3	2.0	2.0

** Where 1 equals least frequent and 3 equals most frequent*

Table 5.26: Staff ranking of their use of adaptive media according to discipline groupings

Question	Business	Engineering	Health Sciences	Humanities	Science
Write an assignment	2	3	1	2	2
Create something, e.g. develop your own website or make a poster	1	1	3	1	2
Build something using specialised software like CAD, Macromedia, *Excel*	2	3	3	2	3
	1.7	2.3	2.3	1.7	2.3

** Where 1 equals least frequent and 3 equals most frequent*

Table 5.27: Relationship between staff use of computers for teaching and learning and age

	< 25 years	26–30 years	31–40 years	41–50 years	>50 years
Infrequent	27%	22%	26%	22%	41%
Occasional	34%	40%	40%	46%	30%
Frequent	39%	38%	34%	32%	21%

professors report frequent use of computers for all activities, compared to 34% of associate lecturers. The exception is use of computers to support practice events.

It is of note that academic staff over 40 and in junior positions were the least frequent users of computers for teaching and learning across all media forms (Figure 5.16). This is interesting in the light of the findings reported earlier that students in the later years of the curriculum also report higher usage of presentational media by lecturers. One contributory explanation for this may be that senior academics may teach the more senior classes and that may be linked to this difference in use of presentational media across the curriculum.

We also note a decrease in use amongst older students: 63% of under-20-year-olds report an overall use (occasional or more), compared to 40% of students over 40 years of age. Students of all ages report a high frequency of use for interactive media and communication, in particular emailing lecturers. However, younger students (under 30) are much more frequent users of adaptive media (48–60%) using,

Table 5.28: Relationship between staff use of computers for teaching and learning, and position

	Associate lecturer	Lecturer	Senior lecturer	Associate professor	Professor
Infrequent	32%	32%	36%	18%	27%
Occasional	34%	44%	38%	39%	26%
Frequent	34%	24%	25%	43%	47%

Figure 5.16: Comparison off overall use of computers for teaching and learning between older junior staff and older senior staff

for example, MCQs more than occasionally when compared to 35% of over-40-year-olds. The most notable age-related difference is in the reported use of chat for communicating. Here 26% of younger students report more than occasional use, compared to only 3% of older students.

Both younger students and staff report an increased as well as a more varied use of computers for teaching and learning. The activities used equally across all age groups are the use of the Internet to find information and the use of email between staff and students.

Gender

Our overall findings with regard to gender and use showed that for students there are no gender differences in terms of overall frequency of use. These findings contrast with research amongst students in African schools which continues to find gendered differences of use (Derbyshire 2003).

We found no marked gendered difference in use amongst academic staff. This in concordance with another African study of 200 academics at ten universities in Nigeria and Kenya, which also found no gender differences in the use of the Internet, with female and male staff using it equally (Oyelaran-Oyeyinka and Adeya 2004).

5.3 Concluding comments on use of computers

Many of the findings of this study provide confirmation of opinions based on hearsay or anecdotal evidence. Our sense that computers are an intrinsic part of teaching and learning in higher education has been confirmed by findings which show that almost no students or staff report that they never use computers as part of teaching or learning events. This means that almost all students and staff report use of some kind. In addition, our study has demonstrated the shifting role of computers within institutions, from predominantly administrative use and minimal use for teaching and learning, to environments where computers are even being reported as being used more for teaching or learning than for any other purpose.

The general commonsense view that younger people are growing up "digitally" (Tapscott 1997) is also confirmed in this study, which shows that amongst younger staff and academics there is more frequent and varied use of

computers as part of their practice. More interesting is the finding that students are using computers as part of their learning activities much more than when asked to do so by academics teaching their courses. While we do observe academic requirement as a driver, it is evidently not the only one. Researchers internationally have been arguing that young adults today think and learn differently because they have grown up with interactive technology at their fingertips (Seely Brown 2002). Locally the assumption has been that limited access makes this kind of integration unlikely. Our findings suggest that broader digital cultural influences are infiltrating higher education and changing students' computer-mediated learning practices. This needs urgent further investigation.

These findings open the door to questions about staff–student interactions, and have immense implications for institutional staff development strategies.

On the other hand, our findings show quite conventional uses of computers, and indicate that the affordances of the new technologies are not being acknowledged in higher educational classroom environments. The potential of certain attributes of computer technologies are not being exploited in support of student learning.

The most dominant uses of computers are the use of interactive media forms which enable engaging with and finding online content, and the use of productive media forms, largely to write assignments.

The extensive use of interactive media highlights the significance of online content in higher education today. This suggests the redefinition of the roles of libraries and librarians in higher education. It also signals the importance of related crucial issues such as plagiarism, information literacy and critical literacy to learning designers, academics and institutional policy makers.

Institutional staff development strategies in the Western Cape will also need to grapple with ways to encourage the most effective application of the potential embedded in computers. While our findings show general use of computers for communication, they show low use for educational purposes. With interactivity and dialogue at the heart of the educational enterprise, computers offer real options for student learning improvement. Similarly computers offer opportunities for self-paced practising and repetition needed as part of the learning process. Our findings also show that the functionality afforded by computer technologies to support these activities is hardly being utilised.

Our findings throw up challenges and identify anomalies. We did not set out to specifically investigate whether the use of computers challenges existing disciplinary-linked teaching and learning strategies. Yet in the light of the existing literature our findings show that in one case (Health Sciences) where computers are used extensively and in varied ways, there is also evidence of teaching and learning strategies not usually associated with this disciplinary grouping being utilised.

We were surprised too by the generally low extent and variety of use reported by the business-related disciplinary groupings, partly because this contradicts findings from elsewhere, but especially as it appears to fly in the face of the apparent needs of business graduates in the workplace.

Finally, the analytical framework we used enabled us to consider use in relation to specific teaching and learning events and the survey provided a useful research tool in sketching the landscape of computer use in the Western Cape. It has identified areas for closer analysis and provided pointers for policy makers wishing to ensure that their extensive investment in technology in the region is justified by more extensive exploitation of the possibilities of computers to support effective student learning.

Endnotes

1 Calculated by examining the number of times a respondent answered "never" or "rarely" to a question and then divided by the number of responses they made. This tells us how many respondents answered "never" or "rarely" in ALL their responses.

2 This forms a contrast to studies from other contexts such as telecentres, which suggests that while computers exist they are often not being used (Benjamin 2000; Warschauer 2003a).

3 Represents an average of responses for "regularly" and "often" for the five activities listed for the event of discovery (see http://www.cet.uct.ac.za/pie/Cz_Brown.htm for further details).

4 Calculated by examining the number of times a respondent answered "never" or "rarely" in ALL their responses and conversely, how many respondents used at least one activity occasionally or more frequently.

5 Navigation and annotation, and through various media elements such as images and videos, e.g. image maps.

6 Students and staff who responded in the affirmative when asked if they used a computer as part of their

courses for finding information, communication, participating in activities, creating things and expressing ideas

7 See section 3.3.2.3 in the Methodology which explains how we grouped the 34 faculties surveyed into disciplines, how these disciplines were organised according to Biglan's framework and how the indices were calculated.

8 Biglan's framework organises disciplines into four fields, these being hard pure fields (natural and pure sciences), hard applied fields (science-based professions, e.g. engineering), soft pure fields (humanities and social sciences), and soft applied fields (social science-based professions, e.g. business).

9 Frequent = responses of "regularly" or "often"

10 For example, medical students at a university in Australia responded very positively to the opportunities offered by a CD ROM An@tomedia that used visuals from multiple perspectives to assist students in answering questions and solving problems particularly in enabling the student to move between different representation of knowledge.

Chapter 6

Access and use

6.1 Assumptions about access and use

As explained earlier in this study, access to ICTs is complex. Its complexity is twofold. Firstly, the resources to be accessed are multifaceted, and secondly, access and use are incessantly interrelated. Not only is access to computers a requirement before use can be made, but a purpose for use also needs to be established before resources are accessed. This can be imagined as kind of virtual Möbius strip, two sides of a concept forming a continuous closed connection.

In this section, use is specifically related to learning. We firstly establish whether or not there is a relationship between access and use. We then address specific relationships by answering the following questions:

- Is there a relationship between home computer access and frequency of use?
- Is there a relationship between personal agency and frequency of use?
- Is there a relationship between contextual access and frequency of use?
- Is there a relationship between access to digital content and frequency of use?

We then look at what a lack of access to these resources means in terms of the use of computers to support learning activities.

We have chosen to focus only on students in this discussion as their access is more highly differentiated than that of staff.

6.2 The relationship between access, frequency and variety of use (for learning)

In order to examine this relationship at a macro level, we first considered whether or not there was a relationship between access and use. We examined two groups of students: those with a below-average frequency of use for learning (53% of the sample), and those with an above-average frequency of use for learning (47% of the sample). We then compared students' frequency of use with their level of access. By doing so we are able to observe that 82% of the students with a high use also have high access (Figure 6.1). This suggests that high access is a strong contributing factor to frequent use, albeit not the only one.

Conversely, low access does not, however, seem to account quite as markedly for low use. Indeed, although 42% of students with low use also have low access, 58% of the students with low use actually have high access (Figure 6.1). This suggests that while there is a relationship between the two, low access is not the only factor contributing to infrequent or low use amongst students.

Figure 6.1: Comparison of students' frequency of use and level of access

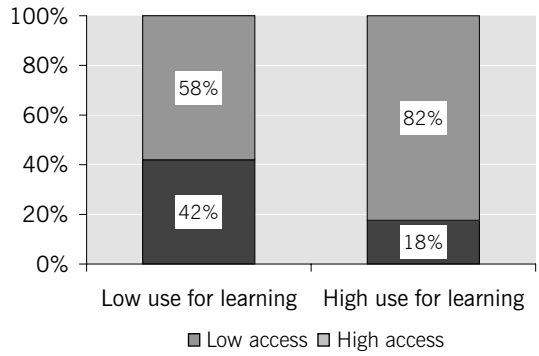
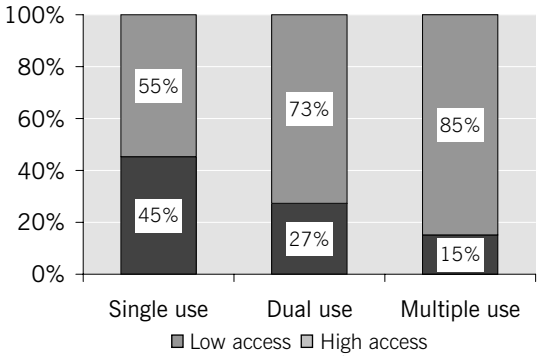


Figure 6.2: Comparison of students' variation of use and level of access



We then examined the variation of use and discovered that 85% of students make use of a computer for a wide range of learning activities. We see too that students with poor access have a more limited range of use of computers for learning, with only 45% having a single use and 27% a dual use.

Given that there appears to be an association between lack of access and lack of use, we are interested to see if we can discern the nature as well as the strength of this relationship.

6.3 Relating lack of access to resources to student computer use for learning

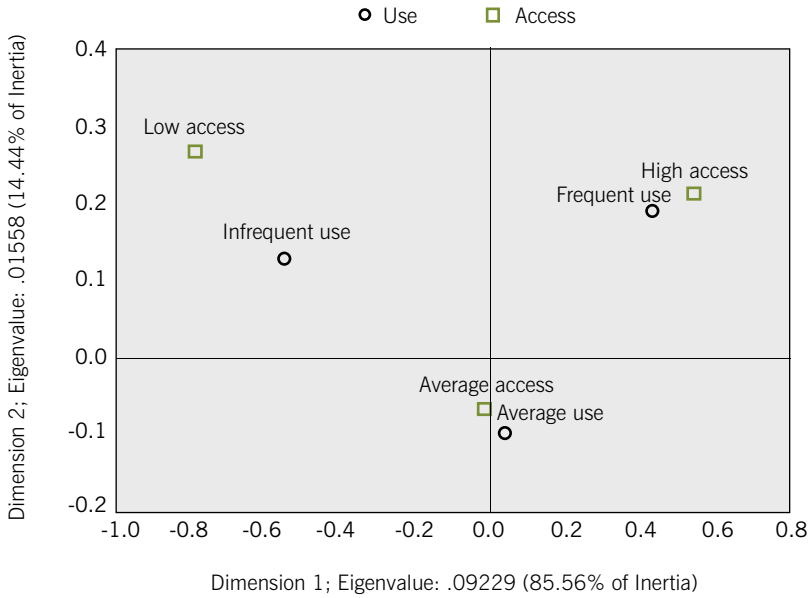
We further explored the access and use relationship using correspondence analysis, a perceptual mapping technique that produces a graphical display of the relationship between different variables or indexes.[1]

We are interested in the relationship between infrequent, average and frequent use of ICTs (represented by the circles) for learning; and low, average and high overall access to ICTs (represented by the squares). This relationship is plotted on a graph.

Figure 6.3 shows a strong correlation between use of ICT for learning and level of access. High access and frequent

To read the graph it is important to look at where the shapes that represent one cluster (e.g. circles, which represent use) are found in relation to another cluster (e.g. squares, which represent access). These graphs should be read by looking at the proximity of the different clusters to each other. One needs to focus on either the horizontal or vertical axes that separate the graph into upper or lower quadrants. If two shapes are located in close proximity on the same side of the graph, this says there is a strong correlation between these two clusters.

Figure 6.3: Relationship between access and use



use are clustered together in the top right quadrant, and low access and infrequent use in the top left quadrant of the graph.

In order to map this relationship between the two variables, this analysis effectively shrinks the results to two dimensions or axes. To get a sense of what each dimension represents, one can examine the points more closely. Dimension 1 (plotted on the x axis) is the most reliable indicator of the associations in the data with an inertia of 85%. In other words, it accounts for 85% of the variation in the data. A closer look at dimension 1 (Figure 6.3) shows that it distinguishes between infrequent and frequent use AND low and high access, thus highlighting the differences between low access and infrequent use (which both fall on the negative side of the axis at a high level of magnitude), and high access and frequent use (which fall on the positive side of the axis, also at a high level of magnitude).

Dimension 2 (plotted on the x axis) only captures 14% of the variation in this data. However, it does seem to be distinguishing between the extremes of access and use (high and low, and frequent and infrequent), and average access and use. However, average access and average use are located close to the point of origin and therefore do not account for much of the variation in the data.

It is important in correspondence analysis to know how well the graph is measuring the variability of the data. The details of this association can be located in appendix 11. It is worth highlighting here, though, that the two dimensions are capturing the associations between the indexes of use and access very well (as demonstrated by the quality value of 1) and that there is a very strong relationship between use of and access to computers for learning (as evidence by the high chi square with a low p value – chi sq. 666.52 p = 0.00).

Delving into this relationship more closely (see details in appendix 11) reveals that low access/infrequent use and high access/ frequent use make the highest contributions to the chi square value.

Figure 6.4 shows that very few students (3%) with infrequent use also have high access.

Conversely, Figure 6.5 shows that very few students who use a computer frequently for learning have low access (2%).

With the relationship between access and use established, we now consider whether there is a particular aspect of access that characterises low use of computers for learning.

Figure 6.4: Categorised histogram of distribution of access amongst students who use a computer infrequently for learning

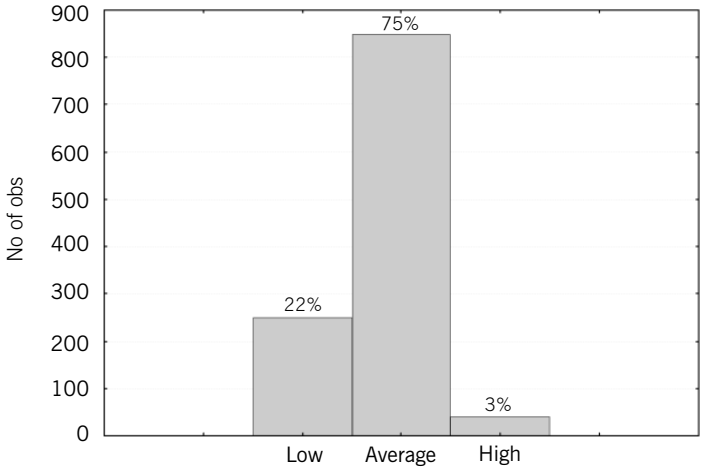
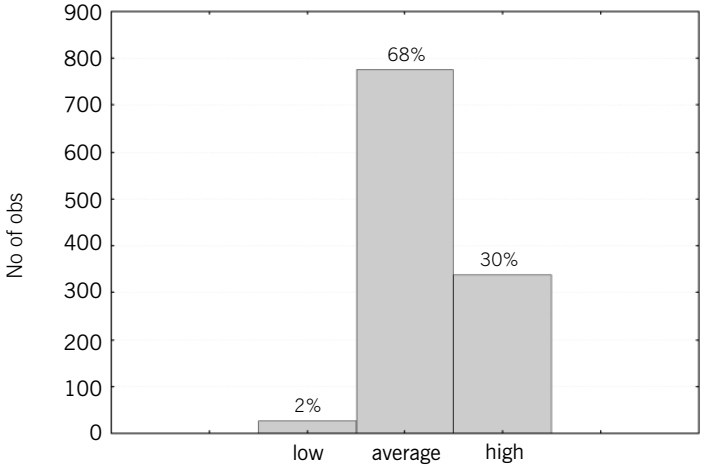


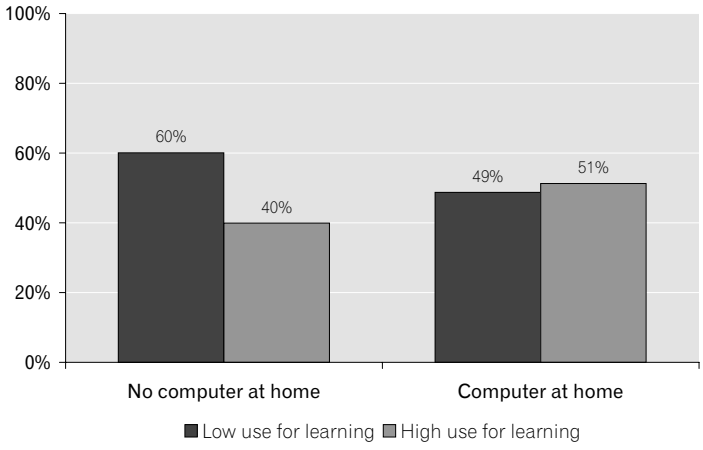
Figure 6.5: Categorised histogram of distribution of access amongst students who used a computer frequently for learning



6.3.1 The relationship between home computer access and frequency of use

A number of studies have suggested a relationship between computers at home and frequency of use. A recent British report notes that the level and quality of ICT use in learning

Figure 6.6: The relationship between home access to a computer and the use of it for learning



is influenced by a number of factors, one of which includes ready access to a home Internet-connected computer (The BECTA Review 2005). Another found that young people were more likely to make effective use of computers if three conditions were in place, one of which was that they had a computer at home (Facer 2002). College students in the US were found to have a greater use of the Internet the longer a computer had been in the home.

In our study we investigated those students who had access to a computer and then the Internet at home, and how this related to their use of a computer for learning.

We find that the majority (60%) of students who do not have access to a computer at home have a below-average use of computers for learning. Lack of a home computer therefore appears to be a constraining factor for use. However, the converse is not true. Students who do have access to a computer at home are comprised evenly of below- and above-average users. It therefore does not appear that having a computer at home increases the likelihood of students using a computer for learning.

This is interesting in the light of the contradictions in the literature about whether home computer access does indeed affect use. While the studies mentioned above support the relationship, at least one other study questions it. A relatively less recent study notes that students with a computer at home do not differ significantly in their overall use of technology in school or college from students without home access. However, students with home computers did use the school/college computers more frequently for Internet and email (Selwyn 1998). This is something that is worth further exploration and research.

In our study the difference in use patterns is not noticeable in terms of having access to the Internet at home, as is evident in Figure 6.7.

6.3.2 The relationship between personal agency and frequency of use

Many researchers have noted the importance of the linkage between personal agency and use. Some have specified that a lack of interest in and aptitude for using computers is a constraining factor in use (Kvasny 2002). Others have found student attitude to technology an enabling factor for use (Miltiadou and Savenye 2003).

We therefore examine the levels of use of students who differ in their disposition and aptitude regarding computers for learning.

Figure 6.8 shows that the majority of students with a low disposition also have below-average use (64%). While the difference in use amongst students with a high disposition is not as marked, a slight majority (56%) of students with a high disposition also have above-average use of computers for learning.

Figure 6.9 shows that 62% of students with a low aptitude also have a low use of computer for learning. Students with an average aptitude have a slightly lower use of computers for learning (55%), whilst more students with a high aptitude also have an above-average use of computers for learning (56%).

6.3.3 The relationship between contextual access and frequency of use

The enabling power of supportive contexts has been noted in the literature, with arguments that strong social networks encourage use (Kvasny 2002). Conversely, lack of social support is observed to constrain use of technology (Warschauer 2003a, 2003b, 2003c). Given that contextual resources seem particularly relevant for students, we were keen to explore this relationship.

Our findings (Figure 6.10) reveal that students with little access to contextual resources in the form of support from families and friends (60%) have below-average use of computers for learning.

The difference in use was not as marked for students with high contextual support, although the majority (55%) did have above-average use.

Figure 6.7: Relationship between having access to the Internet at home and use of a computer for learning

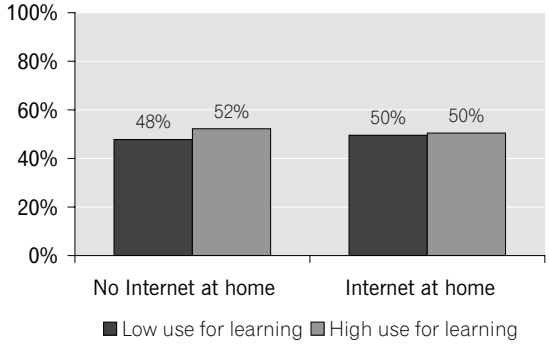


Figure 6.8: Relationship between disposition and use of a computer for learning

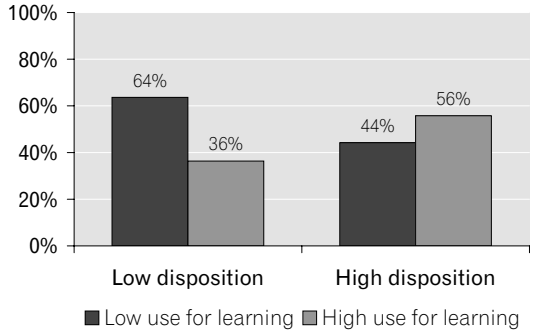
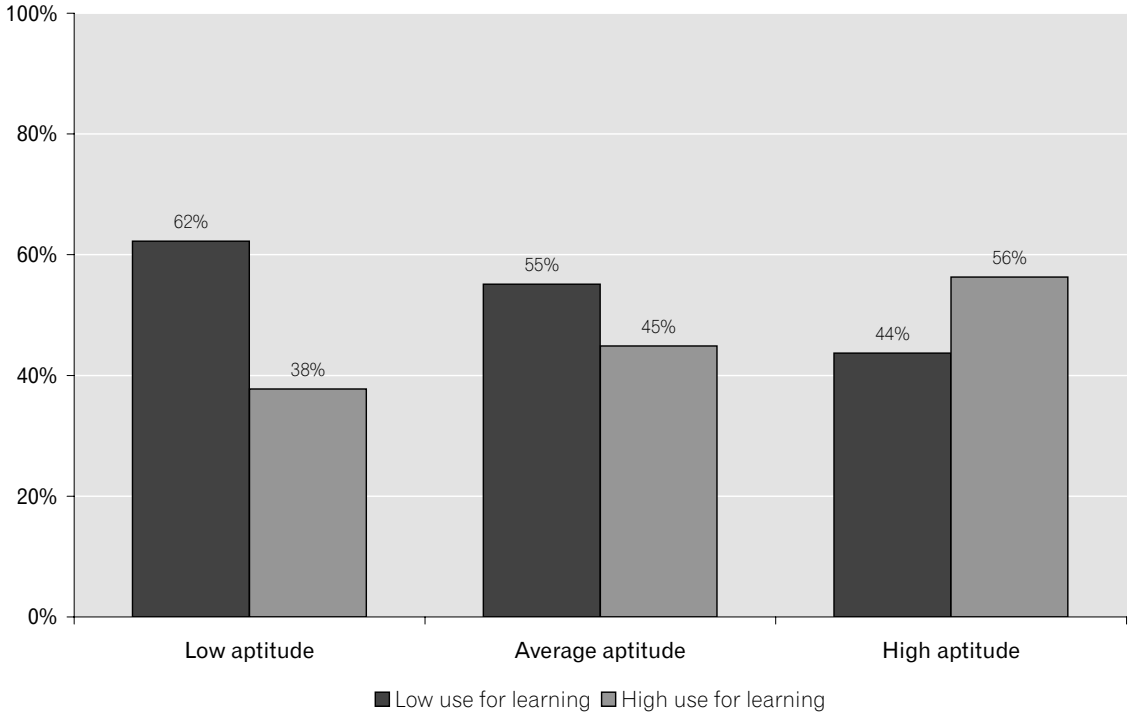


Figure 6.9: Relationship between aptitude and use of a computer for learning



6.3.4 The relationship between access to digital content and frequency of use

Figure 6.11 shows how student frequency of use of computers for learning changes according to perceived adequacy of digital content.

Even though the number of students who perceived digital content to be inadequate was very low, we decided to explore this relationship with use. We looked at those students whose perception of the adequacy of digital content was low compared to those whose perception was higher. Of students who perceived digital content to be less adequate, 58% also had a lower use of computers (Figure 6.11). This

Figure 6.10: Relationship between contextual support and the use of a computer for learning

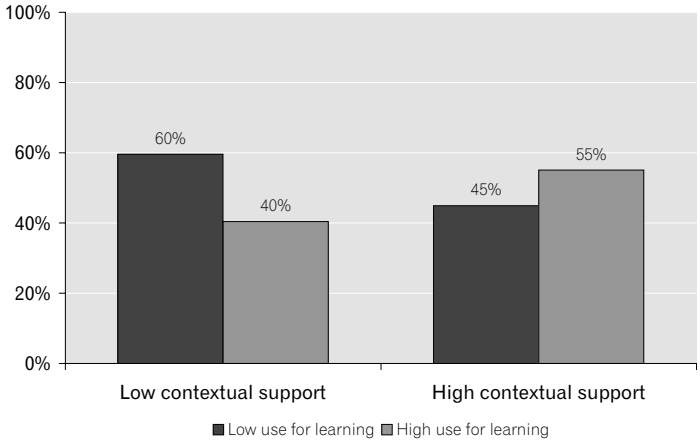
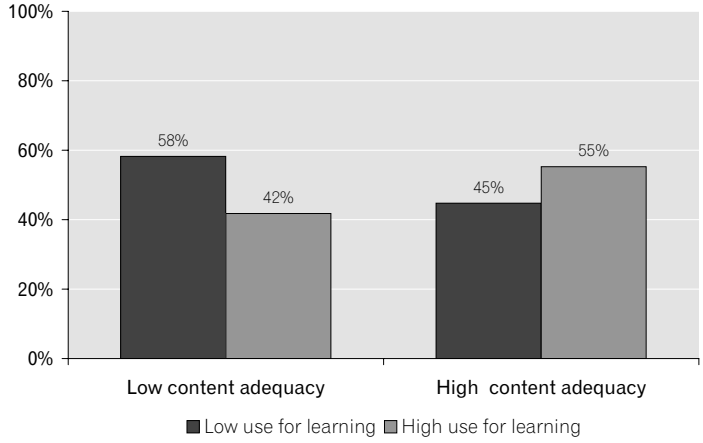


Figure 6.11: Relationship between perceived adequacy of digital content and the use of a computer for learning



is interesting as it demonstrates that although the majority of students think that their access to digital content is adequate, those who find it inadequate also have a below-average use of a computer for learning.

Overall, when we review the relationship between access and use we note that frequency of use is affected by limited access to several resources. Thus frequency of use is constrained by not having computer at home, a low disposition towards using a computer, low computer aptitude, low contextual support and low perceived adequacy of digital content. The converse is not always true. Having a computer or Internet access at home does not appear to enable the use of a computer for learning. Other than that consideration, we do observe slightly more frequent use amongst students who have a high disposition towards using a computer, high computer aptitude, high contextual support and high perceived adequacy of digital content.

6.4 Understanding low use

Despite these relationships described between access and use overall, there are many students with reasonable access who still do not or rarely use a computer. Those researchers who have grappled with student non-use of ICTs (Selwyn 2003; Cushman and Klecun 2005) have argued that non-users are not a homogeneous entity and that the reasons for the lack of use of ICTs are complex and multilayered.

In order to try to understand the reasons for lack of use in our region, we have analysed the qualitative data in more detail.

It is interesting to note in examining the qualitative feedback that people with infrequent use made fewer comments than those with frequent use.

Having made the assumption that access can be an important constraining factor, we focused on that group of students with average access and infrequent use. The group comprised 821 students, i.e. 13% of the total sample.

Of this group we were able to extract meaningful qualitative data from 260 students. The majority of answers were negative. This is not surprising given that respondents are probably more likely to take the time to comment on negative aspects than positive ones. However, 15% of the comments were positive and we have noted into which areas they fell.

We examined these responses in terms of our resource groupings.

Technological resources

Physical access still dominates student concerns. Despite having access, it is not always easy or good enough for their requirements:

The only comment i have is that the computers are extremely slow and at times when you need to log on immediately it takes very long. The computers at [lab] are disastrous they are old. My floppy disc has gotten stuck in them twice in the last 3 weeks.
(UCT, Humanities, 1st year undergrad., female, <20 years, Setswana)

Table 6.1: Comparison of frequency of qualitative responses across different use categories

	% of total sample	% who made qualitative responses	% who did not make qualitative responses
Infrequent use	18%	15%	22%
Average use	61%	62%	61%
Frequent use	19%	22%	16%

However, there are contradictions in needs:

More computers would be very helpful as well as upgrading all computers so that all of them have internet and at least stiffy disk drives for saving.
(UWC, Community and Health Sciences, 3rd year undergrad., female, <20 years, English)

One student talks about wanting newer computers but complains about the lack of stiffy drives (presumably replaced by newer technologies like USB ports and CD ROMs).

The practical conditions of time are the next big issue. This ranges from labs not being open when students want to use them, to long waits for computers, to booking systems which limit use:

To access to a computer in your free time is difficult because you always have to make a booking or stand in long lines. Nothing gets in the way sometimes it's just my fault like if i don't book in time or my laziness. but i do wish they could open the labs all night!!
(UWC, Economic and Management Sciences, 1st year undergrad., female, <20 years, Afrikaans)

Internet access for at least 2 hours not one hour. Sometimes we do research then time ends without finishing.
(UWC, Arts, 2nd year undergrad., female, 21–25 years, isiXhosa)

The issue of affordability emerges particularly in relation to Internet access:

Sometimes its difficult to access info due to the internet fee and at the same time you are in need of the info.
(PenTech, Business, 2nd year preliminary, female, <20 years, Setswana)

i think internet access should be free as some of us are poor & there are a lot of benefits of using it.
(CTech, Business, 1st year preliminary, female, <20 years, English)

Table 6.2: Sample of students who were infrequent users with average access who responded to qualitative questions

Total group	Total who respond to OE Q	Total meaningful responses
821	321 (40%)	260 (31%)

Table 6.3: Frequency and type of responses to open-ended questions – infrequent users with average access

Indicator	Total (n)	Positive (n)
Availability	64	7
Time	59	2
Adequacy	55	4
Interest	27	15
Support	27	3
Cost	26	2
Purpose	18	11
Training	13	
Skills	11	
Knowledge	5	3
Security	2	
Total	**307**	**47**

Its very difficult to keep up with the high cost of internet & you must use your internet bytes very carefully because it is very expensive.
(CTech, Management, 3rd year undergrad., male, <20 years, Afrikaans)

This is an issue which is revealed as a serious reality for a particular group of students, as more infrequent users are from a lower socio-economic group than are average or frequent users.

Interestingly, the two areas which demonstrate the highest proportion of positive comments related to personal agency, particularly the indicators of disposition.

These responses relate to educational purpose:

easier way to find info than to go physically to the library
(CTech, Business, 3rd year undergrad, male, 21–25 years, German)

I like sending emails and gathering info off the net.
(PenTech, Business, 1st year undergrad., male, <20 years, Afrikaans)

They bring fun in learning
(CTech, Engineering, 3rd year undergrad., male, 26–30 years, SiSwati)

My course does not involve using a computer.
(CTech, Applied Science, 1st year, preliminary, female, <20 years, isiXhosa)

And recreational purpose:

To investigate your favourite things
(PenTech, Business, 1st year preliminary, male, <20 years)

Play to many games
(SU, Engineering, 1st year undergrad., male, <20 years, Afrikaans)

Send sms often
(CTech, Management, 1st year preliminary, female, <20 years, English)

Most people had a positive disposition towards the use of computers:

They are the best resources for education students must be encouraged & be taught how to use it.
(PenTech, Science, 1st year undergrad, male, 21–25 years, isiXhosa)

everything is available on the net, if you miss something in class
(SU, Science, 1st year undergrad., female, <20 years, Afrikaans)

However some had a negative disposition:

I think that the computer lessons are a waste of time thus should be optional. Half the time there are not enough computers for everyone so learning is restricted.

(UWC, Humanities, 1st year undergrad., female, <20 years, English)

There is still life outside computers
(UCT, Engineering, 3rd year undergrad, male, 21-25 years, SeSotho)

I use computers when and where necessary other wise i just do it the old fashioned way.
(UCT, Science, 1st year undergrad., female, <20 years, English)

The main issue emerging in terms of contextual resources is support, linked specifically to training and skills:

those who dont know suffer a lot because to shy to ask.
(CTech, Applied Science, 2nd year undergrad., female, <20 years, isiXhosa)

There should be manuals next to all computers at tech as to general usage email etc for those of us who are a little insure about computer usage.
(CTech, Built Environment, 3rd year preliminary, female, 21–25 years, English)

If there could be compulsory comp classes (training) for students esp 1st years which are not having comp as subject.
(PenTech, Science, 3rd year undergrad., male, 21–25 years, isiXhosa)

Interestingly, comments about support are not limited to IT support staff. Lecturers and tutors are seen as support or hindrances as well:

Yes my lecturer mr X does not have patience for us
(CTech, Business, 1st year undergrad., female, <20 years, isiXhosa)

No help from monitors
UCT, Engineering, 1st year undergrad., female, <20 years, isiXhosa)

Table 6.4: Comparison of levels of use and socio-economic group

Level of use	Low SE group	Average SE group	High SE group
Infrequent	55%	23%	22%
Average	42%	25%	33%
Frequent	33%	23%	44%
Grand total	**43%**	**24%**	**33%**

Table 6.5: Comparison of qualitative responses of infrequent users with average access in terms of gender

	Female total	Male total	Female positive	Male positive
Adequacy	25	28		
Availability	28	32	3	4
Cost	**16**	**8**	2	
Interest	**9**	**18**	5	10
Knowledge	2	2		2
Purpose	9	7	5	4
Security	1	1		1
Skills	8	4		
Support	**19**	**8**	1	2
Time	**32**	**24**	1	1
Training	8	5		1
Total	**157**	**137**	**17**	**25**

Unfriendly lecturers
(CTech, Business, 3rd year preliminary, female, 21–25 years, Afrikaans)

Not well taught by our tutors.
UWC, Economic and Management Science, 1st year undergrad., male, <20 years, isiXhosa)

An examination of the gender differences in these responses shows that issues of cost, support and time are more frequently cited by women. These are matters of concern. Men are much more likely to make comments relating to interest, usually in a positive way.

These findings echo and corroborate the quantitative findings in the study.

Overall, our findings show that while students might have average access to technology, particular considerations constrain use. In terms of technological resources, access needs to be easy and available when students need it. Affordability is also a constraining factor. In terms of personal agency, disposition is both an enabling and constraining factor of use.

6.5 Concluding comments on access and use

The correspondence analysis has indicated that there is a relationship between level of access and use of ICTs for teaching and learning, and in general. In particular, low access and infrequent/no use are strongly associated, as are high access and frequent use.

Infrequent users of ICTs are likely to have low access, and frequent users of ICTs are likely to have high access. Whilst this does not account for all cases, it does make a strong case that increasing access also increases use.

We note that infrequency of use is affected by not having a computer at home, low disposition towards using a computer, low computer aptitude, low contextual support and low perceived adequacy of digital content. Lack of access to these resources is a constraining factor of use.

We also note that even where students have average access to these resources, they continue to be constrained by ease and adequacy of access, availability of access, necessary support, as well as the need for a reason to use a computer. These findings confirm our earlier assumptions. Access is not binary – rather it exists in gradations.

Endnotes

1 Correspondence analysis is a descriptive/exploratory technique designed to analyse simple two-way and multi-way tables containing some measure of correspondence between the rows and columns. The results provide information which is similar in nature to those produced by Factor Analysis techniques, and they allow one to explore the structure of categorical variables included in the table.

Chapter 7

Conclusion

In concluding this study we revisit the aims expressed at the outset of this report. We summarise and interpret our findings, review our intentions and suggest ways in which our outcomes can be taken forward.

The first three aims of the study relate to access. The first two focus on the resources that need to be accessed in order to use computers for teaching and learning in higher education. We investigate four resource groupings: technological resources, resources of personal agency, contextual resources and online resources. Our first aim considers students, our second considers staff and our third compares students' and staff access.

Our findings about technological access for students indicate that the provision of data about the presence or absence of mere physical access does not adequately tell the story. Indeed, simply having access to a computer is not enough. Both on campus and off campus, that access is enabled and constrained by practical considerations, which add an additional dimension and increased complexity for students. Access to supportive practical conditions makes all the difference to the student learning experience with computers.

Institutions in our region approach the structuring of student access to computers in quite different ways, with options ranging from centralised or faculty-based approaches to a mixture of both. However, student access is not primarily constrained by the institutional structures nor by the total number of computers they have. Rather, student access is constrained or enabled by the availability of computers.

Opening hours, booking conditions and the conduciveness of the learning environment are crucial to the accessibility of student computers. In all except one of our institutions insufficient availability is a constraining factor.

Students demonstrate creativity when accessing computers off campus even when they have access to a computer at home. Their need to exploit a variety of options is likely due to the limitations of home computers, where few have sole access or Internet connectivity. Affordability is a constraining factor for many students as well.

Students report a higher ease of access at the institutions where computers are made available by the institution for extended hours. This facilitates access particularly to students in residences and those who live close by. It would be worth exploring the reasons for ease of access further as these findings strongly point to ease of access on campus being facilitated by availability as opposed to numbers. At the same time, it is surprising that students report greater ease of access off campus as they have less access to a computer off campus compared to on campus. This could be due to greater flexibility in off-campus use in terms of when and where they access computers, or it could be related to where students live. It might even be due to students' having higher expectations of access on campus. These findings support the inclusion of practical conditions as an integral component of technological access.

Despite the many divisions amongst students in terms of aptitude and experience, there is remarkable consensus

about the value of computers. Students are overwhelmingly positive about the benefits of computers, both generally and particularly, for teaching and learning. Whilst diverse student aptitudes certainly present challenges for educators, their positive views of computers are an enabling resource on which to draw, as is their high sense of self-efficacy.

Students have good access to supportive contextual resources. Given the unanimity of their positive attitudes, it is unsurprising that their friends are more supportive (in terms of interest and actual use) than their families are. Peer support is an enabling resource which students draw on; it creates favourable environments which encourage use. It is also important for learning as we note that students turn to their peers more often to solve computer-related problems than they do formal support structures. These findings suggest that peer-to-peer learning is already in place in some form. They suggest an opportunity for learning designers to consciously incorporate peer-to-peer processes in learning design and curriculum development processes.

Of all the findings of this study, and in the light of the distinct lack of South African content online, the findings regarding online content are the most unexpected. We are astounded that the paucity of relevant local digital content is not considered a matter of concern, and that students do not bemoan their lack of access to suitable, locally produced, contextually relevant content in the languages of their choice. We can only guess at the reasons for the high levels of satisfaction: that higher education content is assumed to be global rather than local in nature, that the language of academia is accepted as being English, and that students lack critical information literacy skills. It certainly warrants further exploration.

Our findings show that access to technological resources is the most difficult and differentiated for students, and therefore, we assume, the most constraining. Resources of personal agency, contextual resources and content resources are reportedly easier to access. Such observations should not, however, suggest that these latter resources are superfluous, and that technological resources form the basis of all access. Indeed, our findings suggest something else: while technological access is necessary, those physical resources may not be drawn on without other resources being in place. Thus access to resources of personal agency and to contextual resources in the form of supportive networks appear to form the foundations of access and use. Without access to *all* these multifaceted resources, technological resources may not be used at all. However these foundations vary in different contexts (for example between staff and students).

We investigated staff access separately from that of students as we expected them to have different experiences of access to resources. And indeed, unlike students, staff do have good access to computers and the Internet at work. This, however, is not always adequate for their teaching needs. Staff mention that they are bearing the costs of improvement in their technological access from research grants despite teaching and learning being part of core university business.

Practical conditions of access are less of an issue for staff than for students, despite the fact that over a third of staff still share access at home. However, the majority of staff have both computer and Internet access at home, and a burning issue which emerges for them is integration between on- and off-campus systems. Their access is additionally undermined by the increasing costs of home computer ownership and connectivity, which they personally carry. An unanticipated finding of this study is the fact that academics are expecting and using networked computers to facilitate virtual working environments which blur the distinctions between on-campus and home working spaces.

We note that staff are enabled by access to an important resource of personal agency – that of a positive disposition towards the use of computers in their working lives. They feel that their lives are being made easier and their work more efficient, and that computers improve their teaching experiences.

Staff are also enabled by their aptitude, with more than half of the respondents reporting more than ten years of computer experience and over two-thirds rating their computer abilities as good to excellent. More than half have availed themselves of training and most have great confidence in their own abilities.

On the other hand, staff are generally not reporting good access to contextual resources. Unlike students who feel they have supportive friends and family, staff are generally unsure what their colleagues think of computers and how often they use them. This suggests both that the collegial encouragement and modelling of possibilities are not predominant, and that academics are not drawing on their colleagues' support for online learning innovation. A related finding is that, rather than ask someone else, over three-quarters of staff prefer to problem solve themselves or ask IT support if they have a problem.

Staff also are constrained by limited access to contextual access at the institutional level. With the exception of one institution, staff use of computers is barely being enabled or driven by formal institutional factors or policies.

As students do, so staff report being very positive about finding digital content that is relevant to their teaching courses and to South Africa. They are also satisfied that digital content is available in the language they want. The majority of respondents from the less monolingual institutions also indicate that they are able to find resources in multiple languages. Given the avowed lack of such resources, we wonder whether they are developing multilingual content themselves and making it available only to their students. Alternatively, they may be particularly adept at locating appropriate multilingual content.

Three of the aims of the study are clustered around use. We set out to determine if staff and students are using computers to support teaching and learning, and if so, to what extent. We also set out to describe staff and student use of specific media forms as part of specific teaching and learning events. Additionally, we aimed to explore staff and student use across the curriculum in relation to level and year of use, as well as use by disciplinary groupings.

The findings of this study corroborate what practitioners and researchers working in online learning in recent years have been sensing – that the use of computers as part of teaching and learning in higher education is increasingly prevalent. With over 97% of all respondents reporting some use, and with commentators reporting little use for computers in teaching and learning in the relatively recent past, we can also conclude that the use of computers has been steadily growing during this "second decade" in higher education in the Western Cape.

The second decade has seen a first wave of an ICT teaching and learning transformation. Indeed the mainstreaming of ICTs for teaching and learning – while still narrow in scope – can be deemed to have occurred from the beginning of the new millennium in the Western Cape.

We note particularly that students report the use of computers to support their learning activities even when they are not asked or required to do so by lecturers and in particular courses. This raises questions about general student digital literacy practices and the interface with their academic practices. It also drives home the disjuncture between students and staff in relation to digital practices, and has serious implications for institutional staff development strategies.

The most frequent student use of computers is for finding information – an indicator, perhaps, of the influence of a broader digital culture where content is king. The unscaffolded nature of that content puts extra pressure on students, who require critical and evaluative skills now more than ever. It also foregrounds concerns about plagiarism and of online content.

Some of the findings of student use challenge conventional wisdom about the possibilities and uses of computers. While computers are known to offer unique opportunities for additional and different kinds of communication, very little evidence of such use for learning purposes emerges from our study. While this may be attributed to all the institutions in the study being contact institutions, it is surprising in the light of general student use of computers for communication purposes. Also, students are generally not exploiting the possibilities offered by computers for self-paced and practice-type activities.

With regard to the use of computers in relation to particular learning and teaching events, we observe definite differences in the use of media forms across the curriculum. In preliminary or foundation years, students' use of interactive media is dominated by the accessing of lecture notes and examples of assignments. Concomitantly, students in later years of undergraduate study use electronic readings and Internet resources more frequently than students do in earlier years. It seems that undergraduate students, especially in the lower years, are not required to undertake much research and therefore use research-related media forms less often. The use of interactive media is closely associated with research activities; the earlier the level of study, the more scaffolding is necessary.

Students in foundation and undergraduate years also report more frequent use of adaptive activities such as those using multiple-choice quizzes and online activities which provide feedback.

Students at higher levels – those above third year – report that lecturers use presentation software and images more often than first- and second-year students report this. We need to establish whether academics are using such narrative media to explain and model more with students who are not beginners, and if so, why this would be the case. One suggestion may be that academics who teach at higher levels may have a lighter teaching load and are therefore able to exploit the opportunities and benefits of computers more easily. Postgraduate and undergraduate students in fourth year or above also report more frequent communication with their lecturers by email than undergraduates do, which is perhaps due to the likelihood of more intense and established relationships with their lecturers. They also use computers to write assignments and create things more frequently, and they use specialised software to build things more frequently.

Students at the lower levels are using computers as part of a narrower range of learning activities. As students progress through higher education, their use of computers for learning becomes more varied and they report a greater breadth in the scope of their activities.

With regard to disciplinary groupings, our findings demonstrate that computers are used differently in terms of both frequency and extent. These differences are closely aligned with entrenched disciplinary-related teaching strategies, suggesting that computers are largely being used to support existing discipline-specific approaches rather than to transform them. It is early days yet. Only a few years ago researchers noted how few studies examine the differences in computer use in relation to disciplines (Neumann and Becher 2002). Ours can be regarded as a contribution which finds that, thus far, knowledge dissemination strategies remain ingrained in disciplinary domains, generally unchallenged by the use of computers.

The notable exception in our study is that of Health Sciences, where the frequency and breadth of use of computers indicate changing teaching strategies. However, given the profound curriculum changes which have taken place in Health Sciences over recent years, these changes cannot be attributed to use of computers alone. In this case it is unclear whether computers are the cause or consequence, with computers having been implemented at the same time as the new curriculum and the two being closely interlinked.

Having reviewed use, we also aimed to examine access and use in terms of the relationship between them. We found that there is a relationship between the level of access and use of computers for teaching and learning. In particular, low access and infrequent or non-use are strongly associated. High access and varied use are strongly associated. There is indication that infrequent users of computers are also likely to have low access and that frequent users of computers are likely to have high access. We can therefore agree with other researchers who emphasise the significant and substantive correlation between technology access and use (Norris, Sullivan et al. 2003).

Lack of access is pertinent for many students. However, lack of use is not constrained by access alone – having a reason or purpose to access computers is crucial. This suggests that there is a strong role for academic staff in defining that purpose and giving students the reason to engage with computers as part of their learning process.

Non-use is a particular topic in its own right. While this study did not set out to specifically engage with it, our findings show that other contributing factors to lack of use include lack of time, high costs and limited support.

We did, however, aim to identify specific groupings for whom access to and use of computers is a particular concern. We found that there are definite differences in access for specific student groups. These differences are more pronounced for some resources than others.

Students from low socio-economic groups find access to computers on campus more difficult, have less access to computers off campus and rate their aptitude lower than their counterparts from high socio-economic groups. This lower access also translates into lower use, as students from low socio-economic groups also use computers less. This finding is congruent with international studies that note amongst Canadian youth that low socio-economic status is linked with less home computer access and low self-efficacy but little difference in attitudes (Looker and Thiessen 2003), and that amongst university students in the UK low socio-economic status is linked with low experience and low skills (Hargittai 2002; Bozionelos 2004). However there are minimal demographic divides on campus which indicates the importance of campus access in addressing digital divides.

In addition, students who speak English as a second language have less access to computers off campus and rate their aptitude lower than their counterparts who speak English as a first language. They also have less access to supportive social networks and have a slightly more negative perception of the adequacy of online content. Differences in the adoption of computers amongst different language groups are not unique to South Africa and have been studied elsewhere (Lizie, Stewart et al. 2004) although in our context some researchers assert that there are correlations between language and class (Wasserman 2002). Whatever the cause, we believe issues of language, access and use warrant further attention – especially important given that second language speakers and students from low socio-economic groups report being less able to access a range of the resources needed to use computers.

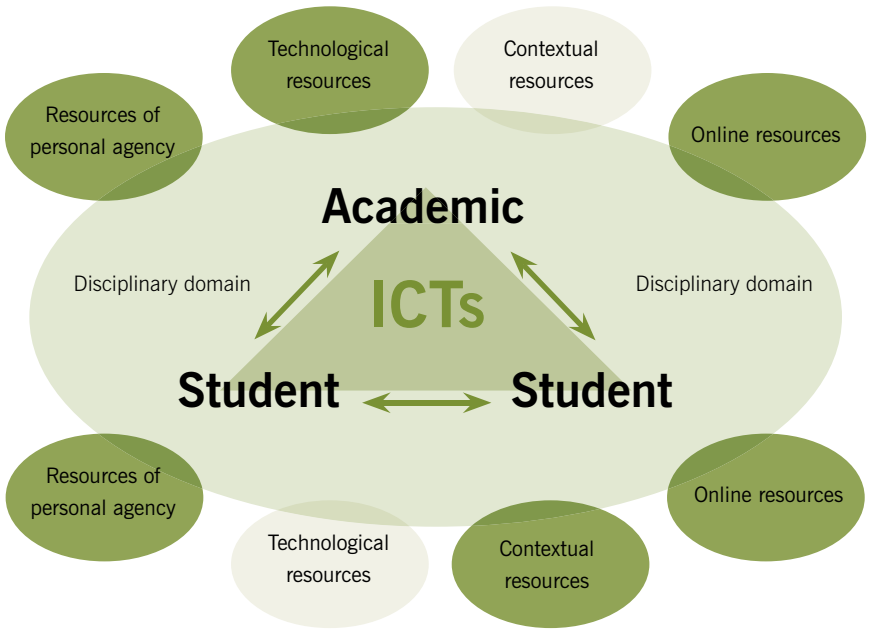
In terms of nationality, international students have more off-campus access than South African or African students and report a higher aptitude. We assume that such students would have a greater need for computer access and connectivity in order to keep in touch with their homes. They may be financially better resourced if they are self-funding their studies in another country. However, a closer analysis relating to countries of origin and educational and technological literacies would be worth making.

Whilst the group of students who report having a disability or illness that impacted on their use of computers is small, they are particularly disadvantaged in terms of off-campus access as well as aptitude. This is not surprising given their different infrastructure requirements which require additional investment both personally and institutionally (Brewer 2002). This social grouping is often noted as being marginalised in terms of computer access perhaps more so than others because they are a minority in society (Department of Communication 2005).

This research has suggested some interesting gender differences that will help us refine future qualitative studies. Although our study found no gender differences with regard to access to technological resources, we did notice a difference in terms of autonomy of access amongst both staff and students with females reporting less autonomy than males. We observe that the lack of a gender gap cannot yet be described as an international trend, except perhaps in North America. We think it likely there is a relationship between the obstacles women have to overcome in order to access both higher education and computers.

We note in both our study and internationally that there are differences recorded in men's and women's confidence with regard to computers as well as in the amount of their experience in using computers. By considering the multiple resources which need to be accessed as interlinked, it is evident that several of our results relate to the issue of confidence. These results include findings amongst students and staff that males and females approach computer-related problem solving differently, and that a lower number of women report adequate institutional support. Coupled with the finding that a greater number of female academics attend university training, we deduce that while the gap between males' and females' access to technological resources may have narrowed, the gap in accessing resources of personal agency has not. We are interested in whether there are relationships between lower autonomy of use amongst females and their lower confidence, interest and different

Figure 7.1: Representation of enabling and constraining factors of access for academic staff and students



Resource groups in light shading are the constrain access whilst those in dark shading enable access.

problem-solving approaches. These are areas that warrant further exploration.

One interesting anomaly is that although male academics report higher technological interest, there is no difference in the frequency of use of a computer between male and female academics with regard to finding information or for recreational purposes. On the other hand, the converse is the case with students. Male students indicate a higher technological interest and make more frequent use of a computer particularly for finding information and recreation. This suggests that not only do their interests in using computers differ from their female counterparts but that this difference also translates into practice.

As for disposition, we did not anticipate that the findings would show such consensus – all students and staff report a positive disposition toward computers. There is a complete absence of differences to be seen across all groupings, with no differences in disposition evident by socio-economic group, gender, nationality or disability. We read this as an affirmation of the high value placed on computers by the higher education community.

These findings demonstrate that in our region a digital divide definitely exists for particular groups of staff and students. Whilst in terms of gender and nationality this divide relates to quite specific aspects of access, in terms of socio-economic group, language group and disability this divide spans many of the resources required for access although it is less evident on-campus. Given the relationship between access and use this certainly impacts on students' use of computers for learning.

And finally we address a fundamental aim of the study regarding the factors which enable and constrain the use of computers for teaching and learning in higher education in the Western Cape. These are visually summarised in Figure 7.1: student use is enabled by access to resources of personal agency, contextual resources and online resources, but constrained by technological resources; and staff use is enabled by technological resources, resources of personal agency and online resources, but constrained by contextual resources.

In line with our findings that students are more likely to use computers when the purpose has been clearly established by the academic, this visual representation positions the academic as both an enabler and a mediator of the use of computers for teaching and learning. However the role of peer interaction cannot be underestimated as – although academics are enablers – students first turn to their peers when they have problems. This relationship between academics and students and amongst students occurs within the domain of the discipline.

This study has argued that the use of computers for teaching and learning is enabled and constrained by access to different kinds of resources. It has demonstrated how academics and students are differently enabled and constrained. These resources are fluid and are experienced differently by people in various contexts and under varying conditions. In addition the relationship between access and use is not static. It can be positively influenced by policy makers, developers, implementers and designers with the understanding that use of ICTs both draws on and contributes to resources accessed. A conscious difference can be made through effective learning design, adequate support, detailed knowledge of how resources are accessed and the appropriate integration of computers thus facilitating more positive teaching and learning experiences and better learning in higher education.

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Appendices

Appendices 2–11 are available as downloadable pdf's from http://www.cet.uct.ac.za/projects/virtualmobius

Appendix 1: Student and staff survey including baseline data

Appendix 2: Pilot survey

Appendix 3: Description of process of pilot survey and feedback received

Appendix 4: Survey covering letters

Appendix 5: Research ethics submission

Appendix 6: Details of the actual versus realised sample

Appendix 7: Construction of indices

Appendix 8: Stories from interviews

Appendix 9: Analytical framework

Appendix 10: Brown, C., Arendse, S. & Mlitwa, N. (2005). ICT Facilities in Higher Education Institutions in the Western Cape. (Unpublished).

Appendix 11: Details of correspondence analysis

Appendix 1

Student and staff survey including baseline data

PART A: ACCESS TO COMPUTERS

Please mark one number for each question. Unless otherwise indicated only select ONE answer.

ABOUT YOUR COMPUTER ACCESS AT [your institution]

A1

	Never	Monthly	Weekly	Daily	(n)
How often do you use a computer at [your institution]?	**3%**	**7%**	**29%**	**61%**	**6481**
How often do you use this computer to access the Internet?	**7%**	**10%**	**35%**	**48%**	**5790**

A2 Where do you **most often** go to use a computer at [your institution]?

7% Residence **10%** Library **49%** Faculty computer lab
28% Central computer lab **6%** Other (please list) _____ **(n) 6105**

A3 When would you **most often** use this computer?

5% Before 9am **23%** Between 9-1pm **24%** Between 1-5pm
11% Between 5-10pm **4 %** After 10pm **33%** Equally across the day **(n) 6229**

A4

	Very Difficult	Difficult	Easy	Very Easy	(n)
How difficult is it to find a computer when you need one?	**18%**	**32%**	**36%**	**15%**	**5672**

A5 What about your **access on campus** helps or gets in the way of your use of computers for learning?

Things that help me	Things that make it hard for me
1.	1.
2.	2.
3.	3.

ABOUT YOUR COMPUTER ACCESS WHEN YOU'RE NOT AT [your institution]

A6 Where do you live whilst you are attending [your institution]?

9% On my own **40%** With immediate family **7%** With friends
7%With relatives **5%** Privately (eg in lodgings) **28%** In residence
2% Other (please list) _____ **n=6380**

A7	Do you own a cell phone?	**91%** Yes	**9%** No		**n=6455**
A8	Do you have use of a computer where you live?	**65%** Yes	**35%** No		**n=6441**
A10	Does this computer have access to the internet?	**34%** Yes	**31%** No	**35%** Not applicable	**n=6423**
A11	Besides where you live, do you have access to a computer elsewhere off campus?	**46%** Yes	**54%** No		**n=6382**

A12 If **Yes to A11** where do you access this computer?

7% Work **2%** Public library **22%** Internet cafe
4% School/ college **49%** Friend/ relative **1%** Community center
2% Other (please list) _____ **n=2859**

A13

	Very Difficult	Difficult	Easy	Very Easy	
How difficult is it for you to use the computer you referred to in A11?	**8%**	**23%**	**44%**	**25%**	**n=3443**

A14 Think about the computer that you **most often** use when not at [your institution]. How many people share use of this computer?

18% Just me **15%** 2 people **13%** 3 people
10% 4 people **26%** More than 4 people **16%** Not applicable **n=5663**

A15 If you share use of a computer are you the primary (main) user?

14% Yes **31%** No **22%** Share equally **32%** Not applicable **n=5775**

A16 What about your **access when not at [your institution]** helps or gets in the way of your use of computers for learning?

Things that help me	Things that make it hard for me
1.	1.
2.	2.
3.	3.

YOUR EXPERIENCE USING A COMPUTER

A17 When did you first start using a computer? **n=5556**

9% <1 year ago **9%** 1-2 years ago **14%** 3-4 years ago
20% 5-6 years ago **26%** 7-10 years ago **22%** > 10 years ago

A18 Have you ever attended training on using a computer at [your institution]? **53%** Yes **47%** No **n=5573**

A19 Is your ability to use a computer limited by a disability/ illness? **2%** Yes **98%** No **n=6325**

A20 How often do you use a computer

	Never	Monthly	Weekly	Daily	
to communicate with people	**9%**	**15%**	**38%**	**38%**	**n=6141**
for study	**4%**	**12%**	**38%**	**45%**	**n=6139**
for recreation	**14%**	**20%**	**35%**	**29%**	**n=5738**
to access information	**2%**	**12%**	**39%**	**45%**	**n=6128**

A21 If **never to any of the statements in A20** would you **like** to start using a computer

to communicate with people	**88%** Yes	**12%** No	**n=1093**
for study	**89%** Yes	**11%** No	**n=936**
for recreation	**73%** Yes	**27%** No	**n=1230**
to access information	**91%** Yes	**9%** No	**n=843**

A22 Did you ever at some point use a computer for the following purposes but stopped for some reason

to communicate with people	**28%** Yes	**72%** No	**n=5148**
for study	**23%** Yes	**77%** No	**n=4575**
for recreation	**26%** Yes	**74%** No	**n=4515**
to access information	**27%** Yes	**73%** No	**n=4598**

A23 If **yes to any of the statements in A22** why did you stop? (select the most appropriate answers) n=477

6% No longer have use of a computer	**6%** Didn't like it	**21%** Didn't have time to use it
29% Problems with connections being too slow	**14%** It got too expensive	**9%** I don't need it
0% Can no longer use due to disability/illness	**3%** Too hard to use	**12%** The computer broke
N/A Other (please list) _____		

A24

	Poor	Average	Good	Excellent	
How would you rate your ability with using a computer generally?	**5%**	**31%**	**43%**	**21%**	**n=6249**

A25

Overall my close friends	Agree	Disagree	Don't know	
think it's important to use computers for educational purposes.	**87%**	**2%**	**10%**	**n=6258**
are competent computer users.	**76%**	**10%**	**13%**	**n=6166**
use computers in their daily lives.	**75%**	**11%**	**12%**	**n=6199**
use computers for recreational purposes	**65%**	**11%**	**23%**	**n=6149**
use computers as a means of communicating with each other	**80%**	**9%**	**10%**	**n=6197**

A26

Overall my close family	Agree	Disagree	Don't know	
think its important to use computers for educational purposes.	**85%**	**5%**	**9%**	**n=6120**
are competent computer users.	**55%**	**31%**	**12%**	**n=6052**
use computers in their daily lives.	**60%**	**30%**	**9%**	**n=6060**
use computers for recreational purposes	**46%**	**35%**	**18%**	**n=6014**
use computers as a means of communicating with each other	**58%**	**31%**	**9%**	**n=6049**

A27 What do you usually do when you have a problem doing something on a computer? (select the most appropriate answers)

20% Problem solve yourself **31%** Ask friends **5%** Ask family
17% Ask institutional IT support **1%** Refer to manual **1%** Other (please list) _____ n=6188

A28 Please indicate whether you agree or disagree with the following statements

	Strongly Disagree	Disagree	Agree	Strongly Agree	
I am able to use a computer for long enough periods of time for my learning requirements.	**7%**	**17%**	**51%**	**25%**	**n=6185**
I am a person who has a high general level of interest in new technological developments.	**4%**	**21%**	**45%**	**25%**	**n=6135**
The internet access at [institution] is adequate for my degree requirements.	**8%**	**16%**	**48%**	**23%**	**n=5761**
The internet access off campus is adequate for my degree requirements.	**16%**	**25%**	**33%**	**11%**	**n=5993**
The technical support I receive from [your institution] for using computers for learning is adequate.	**10%**	**21%**	**46%**	**11%**	**n=6121**

A34 What about your **experience using a computer** helps or gets in the way of your use of computers for learning?

Things that help me	Things that make it hard for me
1.	1.
2.	2.
3.	3.

A35 Are there any additional comments you wish to make about your access to computers?

PART B: YOUR COURSES AND COMPUTERS

USING A COMPUTER FOR LEARNING: YOUR COURSES

Please write number of courses

B1 How many courses are you doing this semester? ..... **<3 (26%) 4 (20%) 5 (23%) >5 (30%)**

B2 How many of your courses **do not** require use of computers by students? ..... **0 (53%) 1 (14%) 2 (10%) >3 (22%)**

B3 How many of your courses are delivered mostly using the web (with little or no face to face contact)? ..... **0 (58%) 1 (16%) 2 (10%) >3 (9%)**

B4 How many of your courses use computers for supplementary purposes (eg providing information about the modules/ course)? ..... **0 (23%) 1 (18%) 2 (16%) >3 (29%)**

B5 How many of your courses have some of the actual teaching and learning activities online? ..... **0 (40%) 1 (24%) 2 (160%) >3 (12%)**

Can you provide an example of such a course? ..... _____

USING A COMPUTER FOR LEARNING: ABOUT THE TYPES OF MEDIA YOU USE

Think about your experience studying at [your institution].

B6 How often have your lecturers explained or demonstrated a concept using

	Never	Rarely	Occasionally	Regularly	Often
powerpoint or another type of presentation software **n=5897**	**20%**	**17%**	**24%**	**23%**	**16%**
audio and/or video clips **n=5807**	**32%**	**26%**	**27%**	**10%**	**5%**
multimedia eg animation **n=5736**	**44%**	**25%**	**20%**	**7%**	**4%**
images or slides **n=5828**	**18%**	**16%**	**23%**	**26%**	**17%**
text **n=5765**	**10%**	**10%**	**17%**	**31%**	**32%**

B7 Have you ever been asked to **find information** for your courses? ..... **92%** Yes **8%** No **n=5992**

B8 Has this ever involved using a computer? ..... **92%** Yes **8%** No **n=5887**

If Yes, go to B9 If No, go to B10

B9 If yes, how often do you use a computer to look for

	Never	Rarely	Occasionally	Regularly	Often
electronic readings **no=5317**	**20%**	**17%**	**30%**	**23%**	**12%**
lecture notes **n=5405**	**16%**	**14%**	**24%**	**29%**	**17%**
internet resources n=5443	**3%**	**8%**	**26%**	**39%**	**24%**
general information about the module/ course **n=5424**	9%	**18%**	**30%**	**28%**	**15%**
examples of previous assignments **n=5389**	**24%**	**22%**	**24%**	**20%**	**12%**

B10 Have you ever been asked to **communicate** as part of your courses? ..... **65%** Yes **35%** No **n=5477**

B11 Has this ever involved using a computer? ..... **55%** Yes **45%** No` **n=5350**

If Yes, go to B12 If No, go to B13

B12 If yes, how often do you use a computer to

	Never	Rarely	Occasionally	Regularly	Often
participate in email discussion eg a list server or newsgroup **n=3133**	**33%**	**21%**	**24%**	**14%**	**8%**
participate in online chat as part of a module/ course **n=6576**	**53%**	**22%**	**16%**	**7%**	**3%**
participate in online discussion forum as part of the course **n=3080**	**52%**	**19%**	**17%**	**8%**	**4%**
participate in an online audio/video conference **n=3090**	**73%**	**15%**	**7%**	**3%**	**2%**
communicate with the lecturer by email **n=3127**	**18%**	**22%**	**35%**	**16%**	**10%**

B13 Have you ever been asked to **participate in activities** for your courses? ..... **69%** Yes **31%** No **n=5636**

B14 Has this ever involved using a computer? ..... **52%** Yes **48%** No **n=5386**

If Yes, go to B15 If No, go to B16

B15 If yes, how often do you use a computer to undertake

	Never	Rarely	Occasionally	Regularly	Often
a multiple choice quiz **n=2898**	**30%**	**19%**	**23%**	**17%**	**11%**
a simulation, role play or case study **n=1988**	**8%**	**34%**	**32%**	**18%**	**8%**
a game **n=2863**	**52%**	**19%**	**16%**	**7%**	**6%**
an interactive task which enables you to drill and practice **n=2857**	**29%**	**19%**	**25%**	**14%**	**6%**
a computer activity which provides feedback **n=2864**	**25%**	**20%**	**29%**	**19%**	**9%**

B16 Have you ever been asked to **create things & express ideas** for your courses? ..... **72%** Yes **28%** No **n=5637**

B17 Has this ever involved using a computer? ..... **63%** Yes **37%** No **n=5409**

If Yes, go to B18 If No, go to B19

B18 If yes, how often do you use a computer to

	Never	Rarely	Occasionally	Regularly	Often
write an assignment **n=3526**	**3%**	**5%**	**14%**	**35%**	**43%**
create something for example developing your own website,19 or making a poster **n=3510**	**30%**	**19%**	**24%**	**15%**	**12%**
build something using specialised software like CAD, Macromedia Excel **n=3500**	**37%**	**16%**	**19%**	**15%**	**13%**

n=3535

USING A COMPUTER FOR LEARNING: YOUR EXPERIENCE

	Please indicate your opinion on the following statements.	Yes	No	Don't know	
B19	I am able to find content on the internet that is relevant to the courses I am studying.	**91%**	**4%**	**5%**	**n= 5697**
B20	I am able to find course content on the internet that is relevant to South Africa.	**83%**	**9%**	**8%**	**n=5675**
B21	I am able to find course content on the internet that has been produced locally.	**70%**	**13%**	**17%**	**n=5648**
B22	The computer resources I have used for studying are available in the language I want.	**84%**	**12%**	**4%**	**n=5655**
B23	The computer resources I have used for studying are available in more than 1 language.	**38%**	**24%**	**37%**	**n=5643**

B 24 Please indicate whether you agree or disagree with the following statements

	Strongly Disagree	Disagree	Agree	Strongly Agree	
The use of computers is likely to result in more valuable learning experiences.	**3%**	**3%**	**46%**	**46%**	**n=5534**
The use of computers is likely to improve communication amongst students.	**3%**	**10%**	**47%**	**39%**	**n=5401**
The use of computers is likely to improve communication between students and teachers.	**3%**	**10%**	**48%**	**37%**	**n=5356**
Computers can give valuable support to my courses.	**2%**	**2%**	**47%**	**46%**	**n=5439**
Computers will help me do routine tasks (like enrolments and obtaining results) more quickly.	**3%**	**4%**	**44%**	**48%**	**n=5368**
I am a person who likes to try out new ways to carry out my learning.	**3%**	**14%**	**47%**	**34%**	**n=5523**
I can picture myself encouraging fellow students to use computers for learning.	**5%**	**11%**	**47%**	**36%**	**n=5200**

B25 What about **your experience of using computers for learning** helps or gets in the way of your use of computers for learning?

Things that help me	Things that make it hard for me
1.	1.
2.	2.
3.	3.

B26 Are there any additional comments you wish to make about your use of computers for learning?

PART C: INFORMATION ABOUT YOURSELF

Please tick one box for each question or write the appropriate response in the space provided.

This is an **anonymous questionnaire**. We do not want to determine your identity nor examine your responses on an individual basis. We are requesting some personal information from each participant to assist in analysis of our results as our research indicates that social background, age, sex and language all influence people's use of computers. We are also requesting information about the courses you are studying as we believe there are differences in the use of computers across degrees. This information will remain confidential and will not be disclosed.

C1 Faculty Grouping

17% Science
15% Engineering
11% Health Science
17% Humanities
38% Business

n=6197

C2 Department (please write)

_____

C3 Qualification for which you are studying (please write)

_____

C4 Qualification level n=6183

23% Preliminary/ Foundation
63% Undergraduate
12% Postgraduate

C5 Current level of study n=6195

42% 1st year
24% 2nd year
20% 3rd year
8% 4th year
1% 5th year
1% Other

C6 Years enrolled at [your institution] (including this year) n=6191

30% < 1 year
20% 1-2 years
34% 3-4 years
6% > 5 years

C7 Attendance pattern

On campus full time
On campus part time
Distance full time
Distance part time

C8 Gender n=6198

47% Male
52% Female

C9 Age n=6194

56% >20 years
35% 21-25 years
4% 26-30 years
2% 31-40 years
41-50 years
>50 years

C10 Nationality (please write)

_____

C11 Home language

29% Afrikaans
36% English
Afrikaans and English
isiNdebele
Sesotho (N)
Sesotho (S)
siSwati
Sepedi
Xitsonga
Setswana
Tshivenda
17% isiXhosa
isiZulu
Other (please list) _____

C12 Occupation of the primary breadwinner in your family. (please write)

_____

C13 Highest education level of the primary breadwinner in your family. (please write)

_____

C14 Are you the first person in your immediate household to go to University? N=6196

48% Yes
51% No

Thank you for taking the time to participate in this survey.

PART A: ACCESS TO COMPUTERS

Please mark one number for each question. Unless otherwise indicated only select ONE answer.

ABOUT YOUR COMPUTER ACCESS AT WORK

A1

	Never	Monthly	Weekly	Daily	n
How often do you use a computer at [your institution]?	**0%**	**1%**	**8%**	**91%**	**511**
How often do you use this computer to access the Internet?	**1%**	**5%**	**16%**	**77%**	**496**

A2 Please indicate whether you agree or disagree with the following statements

	Strongly Disagree	Disagree	Agree	Strongly Agree	n
The internet access at [your institution] is adequate for my teaching requirements	**10%**	**18%**	**40%**	**32%**	**486**
The hardware and software composition of my computer at [your institution] is adequate for my teaching requirements	**10%**	**19%**	**40%**	**31%**	**489**

A3 What about your **access at** [your institution]helps or gets in the way of your use of computers for teaching?

Things that help me	Things that make it hard for me
1.	1.
2.	2.
3.	3.

ABOUT YOUR COMPUTER ACCESS AT HOME

A4	Do you own a cell phone?	**94%** Yes	**6%** No		**n 509**
A5	Do you have use of a computer where you live?	**95%** Yes	**5%** No		**n 510**
A6	Does this computer have access to the internet?	**80%** Yes	**16%** No	4% Not applicable	**n 512**

A7 If you have a computer at home, how many people share use of it?

29% Just me	**31%** 2 people	**13%** 3 people	**n 478**
14% 4 people	**5%** More than 4 people	**8%** Not applicable	

A8 If you share use of a computer are you the primary (main) user?

				Not applicable
44% Yes	12% No	17% Share equally	27%	433

A9 Please indicate whether you agree or disagree with the following statements

	Strongly Disagree	Disagree	Agree	Strongly Agree	
The internet access at home is adequate for my teaching requirements	**28%**	**29%**	**26%**	**17%**	**n 457**
The hardware and software composition of my computer at home is adequate for my teaching requirements	**21%**	**28%**	**29%**	**21%**	**n 469**

A10 What about your **access at home** helps or gets in the way of your use of computers for teaching?

Things that help me	Things that make it hard for me
1.	1.
2.	2.
3.	3.

YOUR EXPERIENCE USING A COMPUTER

A11 When did you first start using a computer?

0% <1 year ago **0%** 1-2 years ago **0%** 3-4 years ago **n 507**
5% 5-6 years ago **16%** 7-10 years ago **77%** > 10 years ago

A12 Have you ever attended training on using a computer at [your institution]? **49%** Yes **51%** No **n 500**

A13 Is your ability to use a computer limited by a disability/ illness? **2%** Yes **98%** No **n 498**

A14 How often do you use a computer

	Never	Monthly	Weekly	Daily	Applicable
to communicate with people n 510	**7%**	**5%**	**37%**	**48%**	**3%**
to do research n507	**7%**	**11%**	**53%**	**25%**	**3%**
for teaching n507	**7%**	**9%**	**48%**	**32%**	**4%**
for work related administration n 507	**6%**	**7%**	**40%**	**44%**	**3%**
to recreation n503	**16%**	**16%**	**47%**	**15%**	**6%**

A15	Poor	Average	Good	Excellent	n
How would you rate your ability with using a computer generally?	**3%**	**24%**	**41%**	**33%**	**506**

A16 Overall my colleagues	Agree	Disagree	Don't know	n
think it's important to use computers for educational purposes.	**55%**	**10%**	**35%**	**509**
are competent computer users.	**50%**	**14%**	**36%**	**507**
use computers in their daily lives.	**54%**	**10%**	**36%**	**507**
use computers for recreational purposes	**33%**	**13%**	**54%**	**506**
use computers as a means of communicating with each other	**57%**	**9%**	**34%**	**506**

A17 Overall my close family	Agree	Disagree	Don't know	n
think its important to use computers for educational purposes.	**60%**	**22%**	**17%**	**499**
are competent computer users.	**57%**	**30%**	**13%**	**500**
use computers in their daily lives.	**57%**	**30%**	**13%**	**498**
use computers for recreational purposes	**52%**	**31%**	**17%**	**497**
use computers as a means of communicating with each other	**55%**	**32%**	**13%**	**498**

A18 What do you usually do when you have a problem doing something on a computer? (select the most appropriate answers)

[**48%**] Problem solve yourself [**7%**] Ask friends [ ] Ask family **n 271**
[**38%**] Ask institutional IT support [ ] Refer to manual [**4%**] Other (please list) _____

A19 Please indicate whether you agree or disagree with the following statements

	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
I am able to use a computer for long enough periods of time for my teaching requirements **n 508**	**8%**	**13%**	**31%**	**44%**	**8%**
I am a person who has a high general level of interest in new technological developments.. **n508**	**9%**	**23%**	**25%**	**43%**	**4%**
The technical support I receive from [my institution] for using computers for teaching is adequate. **n 506**	**11%**	**20%**	**29%**	**36%**	**5%**

A20 What about your **experience using a computer** helps or gets in the way of your use of computers for teaching?

Things that help me	Things that make it hard for me
1.	1.
2.	2.

A21 Are there any additional comments you wish to make about your access to computers?

PART B: YOUR COURSES AND COMPUTERS

USING A COMPUTER FOR TEACHING: YOUR COURSES

Please write number of courses

B1 How many courses are you teaching this semester? ..... _____

B2 How many of your courses do not require use of computers by students? ..... _____

B3 How many of your courses are delivered mostly using the web (with little or no face to face contact)? ..... _____

B4 How many of your courses use computers for supplementary purposes (eg providing information about the modules/ course)? ..... _____

B5 How many of your courses have some of the actual teaching and learning activities online? ..... _____

Can you provide an example of such a course? ..... _____

USING A COMPUTER FOR LEARNING: ABOUT THE TYPES OF MEDIA YOU USE

Think about your experience at UCT.

B6 How often have you explained or demonstrated a concept using

	Never	Rarely	Occasionally	Regularly	Often
powerpoint or another type of presentation software **n 512**	**14%**	**16%**	**13%**	**41%**	**16%**
audio and/or video clips **n 511**	**16%**	**20%**	**15%**	**39%**	**10%**
multimedia eg animation **n503**	**24%**	**20%**	**11%**	**35%**	**10%**
images or slides **n511**	**13%**	**14%**	**13%**	**44%**	**16%**
text **n507**	**6%**	**14%**	**7%**	**50%**	**23%**

B7 Have you ever asked your students to **find information** for your courses? ..... **89%** Yes **11%** No **n 504**

B8 Has this ever involved using a computer? ..... **90%** Yes **10%** No **n 490**

If Yes, go to B9 If No, go to B10

B9 If yes, how often do you ask students to use a computer to look for

	Never	Rarely	Occasionally	Regularly	Often
electronic readings **n 440**	**8%**	**17%**	**21%**	**45%**	**9%**
lecture notes **n 433**	**15%**	**18%**	**14%**	**42%**	**8%**
internet resources **n448**	**2%**	**15%**	**23%**	**51%**	**11%**
general information about the course **n 441**	**10%**	**17%**	**17%**	**45%**	**10%**
examples of previous assignments **n 439**	**24%**	**18%**	**12%**	**39%**	**8%**

B10 Have you ever asked your students to **communicate** as part of your courses? **n 489** ..... **82%** Yes **18%** No

B11 Has this ever involved using a computer? **n 480** ..... **66%** Yes **34%** No

If Yes, go to B12 If No, go to B13

B12 If yes, how often do you ask students to use a computer to

	Never	Rarely	Occasionally	Regularly	Often
participate in email discussion eg a list server or newsgroup **n 358**	**25%**	**20%**	**18%**	**28%**	**9%**
participate in online chat as part of a course **n 357**	**33%**	**21%**	**13%**	**25%**	**8%**
participate in online discussion forum as part of the course **n 357**	**31%**	**21%**	**14%**	**26%**	**8%**
participate in an online audio/video conference **n 357**	**39%**	**18%**	**10%**	**25%**	**8%**
communicate with the you by email **n 361**	**7%**	**13%**	**20%**	**43%**	**16%**

B13	Have you ever asked your students to **participate in activities** for your courses?	**81%** Yes	**19%** No	**n 481**
B14	Has this ever involved using a computer?	**51%** Yes	**49%** No	**n 469**
		If Yes, go to B15	If No, go to B16	

B15 If yes, how often do you ask students to use a computer to undertake

	Never	Rarely	Occasionally	Regularly	Often
a multiple choice quiz **n 296**	**38%**	**18%**	**16%**	**23%**	**5%**
a simulation, role play or case study **n 291**	**39%**	**16%**	**18%**	**21%**	**6%**
a game **n 291**	**49%**	**14%**	**14%**	**18%**	**4%**
an interactive task which enables them to drill and practice **n 293**	**37%**	**14%**	**18%**	**25%**	**7%**
a computer activity which provides feedback **n 294**	**34%**	**16%**	**19%**	**26%**	**7%**

B16	Have you ever asked your students to **create things & express ideas** for your courses?	**82%** Yes	**18%** No	**n 492**
B17	Has this ever involved using a computer?	**66%** Yes	**34%** No	**n 479**
		If Yes, go to B18	If No, go to B19	

B18 If yes, how often do you ask students to use a computer to

	Never	Rarely	Occasionally	Regularly	Often
write an assignment **n 378**	**4%**	**6%**	**12%**	**47%**	**31%**
create something for example developing their own website, or making a poster **n 374**	**20%**	**11%**	**17%**	**33%**	**19%**
build something using specialised software using CAD, Macromedia, Excel **n 372**	**24%**	**8%**	**17%**	**31%**	**20%**

B19	Did you ever at some point use one of the above mentioned media for teaching purposes but stopped for some reason?	**18%** Yes	**82%** No	**n 472**

B20 If yes which ones?

_____

B21 If yes why did you stop? n 73

3% No longer have a reason to use the media	**4%** Didn't find it useful	**1%** Didn't have time to use it
1% I don't need it	**16%** Problems with slow connections	**8%** Too hard to use
N/A Didn't have much success with the media	**66%** Other (please list) _____	

USING A COMPUTER FOR TEACHING: YOUR EXPERIENCE

	Please indicate your opinion on the following statements.	Yes	No	Don't know
B22	I am able to find content on the internet that is relevant to the courses I am teaching. **n 495**	**93%**	**3%**	**3%**
B23	I am able to find course content on the internet that is relevant to South Africa. **n 493**	**87%**	**6%**	**6%**
B24	I am able to find course content on the internet that has been produced locally. **n 494**	**77%**	**12%**	**10%**
B25	The computer resources I have used for teaching are available in the language I want **n 455**	**92%**	**4%**	**3%**
B26	The computer resources I have used for teaching are available in more than 1 language. **n 491**	**63%**	**17%**	**19%**

B 27 Please indicate whether you agree or disagree with the following statements

	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
The use of computers is likely to result in more valuable learning experiences. **n503**	**3%**	**10%**	**23%**	**58%**	**6%**
The use of computers is likely to improve communication amongst students. **n 501**	**3%**	**11%**	**23%**	**55%**	**8%**
The use of computers is likely to improve communication between students and teachers..**n 502**	**3%**	**9%**	**25%**	**56%**	**6%**
Computers can give valuable support to my courses. **n 502**	**2%**	**7%**	**26%**	**60%**	**5%**
Computers will help me do routine administrative tasks more quickly.**n502**	**3%**	**7%**	**21%**	**65%**	**5%**
I am a person who likes to try out new ways to carry out my teaching.**n501**	**2%**	**8%**	**26%**	**60%**	**4%**
I can picture myself encouraging colleagues to use computers for teaching. **n500**	**3%**	**15%**	**21%**	**55%**	**6%**

YOUR STUDENTS EXPERIENCE OF USING COMPUTERS FOR LEARNING

B 28 Please indicate whether you agree or disagree with the following statements

	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
Students have adequate support to solve technical computer problems when they occur. **n496**	**25%**	**31%**	**16%**	**10%**	**18%**
Students have sufficient knowledge about computers to use them for learning. **n496**	**22%**	**31%**	**24%**	**11%**	**13%**
There are enough computers for students in my faculty to use for their learning activities**. n496**	**31%**	**30%**	**13%**	**12%**	**14%**
Computers are available to students in my faculty whenever they need them. **n495**	**31%**	**32%**	**13%**	**10%**	**13%**
The hardware and software composition of computers are sufficient for my students learning requirements **n494**	**24%**	**22%**	**25%**	**12%**	**16%**

B29 What about **your experience of using computers for teaching** helps or gets in the way of your use of computers?

Things that help me	Things that make it hard for me
1.	1.
2.	2.
3.	3.

ABOUT THE [your institution] TEACHING AND LEARNING CONTEXT

B30 Please select the phrase you normally use to describe the use of technology in teaching and learning n 458

7% Online learning	**22%** e-learning	**5%** ICT's
7% Educational technology	**2%** Flexible learning	**11%** Web based learning
22% **Co**mputer based learning	**10%** Resource based learning	**13%** Other (please list) _____

Does [your institution] have an institution wide strategy for the use of computers in teaching and learning? n490

32% Yes 26% In progress 8% No 34% Don't know

B31 If **yes** to B30 which in your personal opinion are [your institution]'s main reasons for developing this strategy? n143

1% Enhancement of distance learning	**2%** Supporting local businesses	**3%** Attracting new student markets
4% Safeguarding existing student markets	**5%** Attracting new industry partners	**6%** Safeguarding existing industry partners
6% Reducing teaching costs long-term	**6%** Widening access for disabled users	**10%** Enhancement of on campus T&L
11% Improved flexibility for on-campus students	**14%** Keeping up with the competition	**2%** Facilitating collaboration
18% Widening access to previously disadvantaged students		**14%** Other (please list) _____

B32 If **no** to B30 which in your personal opinion are [your institution]'s main reasons for not developing this strategy?

1 There is no perceived demand for online learning among our staff and students/ potential students
2 Online learning is currently not relevant in the main disciplines at my institution
3 A 'bottom-up' or department-driven approach is being taken
4 The infrastructure to introduce online learning is beyond the means of my institution at present
5 Online learning is unproven as a technology and learning medium
6 Other issues are currently more pressing (please list) _____

B33 Please indicate whether you agree or disagree with the following statements

	Poor	Average	Good	Excellent	Don't Know
Readiness to change amongst people at [my institution] when it comes to using computers for teaching is **n 497**	**23%**	**20%**	**45%**	**4%**	**8%**
Support from leaders at [my institution] for using computers for teaching and learning is **n 498**	**26%**	**14%**	**47%**	**6%**	**8%**
The vision at [my institution] for using computers for teaching and learning is	**23%**	**11%**	**47%**	**7%**	**11%**
At [my institution], the actual use of computers for teaching and learning is	**25%**	**21%**	**42%**	**3%**	**9%**
At [my institution] the technical support I receive when using computers for teaching and learning is **n 493**	**27%**	**17%**	**45%**	**7%**	**4%**

B34 Are there any additional comments you wish to make about your use of computers for teaching?

PART C: INFORMATION ABOUT YOURSELF

Please tick one box for each question or write the appropriate response in the space provided.

This is an **anonymous questionnaire**. We do not want to determine your identity nor examine your responses on an individual basis. We are requesting some personal information from each participant to assist in analysis of our results as our research indicates that social background, age, sex and language all influence people's use of computers. We are also requesting information about the courses you are teaching as we believe there are differences in the use of computers across degrees. This information will remain confidential and will not be disclosed.

C1 Faculty Grouping

- **29%** Business
- **14%** Engineering
- **12%** Health Science
- **24%** Humanities
- **21%** Science

C2 Department (please write)

_____

C3 Years working at UCT (including this year)

- **12%** < 1 year
- **7%** 1-2 years
- **19%** 3-4 years
- **62%** > 5 years

C4 Type of appointment

- **9%** Associate Lecturer
- **41%** Lecturer
- **25%** Senior Lecturer
- **13%** Associate Professor
- **12%** Professor
- **6%** Non-academic

C5 Gender

- **60%** Male
- **40%** Female

C6 Age

- ☐ >20 years
- **9%** 21-25 years
- **9%** 26-30 years
- **25%** 31-40 years
- **29%** 41-50 years
- **28%** >50 years

C7 Nationality (please write)

_____

C8 Home language

- **15%** Afrikaans
- **59%** English
- **10%** Afrikaans and English
- ☐ isiNdebele
- ☐ Sesotho (N)
- ☐ Sesotho (S)
- ☐ siSwati
- ☐ Sepedi
- ☐ Xitsonga
- ☐ Setswana
- ☐ Tshivenda
- **1%** isiXhosa
- ☐ isiZulu
- **16%** Other (please list) _____

Appendix 2

Pilot survey

Pilot Study

Have your say about using computers for studying

October 2003

Dear Student

I am inviting your participation in this study which aims to look at what access you have to computers and how you may be using them for learning.

This questionnaire is intended for students in the 5 Higher Education Institutions in the Western Cape. It is part of a larger project which aims to improve our understanding of quality and equity issues in educational technology.

The questionnaire consists of 9 pages with a total of 34 questions. We estimate that it will take you approximately 15 minutes to complete. The majority of the questions are in a multiple choice format and ask you to select the most appropriate answer. However there is opportunity for you to write further comments on each section should you wish to do so.

We are not trying to find out your identity nor examine your responses on an individual basis. This is intended to be an **anonymous questionnaire**. Participation is voluntary. By completing this questionnaire you are consenting to take part in this research. If at any stage you do not wish to continue just stop and do not return the questionnaire. If you do not wish to answer a question at any stage then please just skip to the next one.

Please keep this statement and if at any stage you have any queries or concerns, please contact either Cheryl Brown (Researcher) or Laura Czerniewicz (Project Leader).

Thank you for your interest in participating in this questionnaire.

Assoc Prof Nan Yeld
Dean, Centre for Higher Education
University of Cape Town

Cheryl Brown
Researcher, HictE Project
Ph: 650 5035
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Laura Czerniewicz
Director, Multimedia Education Group,
University of Cape Town
Ph: 650 5036
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About your computer access on campus

Question 1

Please select the most appropriate response	Yes	No
Do you use a computer at {insert name of institution}?	❑	❑

Question 2

Please select the most appropriate response	Residence	Library	Computer Lab	Other (complete blank)
If yes where do you access the computer?	❑	❑	❑	_____

Question 3

Please select the most appropriate response	Before 8am	Between 8-12pm	Between 12-5pm	Between 5-10pm	After 10pm
When would you most often use a computer at {insert institution name }?	❑	❑	❑		

Question 4

Please select the most appropriate response	Very difficult	Difficult	Can't say /no opinion	Easy	Very easy
How easy is it to find an available computer at {insert institution name } when you need one?	❑	❑	❑	❑	❑

Question 5

Please select the most appropriate response	Never	Rarely	Occasionally	Regularly	Often
How often do you use this computer to access the Internet?	❑	❑	❑	❑	❑

Question 6

How much do these factors encourage or discourage your current level of use of computers	Strongly discourage	Discourage	Neither	Encourage	Strongly encourage
Having access to a computer on campus.	❑	❑	❑	❑	❑
Where computers are available on campus.	❑	❑	❑	❑	❑
When computers are available for use on campus.	❑	❑	❑	❑	❑
The availability of a computer on campus when you need one.	❑	❑	❑	❑	❑
Whether the computer has access the Internet.	❑	❑	❑	❑	❑

Are there any additional comments you wish to make about your computer access on campus?

_____
_____
_____
_____
_____
_____

About your computer access when you're off campus

Question 7

Please select the most appropriate response	Immediate family	Friends/ relatives	Privately eg lodgings, digs, student housing	Residence	Other
Where do you live whilst you are attending University/ Technikon					

Question 8

Please select the most appropriate response	Yes	No
Do you have a computer where you live?	❑	❑

Question 9a

Please select the most appropriate response	Yes	No
Do you have access to a computer elsewhere off campus?	❑	❑

Question 9b

Please select the most appropriate response	Work	Public Library	Internet café	School/ college	Friend/ relative	Community center
If so where?	❑	❑	❑	❑	❑	❑

Question 9c

Please select the most appropriate response	Less than 2 km	2-5km	5-10km	10-15km	More than 15km
How far do you have to travel to access this computer?	❑	❑	❑	❑	❑

Question 9d

Please select the most appropriate response	Very difficult	Difficult	Can't say /no opinion	Easy	Very easy
How convenient is access to this computer?	❑	❑	❑	❑	❑

Question 10

Please select the most appropriate response	Just me	2 people	3 people	4 people	More than 4 people
Think about the computer you usually use off campus. How many people share use of this computer?	❑	❑	❑	❑	❑

Question 11

Please select the most appropriate response	Yes	No	Not applicable
If you share use of a computer are you the primary (main) user?	❑	❑	❑
Does this computer have access to the internet/ web?	❑	❑	❑

Question 12

How much do these factors encourage or discourage your current level of use of computers	Strongly discourage	Discourage	Neither	Encourage	Strongly encourage
Access to a computer off campus.	❑	❑	❑	❑	❑
Access to a computer where you live.	❑	❑	❑	❑	❑
Sharing use of the computer off campus.	❑	❑	❑	❑	❑
The amount you have to travel to access a computer off campus.	❑	❑	❑	❑	❑
The convenience of access to a computer off campus.	❑	❑	❑	❑	❑
Being the primary (main) user of the computer you use off campus.	❑	❑	❑	❑	❑
Having access to the internet/ web from the computer you use off campus.	❑	❑	❑	❑	❑

Are there any additional comments you wish to make about access to a computer off campus?

_____
_____
_____
_____
_____
_____

Your experience using a computer

Question 13

Please select the most appropriate response	This year	About a year ago	2-3 years ago	3-5 years ago	More than 5 years ago
When did you first start using a computer?	❑	❑	❑	❑	❑

Question 14

How often do you use a computer	Never	Rarely	Occasionally	Regularly	Often
to communicate with people?	❑	❑	❑	❑	❑
to study?	❑	❑	❑	❑	❑
for recreation?	❑	❑	❑	❑	❑

Question 15

If your answer above was never or rarely would you LIKE to start using a computer	Yes – Interested	No – not interested	Don't know / no opinion
to communicate with people?	❑	❑	❑
to study?	❑	❑	❑
for recreation?	❑	❑	❑

Question 16

Did you ever at some point use a computer for the following purposes but stopped for some reason?	Yes	No
to communicate with people?	❑	❑
to study?	❑	❑
for recreation?	❑	❑

If Yes to any of the above go to Q 17, if no go to Question 18

Question 17

If yes why did you stop?	
No longer have or have use of a computer	❑
Didn't like it/want it/ not interesting/useful	❑
Didn't have time to use it/ wasn't a good use of my time	❑
Can no longer get to the place where I used to have access	❑
The computer broke	❑
Changed/lost jobs/lost access from work	❑
It got too expensive	❑
I don't need it	❑
Problems with connections being too slow/not reliable	❑
Too hard to use	❑
Can no longer use due to disability/illness	❑

Question 21

	Very poor	Poor	Average	Good	Very good	Can't say/ no opinion
How would you rate your expertise with using a computer generally	❑	❑	❑	❑	❑	❑

Question 18

My close friends and family	Definitely do not agree	Generally do not agree	Can't say / no opinion	Generally Agree	Definitely Agree
Think its important to use computers for study.	❑	❑	❑	❑	❑
Are generally competent computer users.	❑	❑	❑	❑	❑
Use computers in their daily lives.	❑	❑	❑	❑	❑
Use computers for recreational purposes.	❑	❑	❑	❑	❑
Use computers as a means of communicating with each other.	❑	❑	❑	❑	❑

Question 19

	Self	Friend	Family	Colleague	Institutional It support
In general who do you go to when you have a computer problem?	❑	❑	❑	❑	❑

Question 20

Please indicate your opinion on the following statements	Definitely do not agree	Generally do not agree	Can't say / no opinion	Generally Agree	Definitely Agree
I able to use a computer for long enough periods of time to do what I need to.	❑	❑	❑	❑	❑
I am a person who has a high general level of interest in new technological developments.	❑	❑	❑	❑	❑
I have a disability/illness which limits my ability to use computers.	❑	❑	❑	❑	❑

Question 21

How much do these factors encourage or discourage your current level of use of computers	Strongly discourage	Discourage	Neither	Encourage	Strongly encourage
Your expertise using a computer.	❑	❑	❑	❑	❑
The opinion of your close family and friends.	❑	❑	❑	❑	❑
Your close family and friends use of computers.	❑	❑	❑	❑	❑
Who you get help from when you have a computer problem.	❑	❑	❑	❑	❑
Access to a computer when you need it.	❑	❑	❑	❑	❑
Ability to use a computer for long enough periods of time to do what you need to.	❑	❑	❑	❑	❑
Your level of interest in new technological development.	❑	❑	❑	❑	❑

Are there any additional comments you wish to make about your experience using a computer?

_____
_____
_____
_____
_____
_____
_____

Using a computer for learning: Your courses

Question 22

	Select number
How many courses have you undertaken this year?	
How many of these courses do not make use of computers for teaching and learning?	
How many of these courses are delivered mostly online (little or no contact?)	
How many of the courses use computers to do things that are only possible on computer?	
In how many of these courses are some of the actual teaching and learning activities online?	
How many course use computers for administrative or supplementary purposes (eg course outlines, information about assignments etc)	

Are there any additional comments you wish to make about using a computer in your courses?

_____
_____
_____
_____
_____
_____
_____

Using a computer for learning: Your personal experience

Question 23

Please indicate your opinion on the following statements	Definitely do not agree	Generally do not agree	Can't say / no opinion	Generally Agree	Definitely Agree
I am a person who likes to try out new ways to carry out my learning.	❑	❑	❑	❑	❑
The network in my institution is adequate in terms of speed and bandwidth for my learning-related purposes.	❑	❑	❑	❑	❑
The network in my institution is sufficiently reliable for my learning-related purposes.	❑	❑	❑	❑	❑
The network off campus is adequate in terms of speed and bandwidth for my learning-related purposes.	❑	❑	❑	❑	❑
The network off campus is sufficiently reliable for my learning-related purposes.	❑	❑	❑	❑	❑
I can picture myself trying to encourage my fellow students to try out new computer based applications for their learning-related tasks.	❑	❑	❑	❑	❑
I am able to find online content that is relevant to the courses I am studying.	❑	❑	❑	❑	❑
I am able to find online content that is relevant to our African context.	❑	❑	❑	❑	❑
I am able to find online content that has been produced locally.	❑	❑	❑	❑	❑
The computer resources I have used for studying are available in the language I want.	❑	❑	❑	❑	❑
The computer resources I have used for studying are available in more than 1 language.	❑	❑	❑	❑	❑

Question 24

How much do these factors encourage or discourage your current level of use of computers	Strongly discourage	Discourage	Neither	Encourage	Strongly encourage
The speed and bandwidth of the network in your institution.	❑	❑	❑	❑	❑
The reliability of the network in your institution.	❑	❑	❑	❑	❑
The speed and bandwidth of the network off campus.	❑	❑	❑	❑	❑
The reliability of the network off campus.	❑	❑	❑	❑	❑
The availability of relevant online content.	❑	❑	❑	❑	❑
The availability of online content that is relevant to the African context.	❑	❑	❑	❑	❑
The availability of online content that has been produced locally.	❑	❑	❑	❑	❑
The availability of online content in the language you want.	❑	❑	❑	❑	❑
The availability of online content in more than 1 language.	❑	❑	❑	❑	❑

Are there any additional comments you wish to make about your personal experience using a computer for learning?
_____ _____ _____ _____ _____ _____ _____

Using a computer for learning: Your opinion

Question 25

Please indicate your opinion on the following statements	**Definitely do not agree**	**Generally do not agree**	**Can't say / no opinion**	**Generally Agree**	**Definitely Agree**
The use of computers is likely to result in an new forms of valuable learning experiences.	❑	❑	❑	❑	❑
The use of computers is likely to improve communication amongst students and teachers.	❑	❑	❑	❑	❑
Computers can give valuable support to my courses.	❑	❑	❑	❑	❑
Computers are likely to improve individual aspects of the learning experience.	❑	❑	❑	❑	❑
Computers will help me do routine (administrative) tasks associated with learning more quickly.	❑	❑	❑	❑	❑
The computer resources I have used for learning are in a format I can easily use.	❑	❑	❑	❑	❑

Using a computer for learning: About the types of media you use

Question 26

Think about the courses you have studied this year. How often has your teacher explained or demonstrated a concept using	**Never**	**Rarely**	**Occasionally**	**Regularly**	**Often**
powerpoint or another type of presentation software	❑	❑	❑	❑	❑
audio and/or video clips	❑	❑	❑	❑	❑
multimedia	❑	❑	❑	❑	❑
images	❑	❑	❑	❑	❑
text	❑	❑	❑	❑	❑

Question 27

Think about the courses you have studied this year. How often have you been asked by your teacher to use a computer to	**Never**	**Rarely**	**Occasionally**	**Regularly**	**Often**
locate electronic readings	❑	❑	❑	❑	❑
locate lecture notes	❑	❑	❑	❑	❑
locate internet resources	❑	❑	❑	❑	❑
locate general information about the course	❑	❑	❑	❑	❑
locate examples of previous assignments	❑	❑	❑	❑	❑
participate in an email based maillist for example a listserver or newsgroups	❑	❑	❑	❑	❑
participate in a real time text based chat online (synchronous – same time, different place) as part of the course	❑	❑	❑	❑	❑
participate in a real time text based chat online (synchronous – same time, different place) as part of the course	❑	❑	❑	❑	❑
participate in text based discussion forum online (asynchronous – anytime, any place) as part of the course	❑	❑	❑	❑	❑
participate in an audio/video conference online	❑	❑	❑	❑	❑
communicate with you by email	❑	❑	❑	❑	❑
undertake a quiz which provides automated feedback	❑	❑	❑	❑	❑
undertake a simulation	❑	❑	❑	❑	❑
undertake a game or case study	❑	❑	❑	❑	❑
undertake another type of interactive task which enables you to repeat or practice an activity and obtain feedback e.g. a matching exercise,	❑	❑	❑	❑	❑
undertake an examination	❑	❑	❑	❑	❑
write an assignment	❑	❑	❑	❑	❑
build or make something from scratch (including a web site, a spreadsheet, a programme , an animation)	❑	❑	❑	❑	❑
undertake an assessment task	❑	❑	❑	❑	❑
for an activity within a tutorial class	❑	❑	❑	❑	❑

Are there any additional comments you wish to make about how you have used or been asked to use computers for learning?

_____
_____
_____
_____
_____
_____
_____

About your Institutional Context

Question 28

Think about your institution as a whole and indicate your opinion with respect to their use of computers for teaching and learning	Very poor	Poor	Average	Good	Very good	Can't say/ no opinion
The readiness to change among the people in my institution when it comes to the using computers for teaching and learning is	❑	❑	❑	❑	❑	❑
The support from the leaders in my institution for using computers for teaching and learning related purposes is	❑	❑	❑	❑	❑	❑
The vision within my institution for using computers for teaching and learning related purposes is	❑	❑	❑	❑	❑	❑
In my institution, the actual use of computers for teaching and learning related purposes is	❑	❑	❑	❑	❑	❑
In my institution the technical support I receive when using computers is	❑	❑	❑	❑	❑	❑

Question 29

How much do these factors encourage or discourage your current level of use of computers	Strongly discourage	Discourage	Neither	Encourage	Strongly encourage
The readiness to change among the people in your institution when it comes to the using computers for teaching and learning.	❑	❑	❑	❑	❑
The support from the leaders in your institution for using computers for teaching and learning related purposes.	❑	❑	❑	❑	❑
The vision within your institution for using computers for teaching and learning related purposes.	❑	❑	❑	❑	❑
The actual use of computers for teaching and learning related purposes in your institution.	❑	❑	❑	❑	❑
The technical support you receive when using computers in your institution.	❑	❑	❑	❑	❑

Are there any additional comments you wish to make about your institutions use of computers for teaching and learning?

_____
_____
_____
_____
_____
_____
_____

Information about yourself to assist us in analysing the data

This is intended to be an **anonymous questionnaire**. We do not seek to determine your identity nor examine your responses on an individual basis. We are requesting some personal information from each participant to assist in analysis of our results. Information obtained in connection with this study that may be identified with you will remain confidential and will not be disclosed.

Question 30

Your faculty					
Your department					
The degree in which you are enrolled					
Your major/specialisation area					
Including this year how many years have you been enrolled at [your institution]					
Your degree level	Undergraduate	Postgraduate			
Your current level of study	1st year	2nd year	3rd year	4th year	5th year
Your attendance pattern	Full time	Part time	Distance		
Your sex	Male	Female			
Your age	20-29	30-39	40-49	50-59	60+
Your nationality					
Your home language					
Are you the first person in your immediate family to go to University					
What is your parents occupation? Mother Father					
What is your parents highest education level Mother Father					

Are there any additional comments you wish to make in general about this questionnaire?

_____
_____
_____
_____
_____
_____
_____

Appendix 3

Description of process of pilot survey and feedback received

Feedback from Pilot study

A request to assist with the HictE survey pilot was made to people at all institutions. Requests were initially made from 3rd Oct with regular follow ups and alternative requests thereafter.

UCT process and responses

Started Wed 15 Oct. I initially approached 7 Faculty IT Managers asking them if it was possible to get 20 students from their faculty to complete the questionnaire and received responses back from 4 people.

Faculty	Response	When
Commerce	Tutors asked students in labs to complete questionnaire	Immediate – 19 responses
Humanities	Offered to get student tutors to complete	End Oct – had problems getting students to complete and return them 3 responses still trying for more
Built Environment	Offered to get student tutors and lab assistants to compete after exams	18 Nov Lab assistant going around getting responses 25 promised by 26 Nov
Health	Interested but timing not suitable. Person who would assist went on leave for 3 weeks. Others no time	NONE

In addition the researcher approached students in a cafeteria at lunchtime after exams to seek their input in the pilot. Students were told about the survey and how long it would take, the researcher let the students complete the survey on their own but walked around collecting them afterwards asking for feedback on their return. 16 responses were obtained this way from students in the Humanities and Commerce faculties.

Total UCT responses: 63

Student feedback

Timing was bad as with exam pressure many students were quite adamant that they did not have the interest or time to undertake the questionnaire. Of the students approached more than half said no to participating.

- All students completed the questionnaire but some said they only finished because they had to give it back to me in the end.
- One student appeared to “get bored” as they ticked the same box for all 30 options in Q 27 and 28.
- Students took between 20-40 mins to do the survey

- Most commented that it was a bit long and they got bored towards the end.
- Some found the wording of the encouraging and discouraging factors confusing although they commented that as they came across them the 2nd and 3rd times it made more sense. Others said they found it irritating. It looked like their answers were being checked. And it seemed to be repetitious.
- Students had a stronger personal interest in the access related questions as opposed to the uses for T&L related questions.
- They noted the lack of age category for under 20's
- One person questioned the usefulness of the research as they felt that these questions were asked often of students and nothing was ever done about them.

Detailed feedback

Vicki Scholtz, the Humanities IT Manager at UCT provided written feedback on specific questions in the survey
Dave Cooper, Course Convenor of PALM students provided detailed verbal feedback on each question

UWC process and responses

Started on Wed12 Nov. Nhlanhla Mlitwa went to the student centre and handed out about 80 questionnaires. He got 21 back.

His key observations were

- Some students took time to complete the forms, but not all returned forms are fully completed;
- Some students are happy to receive forms, but as they start -- get frustrated by the length, and some just refuse to go on thereafter;
- Most feedback indicates problems with questions 6 and 12.
- People complain about repetition in certain questions.

Neetha Ravjee took 20 questionnaires with the aim of distributing to masters students in the EPU lab and to specific students who worked in the Unit. She also gave 15 to Sibusiso Mkhize to distribute at his residence. So far she has 3 returned and noted that it takes more like 30 mins for students to complete.

Total UWC responses: 24 + 15

Detailed feedback

Neetha Ravjee and Charlton Koen are providing detailed feedback on the survey on Wed 26th Nov.

PenTech process and responses

Started Fri 31st Oct. Met with Garnett Gabriels, Head of the It Center. He undertook to distribute these to his 92 student assistants. He had received 35 returns on Fri 7 November.

Total PT responses: 35 +

Titbits from …

Sample of 15 students from the Robert Leslie Building after exams
13 valid responses

5 Commerce Faculty 8 Humanities Faculty

8 Eng home lang speakers, 2 African home lang speakers

Most students used computer labs on campus
They had a preference to access these during Uni hours
Half found it difficult to find a computer on campus
Majority often used Uni computers to access the Internet

Majority live with immd family
80% had a computer where they lived
80% also had access to a computer elsewhere with friends and Internet cafe being cited most freq. This was usually within 5km travel time and was cited as convenient to access
Majority of students shared use of a computer with 2 or more people. Half of them were the primary user. Majority of off campus computers did NOT have internet access. 90% of students had been using a computer for more than 3 years. They used it most to communicate, then for study and then for recreation.

75% rated their computer expertise as good to very good.
For the majority of students family and close friends were supportive and knowledgeable about computers.
Students tended to solve problems by approaching friends or IT support
All students were in agreement that they could use a computer for long enough periods of time when they needed to.
Most had an interest in new technology. and new ways of learning.
Students were split about the reliability and efficiency of University network hovering around the medium whilst most agreed off campus networks were not adequate.
Whilst most agreed they could find online content relevant to their courses (and produced locally) they were split about its relevance to the African context.
2 students indicated that the resources were definitely not in the language they wanted whilst most indicated they were only available in one language.

All were in agreement about the value of computer resources for learning, communication and support.

Teachers used ppt and text (9) and images (8) more than occasionally to explain concepts whilst the use of Audio/video, and multimedia (6) were less frequent their use did cluster around occasionally

Students were regularly or often asked to use a computer to
locate lectures notes (10)
write an assignment (9)
Locate electronic readings (8)
Communicate with lecturer by email (8)
Locate internet resources (7)
undertake an assessment task (7)

Students were never or rarely asked to use a computer to
undertake an exam (11)
participate in a audio/video conference (11)
participate in an online discussion forum (10)
use real time chat (10)
Build or make something from scratch (9)
participate in email list (8)
locate examples of previous assignment (8)

Some thoughts
A group of computer literate students with good access who despite the problems they encounter all feel they get sufficient time on computers to do what they need to do. All think its NB for learning BUT have a very narrow use of computers for T&L activities

Appendix 4

Survey covering letters

CAPE TECHNIKON
office of
the senior vice-rector: academic

16 February 2004

Dear Student/ staff

I am inviting your participation in this study which aims to look at what access you have to computers at the Cape Technikon and how you may be using them for learning.

This study is part of the larger cross institutional HictE (Information and Communication Technologies in Higher Education) Project. The goals of the project are to improve our understanding of quality and equity issues in educational technology in higher education in the Western Cape.

This survey is one component of the project and aims to examine if higher education students in the Western Cape have reasonable access (in the broadest sense of the word) to computers and how computers are being used to support teaching and learning.

Research of this kind has never been conducted in South Africa and the outputs will inform policy-making around educational technology development in our region.

The results will prove invaluable to the Cape Technikon in gaining a real sense of how students experience ICT at the institution and will help us to increase access to computers and improve the quality of learning materials in the future.

We thank you for your participation and look forward to sharing the outcomes of this project with the Technikon community.

With kind regards

Prof Nick Kok
Sen

PO Box 652 Cape Town 8000
Keizersgracht, District Six
Telephone 27 21 460 3356
Facsimile 27 21 460 3694
e-mail nkok@ctech.ac.za
Website www.ctech.ac.za

UNIVERSITY OF CAPE TOWN

Centre for Higher Education Development

University of Cape Town
Private Bag · Rondebosch 7701
Office of the Dean
Tel: (27 21) 650-2645
Fax: (27 21) 685-5743
Email: ched@ched.uct.ac.za

Dear Student/ Staff member

I am inviting your participation in this study which aims to look at what access you have to computers at the University of Cape Town and how you may be using them for learning.

This study is part of the larger cross-institutional HictE (Information and Communication Technologies in Higher Education) Project. The goals of the project are to improve our understanding of quality and equity issues in educational technology in higher education in the Western Cape.

This survey is one component of the project and aims to examine if higher education students in the Western Cape have reasonable access (in the broadest sense of the word) to computers and how computers are being used to support teaching and learning.

Research of this kind has never been conducted in South Africa and the outputs will inform policy-making around educational technology development in our region.

The results will prove invaluable to UCT in gaining a real sense of how students experience ICT at our institution and will help us to increase access to computers (by informing the Information and Communication Technology Strategy Project) and improve the quality of learning materials in the future.

Thank you for your participation and I look forward to sharing the outcomes of this project with the University community.

Yours sincerely,

ASSOC PROF NAN YELD
DEAN, CENTRE FOR HIGHER EDUCATION DEVELOPMENT

PENINSULA TECHNIKON

OFFICE OF THE DEPUTY VICE-CHANCELLOR : ACADEMIC

Enquiries:
Ref No:

Dear Student/ staff

I am inviting your participation in this study which aims to look at what access you have to computers at Peninsula Technikon and how you may be using them for learning.

This study is part of the larger cross institutional HictE (Information and Communication Technologies in Higher Education) Project. The goals of the project are to improve our understanding of quality and equity issues in educational technology in higher education in the Western Cape.

This survey is one component of the project and aims to examine if higher education students in the Western Cape have reasonable access (in the broadest sense of the word) to computers and how computers are being used to support teaching and learning.

Research of this kind has never been conducted in South Africa and the outputs will inform policy-making around educational technology development in our region.

The results will greatly assist us in promoting computer literacy among students and developing an appropriate e-learning environment on campus.

I look forward to sharing the outcomes of this project with our community

Yours sincerely

PROF A.P. STAAK
DEPUTY VICE CHANCELLOR : ACADEMIC AFFAIRS

P O Box 1906 Bellville 7535 • Symphony Way (off Modderdam Rd) Bellville 7530 • Tel: +27 21 959 6911/ 959 6202
Fax: +27 21 959 6002 • Website: http://www.pentech.ac.za • E-Mail: staaka@mail.pentech.ac.za

University of the Western Cape

Private Bag X17 **Bellville 7535 South** Africa
Telephone : +27 021 959-3245 Fax : +27 021 959-2775/1234
email: dkeats@uwc.ac.za/jlesch@uwc.ac.za

INFORMATION AND COMMUNICATION SERVICES
OFFICE OF THE EXECUTIVE DIRECTOR

Dear Student/ staff member

I am inviting your participation in this study which aims to look at what access you have to computers at the University of the Western Cape and how you may be using them for learning.

This study is part of the larger cross institutional HictE (Information and Communication Technologies in Higher Education) Project. The goals of the project are to improve our understanding of quality and equity issues in educational technology in higher education in the Western Cape.

This survey is one component of the project and aims to examine if higher education students in the Western Cape have reasonable access (in the broadest sense of the word) to computers and how computers are being used to support teaching and learning.

Research of this kind has never been conducted in South Africa and the outputs will inform policy-making around educational technology development in our region.

The results will prove invaluable to UWC in gaining a real sense of how students experience ICT at our institution and will help us to increase access to computers and improve the quality of learning materials in the future.

We thank you for your participation and look forward to sharing the outcomes of this project with the University community.

Sincerely,

Derek Keats

Email sent to Stellenbosch University students

From: HICTE Prof WT Claassen <hicte@sun.ac.za> [mailto:HICTE@sun.ac.za]
Sent: 30 April 2004 14:14
To: FPMOORE@SUN.AC.ZA
Subject: Hicte navorsingsprojek / Hicte research project

Beste student/ dosent (English message follows below)

Die Universiteit Stellenbosch neem deel aan die HICTE (Information and Communi-ca-tion Technologies in Higher Education) navorsingsprojek, wat ontwerp is om, as inter-institu-sio-nele projek, ons kennis van kwaliteit- en gelykheidskwessies met betrekking tot die gebruik van informasie-en kommunikasietegnologie (IKT) in hoër onderwys in die Wes-Kaap te verbeter.

Een komponent van die studie is 'n opname onder dosente en studente (deur elektroniese vraelyste). Dit het ten doel om die toegang wat dosente en studente tot rekenaars het, en hoe hulle rekenaartegnologie gebruik om leer- en onderrig-aktiwiteite te ondersteun aan die Universiteit Stellenbosch en ander instellings in die Wes-Kaap, te ondersoek.

Van die kant van die Bestuurspan van die Universiteit ondersteun ons dit dat die Universiteit deelneem aan hierdie projek en dat die vraelys ook aan dosente en studente van die Universiteit gestuur word.

Die vraelys is beskikbaar by http://www.hicte.uwc.ac.za/survey/start.asp
en dit behoort u ongeveer 10-15 minute te neem om te voltooi. (Let asb. daarop dat u Inetkey moet oopmaak om die vraelys te voltooi.)

Die inligting wat uit hierdie opname kom, sal vir ons van groot waarde wees in ons eie evaluering van die stand van die gebruik van IKT, asook in verdere beplanning in hierdie verband. U ondersteuning vir hierdie projek sal waardeer word.

Baie dankie
Prof WT Claassen
(Viserektor (Navorsing))

Dear student /lecturer

Stellenbosch University is participating in the HictE (Information and Communication Technologies in Higher Education) Research Project, which is a cross institutional project designed to improve our understanding of quality and equity issues with regard to the use of information and communication technology (ICT) in higher education in the Western Cape.

One component involves a survey of staff and students (through electronic questionnaires.) This aims to explore what access staff and students have to computers and how they are being used to support teaching and learning at SU and the other HE institutions in the Western Cape.

We, as the management team of the University, support the University's participation in the project and the fact that the survey is sent to lecturers and students at the University.

The questionnaire is available at http://www.hicte.uwc.ac.za/survey/start.asp
and should take you about 10-15 minutes to complete. (Please take note that you have to open Inetkey to complete the survey.)

The information gathered through this survey will be of great value to us in our own evaluation of the use of ICTs, as well as in further planning in this regard.

Your support for this project will be appreciated.
Thank you
Prof WT Claassen
(Vice-Rector (Research)

Appendix 5

Research ethics submission

UNIVERSITY *of the* WESTERN CAPE

DEPARTMENT OF RESEARCH DEVELOPMENT

SR1

UWC RESEARCH PROJECT REGISTRATION AND ETHICS CLEARANCE APPLICATION FORM

This application will be considered by UWC Faculty Board Research and Ethics Committees, then by the UWC Senate Research Committee, which may also consult outsiders on ethics questions, or consult the UWC ethics subcommittees, before registration of the project and clearance of the ethics. No project should proceed before project registration and ethical clearance has been granted.

A. PARTICULARS OF INDIVIDUAL APPLICANT

NAME: Laura Czerniewicz TITLE: Ms

DEPARTMENT: Multimedia Education Group of Cape Town FACULTY: Center for Higher Education, University

FIELD OF STUDY: Access and Educational technology

ARE YOU:		
A member of UWC academic staff?	Yes ☐	No ✓
A member of UWC support staff?	Yes ☐	No ✓
A registered UWC student?	Yes ☐	No ✓
From outside UWC, wishing to research at or with UWC?	Yes ✓	No

B. PARTICULARS OF PROJECT

PROJECT NUMBER: TO BE ALLOCATED BY SENATE RESEARCH COMMITTEE:

EXPECTED COMPLETION DATE: Dec 2004

PROJECT TITLE:

Use of Computers to support Teaching and Learning: A survey of academic staff and students at higher education institutions in the western cape

THREE KEY WORDS DESCRIBING PROJECT:

access, computers, teaching and learning

PURPOSE OF THE PROJECT:

This study is part of the cross institutional project HictE (Information and Communication Technologies in Higher Education) Project. The goals of the project are to improve our understanding of quality and equity issues in educational technology in higher education in the Western Cape.

This survey is one component of the project and aims to examine if higher education students in the Western Cape have reasonable access (in the broadest sense of the word) to computers and how computers are being used to support teaching and learning.

C. PARTICULARS REGARDING PARTICULAR RESEARCHERS

HictE Project Leader

Prof Derek Keats
Chair, HictE Project Management Committee
Executive Director
Information and Communication
University of the Western Cape
Phone: 9593245
Email: dkeats@uwc.ac.za

PRINCIPAL RESEARCHER:

Laura Czerniewicz
Project Leader , HictE Sub Project 3
Director, Multimedia Education Group,
University of Cape Town
Ph: 650 5036
Email: lcz@ched.uct.ac.za

OTHER RESEARCH PROJECT LEADERS:

Cheryl Brown
Researcher , HictE Sub Project 3
Ph: 650 5035
Email: cbrown@ched.uct.ac.za

OTHER CO-RESEARCHERS:

THESIS: STUDENT RESEARCHER:

THESIS: SUPERVISOR:

C. GENERAL INFORMATION

STUDY LEAVE TO BE TAKEN DURING PROECT (days):

IS IT INTENDED THAT THE OUTCOME WILL BE SUBMITTED FOR PEER REVIEWED PUBLICATION?
YES ☒ NO ☐

COMMENTS: DEPARTMENTAL CHAIRPERSON:

SIGNATURE OF THESIS STUDENT RESEARCHER – WHERE APPROPRIATE:

DATE

SIGNATURE OF THESIS SUPERVISOR – WHERE APPROPRIATE:

DATE

SIGNATURE OF PRINCIPAL RESEARCHER – WHERE APROPRIATE:

DATE:

SIGNATURE OF DEPARTMENTAL CHAIRPERSON:

DATE:

NOTE: THESE SIGNATURES IMPLY AN UNDERTAKING *BY THE RESEARCHERS*, TO CONDUCT THE RESEARCH ETHICALLY, AND AN UNDERTAKING BY THE THESIS SUPERVISOR (WHERE APPROPRIATE), AND THE DEPARTMENTAL CHAIRPERSON, TO MAINTAIN A RESPONSIBLE OVERSIGHT OVER THE ETHICAL CONDUCT OF THE RESEARCH.

E. DESCRIPTION OF PROJECT AND RESEARCH ETHICS STATEMENT

Please type below, or attach a typed document, usually between 500 and 5000 words, setting out the purpose and process of the research. Please include a clear research ethics statement. The onus is on the applicant to persuade UWC that the research will be conducted ethically. This will normally require evidence of an up to date research ethics literature search in the particular discipline; evidence of what the world standard ethical practice is, in the particular discipline; an explanation of how the proposed research is to be conducted ethically; a detailed justification of any proposed departure from world standard ethical practice; and a clear undertaking to conduct the research ethically. It may be useful also to agree to conduct the research in line with the published ethical rules of a national or international disciplinary association. UWC reserves the right to stop or suspend any research undertaken by its staff or students, or by outsiders on its property or in association with it, if the research appears to be unethical.

Purpose of research

The HictE (Information and Communication Technologies in Higher Education) survey is a sub-project of a cross institutional Carnegie funded project "Enhancing Quality and Equity in Higher Education through the innovative application of ICT". The goals of the Project are to improve our understanding of quality and equity issues in educational technology in higher education in the Western Cape. We also want to identify delivery and usage trends in the region.

The survey which will target academic staff and students in the 5 Higher Education Institutions in the Western Cape. aims to

- examine the different types of resources people need to draw on in order to have access to new technologies for higher education;
- consider the factors which encourage or inhibit peoples take up and usage of new technologies for teaching and learning
- identify the teaching and learning activities which people engage in (with a view to ascertaining whether people are exploiting all the possibilities of the new digital media forms)

Research of this kind has never been conducted in South Africa and the outputs will prove invaluable in providing baseline information to improve access to and quality of learning materials and in developing a locally appropriate e-learning environments.

Sampling Process

Research indicates that the more support a survey has within the institution the more participants will see a value in completing the questionnaire and the higher the response rate.

Academic staff:
February: Senior Management at each institution will raise awareness of survey at Deans meetings and ask each Dean to encourage their faculties to participate at Faculty meetings
March: All academic staff will be invited to participate in the survey though an email from Derek Keats. The email will provide a link to the online questionnaire.
April: Academic staff will be reminded about the invitation to participate in the survey and encouraged to respond if they have not already done so.

Students:
Strategy 1:Paper Questionnaire
Based on the Sayed approach in the Adamaster survey on Information Literacy (Sayed 1998)

A representative course in each Faculty will be chosen.
Students at 1st, 3rd and postgrad level in that course will be surveyed.
Our aim is to sample 10% of institutional student population.
The questionnaire will be administered at lectures with a fieldworker providing introduction and collection of the completed questionnaires.

Strategy 2: Online Questionnaire
All students will be invited to participate in the survey though an email from Derek Keats. The email will provide a link to the online questionnaire.
In addition links to the online questionnaire will be provided on student lab computers and through KEWL.

General: Message will also be placed on desktops given staff and students an option to link to the online survey when they login.

Ethics Statement
In undertaking this research various sources have been consulted in order to ensure that this study meets acceptable ethical guidelines. The project team also undertake to abide by the Code of Research Ethics of the Human Sciences Research Council.

We agree that participants in the survey should know they are taking part in research and that this research should be carried out with their consent. This consent is voluntary and should be based on an adequate understanding of the survey.

In order to give participants a clear understanding of the study we provide a

- Letter of invitation to participate from Prof Derek Keats
- Information statement from the Researchers, Laura Czerniewicz and Cheryl Brown
- Verbal overview of the study by the fieldworker handing out the paper questionnaires.

Consent Mechanisms
Paper questionnaire: The questionnaire is anonymous and will be handed out to students in a group situation. The return of a completed questionnaire will be accepted as indication of the respondents consent to participate in the study. (This is made clear to participants in the Information Sheet)
Online questionnaire: Participants will be presented with the information sheet prior to accessing the questionnaire. In order to proceed with the questionnaire they will have to "Accept" the statement. Again a completed questionnaire will be viewed as the respondents consent to participate in the study. Uncompleted questionnaires will not be saved by the server.

We are requesting some personal information from each participant to assist in analysis of our results as our research indicates that social background, age, sex and language all influence people's use of computers. We are also requesting information about the courses people are studying/teaching as we believe there are differences in the use of computers across courses. This information will remain confidential and will not be disclosed.

Attachments to the Application

- Invitation to participate
- Information Sheet
- Fieldworker notes

References

Code of Research Ethics of the Human Sciences Research Council
http://www.hsrc.ac.za/about/researchEthics/

Book 1: General Principles including research on children, vulnerable groups, international collaboration and epidemiology.*: Guidelines on Ethics in Medical Research: General Principles.* South African Medical Research Council's ethics policy
http://www.sahealthinfo.org/ethics/book1.htm

National Statement on Ethical Conduct in Research Involving Humans (HTML)
National health and Medical Research Council of Australia..
http://www.health.gov.au/nhmrc/publications/humans/contents.htm

University Human Research Ethics Manual, Queensland University of Technology
http://www.qut.edu.au/draa/or/ethics/human/manual.html

Human Ethics. University of Sydney. http://www.usyd.edu.au/ethics/human/

ITS and Online Survyes: Ethical Issues and "Netiquette". University of texas.
http://www.utexas.edu/learn/surveys/ethics.html

Research On-Line: Human Participants Ethics Issues, by John Mueller, University of Calgary
http://psychology.ucalgary.ca/Research/ethics/on-line_ethics.html

Sayed, Yusuf. 1998. *The Segregated Information Highway: Information Literacy in Higher Education*. Cape Town. University of Cape Town Press.

Form issued by: Professor Renfrew Christie, UWC Dean of Research, February 2002.
(959 2949; 959 2948 secretary, 959 3170 fax, email: rchristie@uwc.ac.za)

INFORMATION SHEET

Please read the following information sheet before beginning the questionnaire.

Dear Student

You are invited to participate in the research project "Use of Computers to support Teaching and Learning: A survey of academic staff and students at higher education institutions in the Western Cape" by completing the attached questionnaire.

Why are we doing this?
The aim of the project is to examine what access you have to computers and how you may be using them for learning.

Who are the researchers?
The study is being carried out by Laura Czerniewicz and Cheryl Brown as part of the Information and Communication Technologies in Higher Education Project.

What do we expect from you in the study?
Participation in this survey is voluntary. By completing this questionnaire you are agreeing to take part in this research. If at any stage you do not wish to continue with the survey you may withdraw your consent by simply not returning the questionnaire or destroying the paper copy.

The questionnaire will take you 30 mins at the most to complete. It consists of 6 pages with a total of 62 questions (some of which are optional). The majority of questions are in multiple choice format and ask you to select the most appropriate answer. However there is opportunity for you to write further comments should you wish to do so.

By completing the questionnaire it will be understood that you have consented to participate in the project, and that you consent to publication of the results of the project with the understanding that anonymity will be preserved.

How are we going to use the results?
This is an anonymous study. We are not trying to find out your identity nor examine the responses on an individual basis. The results of the project will be published, but you may be assured that any information obtained in connection with this study that may be identified with you will remain confidential and will not be disclosed.

What are we doing to ensure confidentiality?
To ensure security, the questionnaires will be stored in a locked filing cabinet in a secured area at the University of Cape Town. They will be destroyed on data entry. Data is being stored electronically in a database on a secured server and access is restricted by password to the researchers.

Please keep this information sheet and if at any stage you have any queries or concerns regarding your participation in the study, please contact us.

Cheryl Brown and Laura Czerniewicz

Researchers: Information and Communication Technologies in Higher Education Project
Contacts: Email : cbrown@ched.uct.ac.za, or lcz@ched.uct.ac.za,
Phone: 650 5035

Appendix 6

Details of the actual versus realised sample

Table 1: Details of student enrolments in 2004 compared with details of student respondents from the survey

Institution	Faculty	Undergraduate				Postgraduate				TOTAL			
		Survey sample (n)	Survey sample (% total)	Actual enrolments (n)	Actual enrolments (% total)	Survey sample (n)	Survey sample (% total)	Actual enrolments (n)	Actual enrolments (% total)	Survey sample (n)	Survey sample (% total)	Actual enrolments (n)	Actual enrolments (% total)
SU	Agric & Forestry	11	3%	850	6%	10	8%	292	4%	21	4%	1142	5%
SU	Arts	80	23%	2957	21%	28	112%	1388	18%	108	23%	4345	20%
SU	Eco & Mgt	81	23%	4141	29%	29	414%	1932	25%	110	23%	6073	28%
SU	Education	8	2%	533	4%	5	36%	1612	21%	13	3%	2145	10%
SU	Eng	43	12%	1399	10%	20	23%	423	5%	63	13%	1822	8%
SU	Health Science	50	14%	1870	13%	5	6%	919	12%	55	11%	2789	13%
SU	Law	8	2%	470	3%	6	26%	353	5%	14	3%	823	4%
SU	Military Sci	1	0%	372	3%		0%	54	1%	1	0%	426	2%
SU	Science	62	18%	1440	10%	26	325%	655	8%	88	18%	2095	10%
SU	Theology	4	1%	111	1%	2	7%	201	3%	6	1%	312	1%
TOTAL		**348**		**14143**		**131**		**7829**		**479**		**21972**	
UCT	Commerce	528	28%	4507	32%	25	10%	1057	21%	553	26%	5564	29%
UCT	EBE	515	27%	2158	15%	7	3%	657	13%	522	24%	2815	15%
UCT	Health Science	359	17%	1594	11%	16	6%	962	19%	375	15%	2556	13%
UCT	Humanities	218	12%	3958	28%	86	35%	1095	22%	304	14%	5053	26%
UCT	Law	97	5%	186	1%	90	37%	539	11%	187	9%	725	4%
UCT	Science	220	12%	1632	12%	23	9%	744	15%	243	11%	2376	12%
TOTAL		1937		14035		247		5054		2184		19089	
CT	Applied Science	195	14%	1722	12%	8	6%	405	14%	203	13%	2124	12%

	BE & Design			1231	8%			167	6%			1398	8%
CT		141	10%			28	20%			169	11%		
	Bus Informatics			3462	24%			382	13%			3831	22%
CT		330	23%			36	25%			366	23%		
	Education			45	0%			1829	63%			1871	11%
CT		194	13%			11	8%			205	13%		
	Engineering			3284	22%			560	19%			3830	22%
CT		144	10%			17	12%			161	10%		
	Management			3836	26%			718	25%			4548	26%
CT		438	30%			42	30%			480	30%		
TOTAL		**1442**		**14676**		**142**		**2926**		**1584**		**17602**	
PT	Business	403	59%	3746	38%	20	40%	56	30%	423	58%	3802	39%
PT	Engineering	35	5%	2439	38%	10	20%	44	47%	45	6%	2483	36%
PT	Science	243	36%	3754	25%	20	40%	89	23%	263	36%	3843	25%
TOTAL		**681**		**9939**		**50**		**189**		**731**		**10128**	
UWC	Arts	206	21%	1996	18%	18	9%	479	14%	224	19%	2475	18%
UWC	Community And Health Sciences	182	18%	1928	18%	19	10%	432	13%	201	17%	2360	17%
UWC	Dentistry	40	4%	585	5%	2	1%	269	8%	42	4%	854	6%
UWC	Economic & Management Sciences	342	34%	2914	27%	105	53%	856	26%	447	37%	3770	27%
UWC	Education	1	0%	641	6%	4	2%	631	19%	5	0%	1272	8%
UWC	Law	29	3%	1391	13%	14	7%	200	6%	43	4%	1591	11%
UWC	Science	202	20%	1496	14%	36	18%	479	14%	238	19%	1975	14%
TOTAL		**1002**		**10951**		**198**		**3346**		**1200**		**14297**	

Appendix 7

Construction of indices

Creation of indices: About Access

Frequency of use

Frequency of usage on campus.

2 items.
4 point scale never to daily
Min 2 Max 8

Items:
A1.1How often do you use a computer at Cape Tech?
A1.2 How often do you use this computer to access the Internet?

Frequency of usage generally

4 items.
4 point scale never to daily
Min 4 Max 16

Items:
How often do you use a computer
A20.1to communicate with people
A20.2for study
A20.3for recreation
A20.4to access information

Frequency of usage overall (two indices combined)

6 items.
4 point scale never to daily
Min 6 Max 24

Items: Combined of above

Adequacy and ease of use

Ease of use

3 items.
4 point scale very difficult to very easy
Min 3 Max 12

Items:

A4 How difficult is it to find a computer when you need one?

A13 How difficult is it for you to use the computer you referred to in A11
A28.1 I am able to use a computer for long enough periods of time for my learning requirements

Adequacy of use

3 items.
4 point scale Strongly disagree to strongly agree
Min 3 Max 12

Items:

A28.3 The internet access at Cape Tech is adequate for my subject requirements.
A28.4 The internet access off campus is adequate for my subject requirements.
A28.5 The technical support I receive from Cape Tech for using computers for learning is adequate

Adequacy and ease of use ON CAMPUS

3 items.
4 point scale Strongly disagree to strongly agree
4 point scale very difficult to very easy
Min 3 Max 12

Items:

A28.3 The internet access at Cape Tech is adequate for my subject requirements.
A28.5 The technical support I receive from Cape Tech for using computers for learning is adequate
A4 How difficult is it to find a computer when you need one?

Adequacy and ease of use OFF CAMPUS

2 items.
4 point scale Strongly disagree to strongly agree
4 point scale very difficult to very easy
Min 2 Max 8

Items:

A13 How difficult is it for you to use the computer you referred to in A11
A28.4 The internet access off campus is adequate for my subject requirements.

Adequacy and ease of use Overall

6 items.
4 point scale Strongly disagree to strongly agree
4 point scale very difficult to very easy
Min 6 Max 24

Items: Combined above

Off campus access

Physical

3 items.

Items
A8 Do you have use of a computer where you live?
A10 Does this computer have access to the internet?
A11 Besides where you live, do you have access to a computer elsewhere off campus?

Recoded as follows
0 NO access off campus
1 a computer elsewhere ONLY
2 a computer at home ONLY
3 a computer AND the Internet at home
4 a computer at home AND elsewhere
5 a computer AND the Internet at home AND a computer elsewhere

Min 0 Max 5

Practical

2 items.

Items
A14 How many people share use of this computer?
A15 If you share use of a computer are you the primary (main) user?

Recoded as follows

1 Not primary user AND >3 people share access
3 Share equally AND 2 people share use
5 Primary user or Only person using computer

Min 0 Max 5

Overall off campus access

Combination of physical and practical indices
Min 0 Max 10

Personal agency

Individual disposition

8 items.
4 point scale Strongly disagree to strongly agree
Min 8 Max 32

B24.1 The use of computers is likely to result in more valuable learning experiences.
B24.2 The use of computers is likely to improve communication amongst students.
B24.3 The use of computers is likely to improve communication between students and teachers
B24.4 Computers can give valuable support to my courses
B24.5 Computers will help me do routine tasks (like enrolments and obtaining results) more quickly
B24.6 I am a person who likes to try out new ways to carry out my learning.
B24.7 I can picture myself encouraging fellow students to use computers for learning
A28.2 I am a person who has a high general level of interest in new technological developments.

Individual aptitude

Min 1 Max 12

A17 When did you first start using a computer
A18 Have you ever attended training on using a computer at Cape Tech?
A24 How would you rate your ability with using a computer generally?

	<2 yrs	3-5 yrs	>6 yrs
poor	1	2	3
average	4	5	6
good	7	8	9
excellent	10	11	12

And then ranked into 3 categories
low <=4
Med >4 <=8
High >8

Context

10 items.
2 point scale Disagree Agree
Min 10 Max 20

A25Overall my close friends

think it's important to use computers for educational purposes.
are competent computer users. .
use computers in their daily lives.
use computers for recreational purposes. .
use computers as a means of communicating with each other

A26 Overall my close family

think its important to use computers for educational purposes. .
are competent computer users. .
use computers in their daily lives.
use computers for recreational purposes. .
use computers as a means of communicating with each other.

Content

5 items.
2 point scale Disagree Agree
Min 5 Max 10

B19 I am able to find content on the internet that is relevant to the subjects I am studying.
B20 I am able to find subject content on the internet that is relevant to South Africa.
B21 I am able to find subject content on the internet that has been produced locally
B22 The computer resources I have used for studying are available in the language I want
B23 The computer resources I have used for studying are available in more than 1 language.

Creation of indices: About Use

Event of Acquisition

5 items.
5 point scale Never to Often
Min 5 Max 25

B6 How often have your lecturers explained or demonstrated a concept using

powerpoint or another type of presentation software
audio and/or video clips
multimedia eg animation
images or slides
text

Event of Discovery

5 items.
5 point scale Never to Often
Min 5 Max 25

B9 If yes, how often do you use a computer to look for

electronic readings
lecture notes
internet resources
general information about the module/ course
examples of previous assignments

Event of Dialogue

5 items.

5 point scale Never to Often
Min 5 Max 25

B12 If yes, how often do you use a computer to

participate in email discussion eg a list server or newsgroup
participate in online chat as part of a module/ course
participate in online discussion forum as part of the module/ course
participate in an online audio/video conference
communicate with the lecturer by email

Event of Practice

5 items.
5 point scale Never to Often
Min 5 Max 25

B15 If yes, how often do you use a computer to undertake

a multiple choice quiz
a simulation, role play or case study
a game
an interactive task which enables you to drill and practice
a computer activity which provides feedback

Event of Creation

5 items.
5 point scale Never to Often
Min 3 Max 15

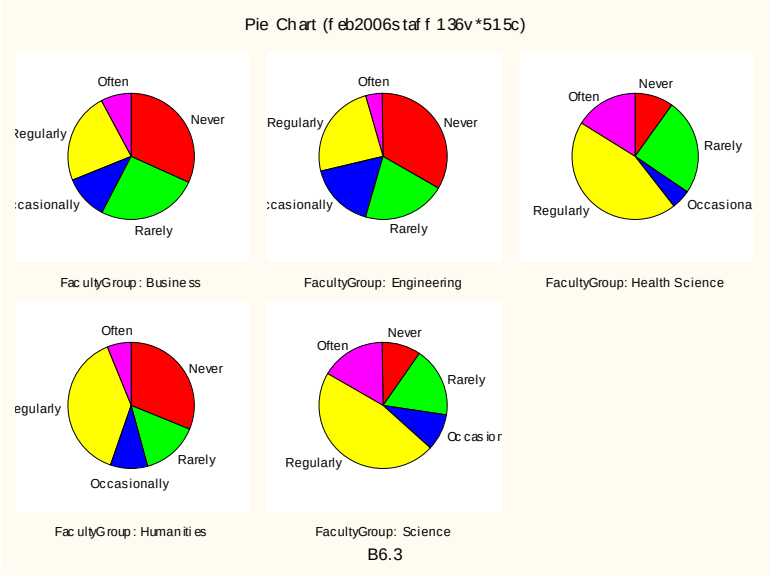
B18 If yes, how often do you use a computer to

write an assignment
create something for example developing your own website or making a poster
build something using specialised software like CAD, Macromedia Excel

Disciplinary groupings

Responses were categorised according to discipline and then ranked the response according to the median response. This created a new index where 1 = most frequent and so on. As an example we can examine staff responses to Question 6.3 asking "How often have you explained or demonstrated a concept using multimedia eg animation?" . The science and health sciences disciplines have a median of regularly. They were both given a ranking or 1. The humanities discipline has a median of occasionally, it was given a ranking of 2 and the business and engineering disciplines had a median of rarely and were given a ranking of 3

Figure 1: Example of staff from different disciplinary groupings response to question 6.3 "“How often have you explained or demonstrated a concept using multimedia eg animation?”



The ranking for this question was therefore

1. Health Science and Science
2. Humanities
3. Business and Engineering

Where the medians were all the same the disciplines were not ranked.

This ranking exercise was conducted for both staff and student responses. It enabled us to examine in which disciplines students and staff are undertaking a particular activity frequently (in terms of each other) irrespective of the actual percentage frequencies which we know differ.

The value of the index we created does not have a meaning in itself other than to indicate where that particular discipline lies in terms of overall ranking. For example, in the example above staff from health science and science disciplines regularly use multimedia as a presentational tool. They report the most frequent use of this activity and are ranked 1. However in terms of another activity the disciplines which are ranked 1 might only be undertaking the activity occasionally. However their occasional use is still more frequent than other discipline which might be reporting rare use so their ranking (in terms of overall frequency of use for that activity) is still 1.

Creation of indices: About demographics

Socio Economic Index

Students were asked 3 questions which we used to determine a rough SE index.

Occupation of primary breadwinner
Highest education level of primary breadwinner
If they were the first person in their immediate family to go to university

These were coded as follows

Occupation
Unemployed 1
Retired 2
Unskilled 3
Trade 4
semi Professional 5
Professional 6

Education Level
None 1
Primary 2
Secondary 3
Apprentership 4
Diploma 5
Degree in progress 6
Degree 7
Postgraduate 8

No 1
Yes 2

The index represents a cumulative score of the 3 items has a minimum of 3 and a maximum of 16.

The index was then split into three groupings. Those at the lowest part of the scale , those around the average and those with high SE

Low SE <7.5	1021	20%
Average SE >7.5 and <12.5	1943	39%
High SE >12.5	1995	40%

Appendix 8

Stories from interviews

UWC story – Interview with Derek Keats

"1*994 saw the web browsers become widely available, saw search engines coming up and content being created*". Prior to that there wasn't much happening in terms of using this technology for its educational potential. AT that time there were very few labs on campus, even fewer with internet access. A handful of people were using it for teaching and learning but really UWC was starting from a "*zero base*".

By the mid to late 1990's academic staff started to get involved and started a process of "*agitation and activism*" within the university to get the decision making process to take it [use of computers for teaching and learning] seriously. Up till then computers were used "*as part of the academic programme mainly for the purposes of enabling the academics to do their administrative part of their work not to do the academic part of their work*". They were "not [used] as a means to supplement or impact in any way on teaching and learning or research."

In 2000 ICTs for teaching and learning started to "*get taken seriously at an institutional level*". A series of changes which began with involving greater representation of academics on committees

In 2001 UWC established the executive portfolio of Information & Communication Services (ICS). The Executive Director of ICS has been tasked with "developing the University into a competitive teaching and learning organization in the field of Higher Education by creatively applying information and communication technologies to the academic project."

The vision of the Executive Director at this stage was to sort out the infrastructure and streamline process so that the foundation was laid for use of computers for teaching and learning.

"*so largely I could not do very much in terms of e-learning and application of IT in the academic programme until I was sure that the back end stuff was in place because the worst thing you can do is go out there and create expectations and then you can't deliver on that expectations.*"

Three seminal events then occurred. The first "was to create a information strategy for the institution and raise awareness about what ICT could do for the institution and also try and mobilise budget".

Another issue which was in a bit of a crisis in the institution was computer literacy. "*There were different faculties doing computer literacy in different ways, some for credit, some for no credit, some done by their own staff, some done by the teach and learning technology unit staff and no real co-ordination between [them]'*. At this point the senate academic planning committee decided it was necessary to come up with an institutional strategy for computer literacy and the Executive Director of ICS agreed to take this on as part of an institutional e-learning strategy which was the second seminal event.

The third involved taking up an opportunity re structure existing services so that academic computing and lab support was brought into the central ITS process which enabled people in e-learning to focus on learning rather than management of infrastructure.

"*Once we got that going, now we can say 'now what is the version in terms of how we use these computers in the academic programme' – so now what we have done is created a unit to give life to that strategy and the detail of that vision are very clearly spelt out in that strategy.*"

Currently these innovations are occurring in pockets throughout the faculties. Science particularly Biology, The English Dept in the Arts faculty that is involved in film and media, Social work and HIV aids projects in community and health sciences, E-learning Management course in Education.

UWC's vision for the future of e-learning involves the use of open source software and recognition of innovation. They do not expect e-learning to be pervasive across the curriculum.

" and my vision is – I have a feeling open source software plays a role in there as well but when I am completed with my five year contract, people recognise UWC as a place where innovations in e-learning happen, it may not be pervasive yet, it may not be everywhere in the academic programme and everybody using it but I would be very happy if we could make some major progress this year and next year in that area, but the people recognise innovations in e-learning happens at UWC. They recognise that UWC can deliver innovative programmes that involve e-learning, blended learning or use of technology to support application, but we have some really innovative new things that we have done, new programmes that we would not have been able to do if we did not have this capability and then when we go out into the world people recognise UWC as a place that is a modern institution using technology in creative and innovative ways and that would be my vision."

There are also some logical issues in terms of the future. A main one being the saturation of space on campus for use as computer labs and there are still not enough computers. The vision is to start looking more at mobile technologies and WIFi connectivity. Ideally *" completely cover the campus with WIFI using free and open source software. Students when they come onto the campus, the system can connect to the network, pick up what their new schedules are and all of those kind of things and at a very low cost, so we are working towards trying to find where the new opportunities lie to give our students access to the latest technology. It may well not be on the desktop or the laptop and it is not to say that we should not give them access to this, obvious superior technologies but you don't need to do everything through those technologies. With one of these [mobile] devices and R100-roll-up-keyboard they can do their typing anywhere and when they come onto campus they can save it onto the e-learning server and then if they want to access it in the lab, they can just call it up and print it, so it is about trying to find alternative ways to bring our students into the information, don't require us to put up a whole lot of new buildings."*

The Stellenbosch story – Interview with Antoinette van der Merwe

During the late nineties computers pockets of the university were using very much still stand alone applications delivered on a CD, very rich in media content. For example language applications were being developed using Authorware and a masters programme had started up on technology in language learning. Pre-1998 for there was another centre which did development for lecturers.

In 1998 a new center was established. One "*of the positions was for co-ordinator e-learning advisor and the idea with this centre and this person or this position was basically to co-ordinate the e-learning activities on campus and to give it some structure, some quality and so forth"* . They went with a "*lean and mean teaching profession model where the advisor of e-learning only could advise, maybe get involved in prototype development which is very vaguely defined but not do any extra development work. Training, advise, co-ordinating, that was the role of this person"*

" *I think it was in 1998 that Stellenbosch University started thinking that stand alone is not the only way to go, …. by the end of 1998 we started investigating the learner management systems with Pretoria, and Potchestroom"* . The idea originated from "*distance education, that was the primary drive at one stage but soon thereafter with the governments regulations and moratoriums on all distance education programmes the focus was shifted towards actually using the learner management system in the contact situation.*"

There was always a "*very tight partnership between us and the IT division, so that the relationship was so good that the infrastructure basically was maintained by them for the purpose of teaching and learning so the infrastructure was in place from the start, they invested and with our e-campus initiative more investments were made in infrastructure so much so that as a result of that we actually now have a very sustainable solution because the big investment was made by means of one injection and now it is relatively sustainable, we can actually maintain it.*"

"In 2001, things started coming together on the strategy level with our strategy for teaching and learning in which e-learning was one of the action plans – tried to integrate it, but then of course also our e-campus strategy in 2002 -2007."

"I don't think that we can underestimate the role that those early adopters played, … Management Science…. Natural Sciences … Physics Department – in first year ". We have the annual WEBCT mini conference and I can still think back to the first one we had in 2001 or we had one every year so probably 2000 and they were just marvelling at the tool because you can upgrade a document and students can download – that type of era and now it is blasé they don't even spend time on that"

Once the implementation was underway the next big year for SU was probably " *2004/5 and maybe even 2003 in the sense that we feel a move away from just minimum presence to really more innovative good practice, more interaction, more assessment in terms of e-learning, so there was definitely a shift, definitely not 100% there but we are seeing slowly but surely the shift from this content delivery,*

frameworks, more interaction, more assessment, better integration of e-learning into teaching learning".

The future …

"what is really happening to a large extent now, I think, is that we are moving close and closer to the whole e-campus vision of 2002 in the sense that a formal integrated system. The e-learning environment is one of those building blocks fitting into that bigger vision, coming together, wrap around our student portal, our staff portal so that tight integration of systems, I think that is really coming together on infrastructure systems level and I think that is improving increasingly on an ongoing basis – everything in one place – interactive and you can get feedback and as I said already I think really forward looking with regards to the use of the technology, I think it is going in the right direction."

" *I should also mention that another direction that Stellenbosch is really going into is the focus on first year to improve throughput rates, so I think, because that is where we know we need to focus attention and I thinking e-learning and the shifting online, it can really help us to get an early warning system off the ground, to see which students are struggling, you know in all the learning aspects, I do think that is another direction in the foreseeable future where Stellenbosch University will focus on throughput in their first year students*".

The CPUT story – Interview with Sakkie Smit and Jaco de Kock

In 1994 the main focus of use of computers academically was Computer Based Training. To answer you question, think 1994 was the use of a computer workstation to do some individual things and we have gone from the typewriter to typing on an integrate keyboard/screen, the mouse came in – I did not have a mouse then, the mouse was not an option then, it was a keyboard and a screen, you remember that, that was where we were and then the end of 1994, the whole sharing of information, the connectivity started, that was the main thing and that is where we come from….

"I think for me in 94 was the change between paper format and the fact that you could electronically store your information, that to me was the main difference…."

" For example CBT Science and the Mathematical Programme where it was – there were Mathematical Programmes available that we still use in Science and Maths at school where they put that in a computer – like the computer was still considered as a machine – you put the floppy – you go through the steps by typing in the numerical things and not being evaluated but a kind of a self-testing and I remembered here and there were programmes or Science things that I could put as a disk into …

But it was still Dos based programmes and we did a lot of stuff that was basically just computer based teaching so you had to boot up this programme and then they needed to do something, like I remember you know having to work in an Apple computer to do little programme or whatever, but in those days we had the idea that computers will be used to teach people's problem solving abilities

I remember in 1999 I was at a conference where I delivered a paper on my chemistry programme before the school started and there was a Prof James Economy and he said that we must share our information with the world wide web and I thin everybody looked at him like "where are you coming from – what is this world wide web" – at that stage he said "this is the way to share academic information" – we are at an educational conference and that is where we are going to share our information, that to me was the first kind of encounter with the fact that there was something like the internet and I realised that was my connection with their university and I went there to work on some programmes there and I think from there it just opened up, the Window 95 and the connection with the internet from there….

In 2000 we started with this whole project as you know on the campus so that was when I became involved with e-learning from the lecturing side. Yes, we lack a policy at the Cape Tech but at the same time we made a policy decision at council level that e-learning should be part of core business. Now what should an e-learning policy say more than what a typical teaching and learning policy says when it says "the use of technology for teaching and learning". It is always a very sensitive issue that you try to put too much in definition of a policy or a working document or whatever and then sometimes it limits you more than what it allows you to work on this. We did have a position paper that means we had a positioning of e-learning within the institution that stated most of the information that you find in any policy so again an academic viewpoint on whether you need policies or whether you need working documents or

positioning documents or whatever the case may be, I think they all will be exactly the same.

Where we're heading

So that is a component and then the nice thing about we had full support from top management but no direct interference. They allowed us to decide on the learner management system black forms, how it is going to be applied and whether we added value. Now, we had a strategic e-learning workshop at Simonstown earlier this year and what came out of that – also some international speakers and that – and what came of this is that all the DVC's who attended, when asked "why", they said, "I would like to know what we have spent our money on"? All of them had exactly the same argument whereas the factors in e-learning – call it directors or heads of units driving this had this thing about "it can work – just allow me to show you that it can work" – you know so give me that space, I will show you and we can support you, we can develop the academics and then you had the typical technical people who may be talking about "but why this platform vs open source" you know the typical technical questions, but you immediately pick it up –

Can you see this is something leaning more technical but at the same time where it may work, it is not to say that it can't work and it works very effectively at an institution such as Stellenbosch, so you can't throw out that model and say that it should not be, so I think that we need to work on vertical structures in terms of specialisation and centralised support but then we need to find a link to integrate that into the faculties, not situated within a support unit, we need to give people within the faculties, the real practitioners but maybe someone, and this is where the Bellville campus if we can get this thing to work, but you know there is a lot more at play than just the mere model, where the IT co-ordinators within faculties may have a minimal teaching load, but a more administrative academic development support function but situated within the faculty.

Still with a link, so they will have a typical matrix organisation structure where they report in terms of the application of e-learning to a central unit, but also vertically responsible to the Dean in terms of the roll-out within the faculty. Now that seems to be a model that can work but to get this integration right and to decide who should manage and where this thing should be positioned, that is our next challenge. And then also the problem is that especially with merger, the people don't want to buy what comes from another institution so even if it works then we need to panel beat this thing into something that is under the hood, very recognisable but as long as you don't see where it comes from then it's – let's call it e-learning inside but let's make it subject to something else like academic ICTs – call it something else, get a new face to this thing, and you see if you can do that ……..

Now again looking at where we are today and making that gap you see that internationally they talk about not anymore the training in isolation, they talk about this dual role that the student is part of the learning process but at the same time must become part of the community in which they are going to operate, the working environment or whatever, so call it work shadowing or work integrated learning or all these aspects and now you need to bring in that aspect into your training as well and again e-learning lends itself to also be part of that because your students stay in touch

when they go out for the typical practical of the in-service or the work integrated or whatever you want to call it session. You have to co-ordinate this, you have the student, the tutors or mentors within the working environment and this is where you start adding the flexibility, the dual learning into this new complex learning environment and this integrate technology and pedagogy and organisation, this is where you start getting the right blend.

The PenTech story

During 1998, the Peninsula Technikon (Pentech) identified Information Technology as a key outcome required in the curriculum of most courses offered on the campus. Pentech then set themselves the goal of offering student access to a PC in a learning environment. Subsequent research proved that the location of an IT room in each faculty would be impractical. A decision was made to construct a centralized IT Centre on the campus, housing a minimum of 1,400 networked PCs in various room configurations, as well as computer laboratory arrangements.

The building was designed and constructed specifically for this purpose. It is security controlled, and also has informal spaces for students to pause between lectures

The learning areas are conceived of in a number of different ways.
Unstructured Open Learning Labs where students from various campus faculties gain access to PCs here, to carry out their assignments by using computer software related to their particular field of study. An assistant is on duty at the help desk with advice on the use of most programmes. All PCs are network-linked via temperature controlled patch rooms to printers where assignments can be transposed into hard copy. Electronic submission of assignments to lecturers forms part of the future phases of the Campus master planning, to thereby move toward using the full potential of the electronic medium.

The atrium ground floor contains eight Internet browsing workstations that are wall-mounted on specially designed joinery to suit the hardware concerned.

The Pentech Business Faculty established itself in a small sector of the ground floor, to fulfil their need for an auditorium and breakaway rooms. These were designed specifically to suite satellite conferencing link-up. Movable room dividers, which are patented acoustic sliding folding systems, were installed.

The IT Center was opened at the start of the 2002 academic year.

In his opening address on 23 April 2002, the Minister of Education: Professor Kadar Asmal Said " the exciting thing about this Centre is the fact that it provides access to students across the entire spectrum, irrespective of their fields of study. Computer literacy has become a way of life and is no longer a domain of the chosen few. It is the language required to pursue research at all levels. It is the language used at all workplace environments."

The UCT story – Interview with Martin Hall and Prags Naicker

The use of computers " started off as an individual sort of notion" in the ;late 80's. "The initial major investment came from the Mellon Foundation … there was a programme to put PCs on the desk of as many people in the then Arts and Social Sciences Faculty as possible and that was the sort of accelerated personal level investment funded by the Mellon foundation, so those early generation machines was sort of coming in to really get people using those PCs for personal production and they were wired for email use but nothing much really beyond that."

There was virtually no engagement at that stage with the notion of IT for teaching and learning, it was entirely developed as a personal tool for individuals .

in 1991 there was a clear distinction between research units and their activities as far as ICT was concerned and there was very limited use in terms of ICT to the campus community as a whole so what you had was – yes people were beginning to use email and so on but largely the online activity was limited to things like the student admin system, the finance system, the HR system and the like.

there was not if you like in the early 90's a clear picture or indeed, if you like an enterprise wide view of how ICT could be used for teaching and learning and it was used in research and not by everyone so you would find excellent example of ICT and its use in areas like Physics, EBE and in Science

The first serious intervention came in the early 90's when relatively significant amount of money was donated "at that time for student oriented PCs in the "Arts Building and was focussed very particularly on Language teaching and learning".

"What was happening there was that the old Language Departments were using tapes and the vision there was to shift them onto Multimedia capable computers for language teaching and that lab was partly equipped but you have to remember that that was a stage where the name 'Multimedia' was significant because the choice then was the standard machine that everybody was using would not have had a sound card or any graphics, so you had to motivate a considerable additional financial investment to equip computers with in fact sound and graphics capability of any sort. So the multimedia bit signalled that this was very much a cutting edge lab"

"So the first educational materials were advanced language teaching software because of course the languages moved ahead of everybody else in establishing student-based IT for the natural reason that as multimedia became available"

"There was other stuff going on around the area of Engineering Education and Maths education". There was early stuff going on in the Health Sciences Faculty at much the same time, donations were raised there and that went into expanding the library for the Health Sciences with computers.

it was never a concerted policy on the part of the university to do that. It kind of crept up incrementally, nobody sat down and said 'we have got to do this stuff'.

"Now the vision [of student learning centers or SLC's) of that which was Mamphela Ramphele's who is very much and it was again a fundraising thing, was the idea – SLCs were meant to be much more than microlabs and they were going to be a place where interactive computer-based education developed but nobody gave any thought at all to exactly how that materials were going to be developed, so they have become nothing more than microlabs and again I think that is the victim of the lack of a policy. "

Then as a response to incremental development "we got two very substantial grants, of well over a million dollars and it established the Multimedia Education Group which now becomes the Centre for Educational Technology and that was part of a conversation the involved 10 or 15 leading universities in the US and UCT in really exploring how multimedia, how education could be developed in that sense."

Now that project itself changed in the course of its evolution – in the early stage it was quite a loose project but then that project became very focussed on actually trying to demonstrate scientifically and statistically the difference by those sort of interventions so there was a lot of emphasis on setting up control groups and trying to measure significant improvements in students marks. Now the overall result of all of those is that you can't find significant improvements"

the Multimedia Education Project which then became the Centre for Educational Technology was consciously led along the philosophy of looking first at teaching requirements and then technology followed from that but only in fact working with people who were great champions it was in faculties. Now that has actually been a self-limiting policy in a way because relatively few people could do that and time will tell whether or not it is the right approach we took, but that is the decision that we took.

UCT was an early adopter so the network and so on, yes it is on every desktop staff and that kind of thing and comparing it to say what was going on in London in the mid 80's and 70's and so on, UCT in fact was doing too badly, it compared reasonably well. Of course what happened in the 90's, you had an explosion in the developed world in that way ICT was being used, huge amounts of funding and money was put into it and you certainly found all the premier universities leaping ahead of us and we were still through the 90's not committing to anything specific.

it was only in 2002, I got appointed in 2001, and in 2002 I kind of came to the conclusion that what we have is just not sustainable and that is where that whole process of finding out what was required for university level at UCT and a lot of talking and basically walking about the place trying to find out what researchers teaches and others were – hence we have ended up now with a reasonable amount of buy-in. UCT will never get total buy-in, but with other universities you may but they will take an order from the Chief Exec – not at UCT but what you need is to get buy-in from the main bodies.

So there is this conversation that needed to take place started to happen in around 2002 and as the conversations developed greater important groupings within the campus community started to see the advantages of thinking about the fact that what we have got now we can put a whole lot more mandate that what we have now but

what it is not going to give you is a kind of infrastructure that would make it impossible for you to extend the use of ICT in the teaching model, the learning model and indeed in the research model, it is not possible to take the whole infrastructure and suddenly say, for example, "we will make extensive use of WEBCT and all its facilities" – it is just not possible, the network will die, it can't be accessed from every requirement that constitutes the campus and so on and so on and the backbone is a pretty small pipe when it comes down to it in terms of bandwidth and so on.

Start talking with researchers

And there was another reason why I started with research because very earlier on I came to the conclusion that if I can satisfy from and infrastructural point of view in terms of type of platforms and that sort of thing that was a research requirements, just about everything else, even things like SAP have minuscule needs in relation to research and I think in the document I used the word "on the slipstream of research a whole lot of the admin stuff just gets taken care of" and on the slipstream of research also a whole lot of stuff like course management software and so on, it then has the platform and infrastructure can run beautifully on and we would not have to do anything special.

However if you don't have the answer to infrastructure to enable this inclusion of all this research and new mathematical models and so on but what will happen is that there will always be this terrible gap between the curriculum and research, so you have all this time on the research side but you can't actually take it across to the teaching side and if you don't take it across to the teaching side then the next generation of researchers who come out of the undergraduate and postgraduate programmes are deficient when they rejoin the research unit as a master student or a doctoral student or post-doc student, they are not equipped because of this gap and once this link got established it became very easy to start talking about teaching and learning and research and for me I think it was perhaps the most critical part of the conversation because it also meant that people to having more holistic conversations about what this is all about and that you could not actually put artificial, this kind of Chinese wall between these things and some of it got to do with poor visibility and understanding of what those pieces of application and software actually does and how it can be used and then people had the most weird interpretation of what WEBCT was all about but I said that all it is, is a platform to enable you to do a number of things. You may not like it, you may say to me that it is not intuitive in this area, in that area and so on and in the way it manages courses but that is all is. It is not going to replace the lecturer's ability to stand up and give a brilliant lecture, explanation or the kind of activities that takes in a lab, all this does is to supplement what the academic, it very rarely replaces it.

Different needs across campus. Some of the areas doing High performance computing are SALDRU, Oceanography, climate change etc

Future
" the next generation of change is obviously going to be around the use of PDA's – I mean should we be developing a policy, I mean we are now in a position in relation

to PDA technology in much the same way as we were probably positioned in about 1994 in relation to the internet. Now given that we did not develop a consistent policy, that we should be now developing a consistent policy with PDA's, maybe yes we should but I have no idea what that policy should be or how we go about designing it because I don't know in five year time whether every student in this university is going to be walking around with a cell phone which does essentially give them the power of a laptop at the moment, I mean people who made early depths on some of the technology on that lost a great deal of money and have gone in the wrong direction. On one view you could say that will happen but we don't know."

I mean first of all it is primarily a communication medium, so do you want peer to peer communication, you know our new standard that we are setting for introducing out new email client in the next year which will be Groupwise actually has an instant messaging function and one of the things that I have insisted on putting on that is a email cell phone facility so that staff can email students with a text message directly from their computers to students' cell phones which cost us vast amounts of money but we would pay for text message rather than for cell phone call, but then you have to ask the students, what do they want, they want peer to peer communication. What information do they want, well they want the information where their lecture venues are and what their exam schedule is, now can that be got through a PDA, you don't get it through PDA, you want pull technology or push, now if you are going to go push you actually have to a whole lot of stuff for your server architecture if you are going to do pull, but then again you must say, well given text messaging is the best, if the whole world can reach me with every variance of Viagra every single morning them surely we can reach our students on their cell phones with basic information about their lectures,

" So my policy to educational technology innovation generally is one that since the future is so unpredictable the most sensible strategy is to be as diverse as possible and then you have winners but you get some losers; you get people on the wrong technology and you invest in stuff that you should not have invested in but you have the ability in one thing that you have invested in."

if there is a UCT experience, the essence of the UCT experience is that all of our educational activities involve some degree of face-to-face interaction, students and students and teachers and students and that we would keep as a baseline. Then I think the question then comes in how does the educational technology support and enhance that educational criteria and philosophies that come from it and of course there are huge possibilities for asynchronous learning within the organisation. Now that is one of the reasons I am actively wanting to change our policy to undergraduate IT in particular residences because at the moment where we essentially firewall the residences on the rest of the campus. Now that to me is wrong because from the student point of view the student should be able to use the technology, they shouldn't not be able to get access to the library bases from their room in the residents, so one of the things that I am proposing that we do next year is to totally revisit our undergraduate IT provision philosophy and to drive it actually much more centrally because I don't think we can resolve undergraduate IT policy because at the end of the day the student is not really remotely interested to know when he or she logged in on the residence they are on one server system and when they log in on another day

on another and this is why they can't get access to their work or their work files, as far as they are concerned they are a member of the community. So we have to drive the undergraduate IT philosophy from a student point of view and say well for what does the student use it and what do they need to know and I am interested in the notion of driving it more from the student use point of view in fact that from the lecturer point of view and that is an interesting thing.

You know, the costs for us in IT provision, now in certain places we must have staffing, like in the knowledge commons where you want interpreted staff, now that is generally educational staff and in fact most of the staff don't in fact interpret, they do basic training in the lab, the do query, the troubleshooting type situation …..

If you have a lab, let's work on 100 workstations and it has to run ideally let's say 16 hours a day, that at least will need three staff members to provide support in that lab, so that is 3 lots of salary and you are therefore looking probably at about half a million rand a year in staffing costs with that lab, so that is R500,000-00, so your staffing cost per computer is R50,000-00, now if you can buy refurbished computers at R2,000-00 and give it to students and it is students who would have sat in that lab, doing their emails, they are happier, you don't have the staffing problem, they are safer because they are not having to be on the campus until after dark, they are responsible for computer, so if they lose it they are going to have to pay for it…

our most biggest expense in the student microlabs is not the computers, it is the staff and the security issues with students at risk, I would actually say 'let's give every student that comes to UCT, let's give them one of those because quite frankly giving every student one of those and then saying we don't want it back, is cheaper than setting up these horrid expensive microlabs where everybody says you have to have some 24/7 service and that is so expensive in staffing.

Appendix 9

Analytical framework

An Investigation into the Use of Computers To Support Teaching And Learning At The Five Higher Education Institutions In The Western Cape

Target Group

The people we are surveying are academic students in the 5 Higher Education Institutions in the Western Cape.

Main aims

1. To develop baseline information regarding **students** access to computers and their use of computers to support teaching and learning.
2. To identify factors which may be hindering and those that may be encouraging the use of computers for teaching and learning.

	Construct	Sub constructs				
1	Type of Access	Technology	Personal	Contextual	Content	
2	Ease of Access	Easy/ Difficult				
3	Types of use (media forms)	Narrative	Interactive	Communicative	Adaptive	Productive
4	Frequency of use	Seldom/ Often				
	Co variables					
1	Demographics					
2	Enabling/ constraining factors					

Indicators

SC 1a: Technology

Availability, location, capacity, infrastructure, time to use, sharing use

SC1b: Content

Language, form (interface design and how accessible it is) and content (is the information useful and relevant).

SC1c: Personal

Attitude to, Disposition to, Ability (cultural and critical literacy practices), Comfort with, Experiences, training
New issues of identity and privacy

SC1d: Contextual

Community support (friends and relatives), Technical support (people official like tutors, lab assistants etc)
Culture of institution

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
Type of access	Technology access	The tangible components of computers and associated telecommunication infrastructure	Location	Where do you live whilst you are attending University/ Technikon	Do you have a computer on your desk at {insert name of institution}?
Type of access	Technology access	The tangible components of computers and associated telecommunication infrastructure	Location	OPTIONAL: If so where?	
Type of access	Technology access	The tangible components of computers and associated telecommunication infrastructure	Location	OPTIONAL: Where do you go to use this computer? [at University/technikon]	
Type of access	Technology access	The tangible components of computers and associated telecommunication infrastructure	Availability	Do you own a cell phone?	
Type of access	Technology access	The tangible components of computers and associated telecommunication infrastructure	Availability	Do you have use of a computer where you live?	Do you have use of a computer where you live?
Type of access	Technology access	The tangible components of computers and associated telecommunication infrastructure	Availability	Besides where you live, do you have access to a computer elsewhere off campus?	
Type of access	Technology access	The tangible components of computers and associated telecommunication infrastructure	Availability	OPTIONAL: Does this computer have access to the internet/ web?	OPTIONAL Does this computer have access to the internet/ web? [home]
Type of access	Technology access	The tangible components of computers and associated telecommunication infrastructure	Adequacy	The internet access off campus is adequate for my course requirements	The internet access off campus is adequate for my teaching requirements.
Type of access	Technology access	The tangible components of computers and associated telecommunication infrastructure	Adequacy		The hardware and software composition of my computer at home is sufficient for my teaching requirements.
Type of access	Technology access	The tangible components of computers and associated	Adequacy	The internet access at [insert name of institution] is adequate	The internet access at work is adequate for my teaching

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
		telecommunication infrastructure		for my course requirements.	requirements.
Type of access	Technology access	The tangible components of computers and associated telecommunication infrastructure	Adequacy		The hardware and software composition of the computer I use at work is adequate for my teaching requirements.
Type of access	Technology access	The tangible components of computers and associated telecommunication infrastructure	Adequacy		The hardware and software composition of computers are sufficient for my students learning requirements.
	12 questions			6 core 3 optional	8 core 1 optional
Type of access	Practical	Control over when and to what extent computers are used	Time	When would you **most often** use this computer? [AT UNIVERSITY/TECHNIKON]	
	1 questions			1 core	1 core
Type of access	Individual disposition - general	A person's interest in and attitude to using computers	Interest	OPTIONAL If you never use a computer would you LIKE to start using a computer, to communicate with people, for study, for recreation, to access information	
Type of access	Individual disposition - general	A person's interest in and attitude to using computers	Interest	I am a person who has a high general level of interest in new technological developments.	I am a person who has a high general level of interest in new technological developments
Type of access	Individual disposition - general	A person's interest in and attitude to using computers	Purpose	Did you ever at some point use a computer for the following purposes but stopped for some reason?, to communicate with people, for study, for recreation, to access information	Did you ever at some point use one of the above mentioned media for teaching and learning purposes but stopped for some reason? OPTIONAL If yes which ones?
Type of access	Individual disposition - general	A person's interest in and attitude to using computers	Purpose	OPTIONAL If yes why did you stop?	OPTIONAL If yes why did you stop?
	4 questions			2 core 2 optional	3 core 1 optional
Type of access	Individual disposition - specific	A person's interest in and attitude to using computers for learning	Purpose	The use of computers is likely to result in more valuable learning experiences.	The use of computers is likely to result in an new forms of valuable learning experiences.
Type of	Individual	A person's interest in and	Purpose	Computers will help me do	Computers will help me do

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
access	disposition - specific	attitude to using computers for learning		routine tasks (like enrolments and obtaining results) more quickly	routine (administrative) tasks associated with teaching more quickly.
Type of access	Individual disposition – specific	A person's interest in and attitude to using computers for learning	Purpose	The use of computers is likely to improve communication amongst students.	
Type of access	Individual disposition – specific	A person's interest in and attitude to using computers for learning	Purpose	The use of computers is likely to improve communication between students and teachers	The use of computers is likely to improve communication amongst students and teachers.
Type of access	Individual disposition – specific	A person's interest in and attitude to using computers for learning	Interest	I can picture myself encouraging fellow students to use computers for learning	I can picture myself trying to encourage my colleagues or to try out new computer based applications for their teaching-related tasks
Type of access	Individual disposition - specific	A person's interest in and attitude to using computers for learning	Interest	I am a person who likes to try out new ways to carry out my learning.	I like to try out new ways of teaching.
	6 questions			6 core	5 core
Type of access	Individual aptitude	A person's knowledge and skills in using a computer	Experience	When did you first start using a computer?	Students have sufficient knowledge about computers to use them for learning.
Type of access	Individual aptitude	A person's knowledge and skills in using a computer	Knowledge	In general what do you do when you have a problem doing something on a computer?	In general what do you do when you have a problem doing something on a computer?
Type of access	Individual aptitude	A person's knowledge and skills in using a computer	Training	Have you undertaken a course on how to use a computer at [insert name of institution]?	
Type of access	Individual aptitude	A person's knowledge and skills in using a computer	Training	Have you undertaken a course on how to find information and use it effectively at [insert name of institution]?	
Type of access	Individual aptitude	A person's knowledge and skills in using a computer	Skill	How would you rate your expertise with using a computer generally	How would you rate your expertise using a computer generally?
	7 questions			7 core	3 core
Type of access	Institutional environment	Integration of technology into the institution	Extent	How many courses have you undertaken this year?	How many courses have you taught this year?
Type of	Institutional	Integration of technology	Extent	How many of your courses do	How many of these courses do

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
access	environment	into the institution		not require use of computers by students?	not make use of computers
Type of access	Institutional environment	Integration of technology into the institution	Extent	How many of your courses are delivered mostly using the web (with little or no face to face contact?)	How many of these courses are delivered mostly online **(little or no** contact?)
Type of access	Institutional environment	Integration of technology into the institution	Extent	How many of your courses have some of the actual teaching and learning activities online?	In how many of these courses are some of the actual teaching and learning activities online?
Type of access	Institutional environment	Integration of technology into the institution	Extent	How many of your courses use computers for supplementary purposes (providing information eg course outlines, assignments, notices, references etc)	How many course use computers for administrative or supplementary purposes (eg course outlines, information about assignments etc)
Type of access	Institutional environment	Integration of technology into the institution	Extent		In my institution, the actual use of computers for teaching and learning is …
Type of access	Institutional environment	Integration of technology into the institution	Policy		Does your institution have an institution wide strategy for the use of computers in teaching and learning?
Type of access	Institutional environment	Integration of technology into the institution	Policy		OPTIONAL If you answered YES, which in your personal opinion are the institutions main reasons for developing this strategy
Type of access	Institutional environment	Integration of technology into the institution	Policy		OPTIONAL If you answered No in Question, which of the following apply?
Type of access	Institutional environment	Integration of technology into the institution	Support	The technical support I receive from my institution for using computers for learning is adequate	Support from leaders in my institution for using computers for teaching and learning is …
Type of access	Institutional environment	Integration of technology into the institution	Support		In my institution the technical support I receive when using computers for teaching and learning is …
Type of access	Institutional environment	Integration of technology into the institution	Support		Students have adequate support to solve technical computer

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
					problems when they occur.
Type of access	Institutional environment	Integration of technology into the institution	Intention		Readiness to change amongst people in my institution when it comes to using computers for teaching and learning is …
Type of access	Institutional environment	Integration of technology into the institution	Intention		The vision within my institution for using computers for teaching and learning is
	14 questions			6 core	12 core, 2 optional
Type of access	Social environment	The interest and support received from a community	Community	My family, Think its important to use computers for educational purposes., Are competent computer users., Use computers in their daily lives., Use computers for recreational purposes., Use computers as a means of communicating with each other.	My family, Think its important to use computers for educational purposes., Are competent computer users., Use computers in their daily lives., Use computers for recreational purposes., Use computers as a means of communicating with each other.
Type of access	Social environment	The interest and support received from a community	Community		My colleagues, Think its important to use computers for educational purposes., Are generally competent computer users., Use computers in their daily lives ,Use computers as a means of communicating with each other.
Type of access	Social environment	The interest and support received from a community	Community	My friends, Think its important to use computers for educational purposes., Are competent computer users., Use computers in their daily lives. ,Use computers for recreational purposes. ,Use computers as a means of communicating with each other.	
	3 questions			2 core	2 core
Type of access	Content	The availability of suitable Content material online	Relevance	I am able to find content on the internet that is relevant to the courses I am studying.	I am able to find content on the internet that is relevant to the courses I am teaching.

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
Type of access	Content	The availability of suitable Content material online	Relevance	I am able to find course content on the internet that is relevant to South Africa.	I am able to find content on the internet that is relevant to our South African context.
Type of access	Content	The availability of suitable Content material online	Locally produced	I am able to find course content on the internet that has been produced locally.	I am able to find content on the internet that has been produced locally.
Type of access	Content	The availability of suitable Content material online	Locally produced		I am able to find content on the internet that has been created by my colleagues.
Type of access	Content	The availability of suitable Content material online	Language	The computer resources I have used for studying are available in the language I want.	The computer resources I have used for teaching are available in the language I want.
Type of access	Content	The availability of suitable Content material online	Language	The computer resources I have used for studying are available in more than 1 language.	The computer resources I have used for teaching are available in more than 1 language.
53 questions	6 questions			5 core	6 core

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
Ease of access	Technology	The tangible components of computers and associated telecommunication infrastructure	Time	How difficult is it for you to use this computer? [a computer other than where you live]	There are enough computers for students in my faculty to use for their learning activities.
Ease of access	Practical	Control over when and to what extent computers are used	Time	I able to use a computer for long enough periods of time to do what I need to.	I able to use a computer for long enough periods of time to do what I need to.
Ease of access	Practical	Control over when and to what extent computers are used	Autonomy	Think about the computer that you MOST often use when not at University/Technikon. How many people share use of this computer?	OPTIONAL If yes, how many people use this computer?
Ease of access	Practical	Control over when and to what extent computers are used	Autonomy	OPTIONAL If you share use of a computer are you the primary (main) user?	OPTIONAL If you share use of a computer are you the primary (main) user?
	5 questions			3 core, 2 optional	2core, 2 optional
Ease of access	Institutional Environment		Support	How difficult is it to find a computer[at university/technikon] when you need one?	Computers are available to students in my faculty whenever they need them.

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
	1 question			1 core	1 core
Ease of access	Content	The availability of suitable Content material online	Format		The computer resources I have used for teaching are in a format I can easily use.
7 questions	1 question				1 core

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
Frequency of use	Individual aptitude	A person's knowledge and skills in using a computer	Never/ often	How often do you use a computer at [name of institution]?	
Frequency of use	Individual aptitude	A person's knowledge and skills in using a computer	Never/ often	How often do you use this computer [at uni] to access the Internet?	How often do you use a computer at work to access the Internet?
Frequency of use	Individual aptitude	A person's knowledge and skills in using a computer	Never/ often	How often do you use a computer , to communicate with people, for study, for recreation, to access information	How often do you use a computer , to communicate with people, to do research, to teach, for work related administration ,for recreation
3 questions	3 questions			3 core	2 core

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
Types of use	Narrative	Uni-directional media where every user sees the same information.	Never/ often	How often has your lecturers explained or demonstrated a concept using powerpoint or another type of presentation software	How often has your lecturers explained or demonstrated a concept using powerpoint or another type of presentation software
Types of use	Narrative	Uni-directional media where every user sees the same information.	Never/ often	audio and/or video clips	audio and/or video clips
Types of use	Narrative	Uni-directional media where every user sees the same information.	Never/ often	multimedia	multimedia
Types of use	Narrative	Uni-directional media where every user sees the same information.	Never/ often	images	images
Types of use	Narrative	Uni-directional media where every user sees the same	Never/ often	text	text

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
		information.			
	5 questions			5 core	5 core
Types of use	Interactive	User control in a non-linear fashion with information remains unchanged by the user.	Never/ often	Have you ever been asked by your lecturer to: Find information using a computer	Have you ever been asked by your lecturer to: Find information using a computer
Types of use	Interactive	User control in a non-linear fashion with information remains unchanged by the user.	Never/ often	Find information using other resources	Find information using other resources
Types of use	Interactive	User control in a non-linear fashion with information remains unchanged by the user.	Never/ often	OPTIONAL If YES how often do you use a computer to look for electronic readings	OPTIONAL If YES how often do you use a computer to look for electronic readings
Types of use	Interactive	User control in a non-linear fashion with information remains unchanged by the user.	Never/ often	lecture notes	lecture notes
Types of use	Interactive	User control in a non-linear fashion with information remains unchanged by the user.	Never/ often	internet resources	internet resources
Types of use	Interactive	User control in a non-linear fashion with information remains unchanged by the user.	Never/ often	general information about the course	general information about the course
Types of use	Interactive	User control in a non-linear fashion with information remains unchanged by the user.	Never/ often	examples of previous assignments	examples of previous assignments
	7 questions			2 core and 5 optional	2 core and 5 optional
Types of use	Communicative	Communication one to one, one to many and many to many both asynchronously & synchronously	Never/ often	Have you ever been asked by your lecturer to: Communicate using a computer	Have you ever been asked by your lecturer to: Communicate using a computer
Types of use	Communicative	Communication one to one, one to many and many to many both asynchronously & synchronously	Never/ often	Communicate using other resources	Communicate using other resources
Types of	Communicati	Communication one to one,	Never/	OPTIONAL If YES how often do	OPTIONAL If YES how often do

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
use	ve	one to many and many to many both asynchronously & synchronously	often	you use a computer to participate in email discussion for example a list server or newsgroup	you use a computer to participate in email discussion for example a list server or newsgroup
Types of use	Communicative	Communication one to one, one to many and many to many both asynchronously & synchronously	Never/ often	participate in online chat as part of the course	participate in online chat as part of the course
Types of use	Communicative	Communication one to one, one to many and many to many both asynchronously & synchronously	Never/ often	undertake a computer activity which provided feedback	undertake a computer activity which provided feedback
Types of use	Communicative	Communication one to one, one to many and many to many both asynchronously & synchronously	Never/ often	participate in online discussion forum as part of the course	participate in online discussion forum as part of the course
Types of use	Communicative	Communication one to one, one to many and many to many both asynchronously & synchronously	Never/ often	participate in an online audio/video conference	participate in an online audio/video conference
Types of use	Communicative	Communication one to one, one to many and many to many both asynchronously & synchronously	Never/ often	communicate with the lecturer by email	communicate with the lecturer by email
	8 questions			2 core and 6 optional	2 core and 6 optional
Types of use	Adaptive	Responsive, lets people take actions and receive feedback	Never/ often	Have you ever been asked by your lecturer to: Participate in an activity using a computer	Have you ever been asked by your lecturer to: Participate in an activity using a computer
Types of use	Adaptive	Responsive, lets people take actions and receive feedback	Never/ often	Participate in an activity using other resources	Participate in an activity using other resources
Types of use	Adaptive	Responsive, lets people take actions and receive feedback	Never/ often	OPTIONAL If YES how often do you use a computer to undertake a multiple choice quiz	OPTIONAL If YES how often do you use a computer to undertake a multiple choice quiz
Types of use	Adaptive	Responsive, lets people take actions and receive feedback	Never/ often	undertake a simulation, role play or case study	undertake a simulation, role play or case study
Types of use	Adaptive	Responsive, lets people take actions and receive feedback	Never/ often	play a game	play a game
Types of	Adaptive	Responsive, lets people	Never/	undertake an interactive task	undertake an interactive task

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
use		take actions and receive feedback	often	which enables you to drill and	which enables you to drill and
	6 questions			2 core and 4 optional	2 core and 4 optional
Types of use	Productive	places the tools in peoples hands enabling them to create things and express their own ideas	Never/ often	Have you ever been asked by your lecturer to: Create things and express ideas using a computer	Have you ever been asked by your lecturer to: Create things and express ideas using a computer
Types of use	Productive	places the tools in peoples hands enabling them to create things and express their own ideas	Never/ often	Create things and express ideas using other resources	Create things and express ideas using other resources
Types of use	Productive	places the tools in peoples hands enabling them to create things and express their own ideas	Never/ often	OPTIONAL If YES how often do you use a computer to create something for example developing your own website, making a poster,	OPTIONAL If YES how often do you use a computer to create something for example developing your own website, making a poster,
Types of use	Productive	places the tools in peoples hands enabling them to create things and express their own ideas	Never/ often	write an assignment	write an assignment
Types of use	Productive	places the tools in peoples hands enabling them to create things and express their own ideas	Never/ often	build something using specialized software like CAD, Macromedia, Excel	build something using specialized software like CAD, Macromedia, Excel
31 questions	5 questions			2 core and 3 optional	2 core 3 optional

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
Demographics	Individual			Your age	Your age
Demographics	Individual			Your home language	Your home language
Demographics	Individual			Your nationality	Your nationality
Demographics	Individual			Your sex	Your sex
Demographics	Individual			Is your ability to use a computer limited by a Disability/ illness	Is your ability to use a computer limited by a Disability/ illness
	5 questions			5 core	5 core

Construct	Sub construct	Definition	Indicators	Questions Student	Questions Staff
Demographics	Course			Your attendance pattern	
Demographics	Course			Your faculty	Your faculty
Demographics	Course			Your department	Your department
Demographics	Course			The qualification for which you are enrolled	The course/degree in which you teach?
Demographics	Course			How many courses have you undertaken this year?	How many courses have you taught this year?
Demographics	Course			Your qualification level	
Demographics	Course			Your current level of study	Your current level of appointment
Demographics	Course			Including this year how many years have you been enrolled at [your institution]	What year were you first appointed at [your institution]
	8 questions			8 core	6 core
Demographics	Socio economic			What is the occupation of the primary breadwinner in your family?	
Demographics	Socio economic			What is your parents highest education level Mother Father	
Demographics	Socio economic			Are you the first person in your immediate household to go to University	
16 questions	3 questions			3 core	
TOTAL questions	**110**			**71 core 25 optional TOTAL: 96 questions**	**59 core 18 optional TOTAL: 77 questions**

Appendix 10

Brown, C., Arendse, S. & Mlitwa, N. (2005). ICT Facilities in Higher Education Institutions in the Western Cape. (Unpublished).

ICT Facilities in Higher Education Institutions in the Western Cape

Unpublished Draft Report of HictE Project. *Dec 2005*
C. Brown, S. Arendse, and N. Mlitwa

Introduction

This research was conducted as part of the cross institutional Carnegie funded project "Enhancing Quality and Equity in Higher Education through the innovative application of ICT". It was motivated by our need to have comprehensive up to date information about the ICT infrastructure and availability and computer: student ratio's in higher education institutions in our region. Data was collected across the four higher education institutions in the Western Cape between March and May 2005 .

Aims

The aim of the study was to calculate the student: computer ratio of each institution, look at how these differed by faculty and examine what practical constraints were operating on these labs.

Methodology

Existing information about student computer facilities were sourced from each institution where available. Based on the information that was provided and that which was being sought by the project team a table was drawn up for each institution. This was then sent to relevant people at each institution with a request for them to complete the table.

The table looked at each student computer lab and sought to find out

- whether it was located in a particular faculty, residence or centrally
- whether any student support was available and if so what type of support and when. How many PC's, printers, scanners and other facilities were available
- when the lab was open over weekdays and weekends
- whether there were any restrictions (eg time limits, or who could access the lab eg departmental, postgraduate, teaching)
- whether it required booking or was available for student drop ins

At UWC a comprehensive audit of computer labs had been conducted in 2004. This had involved walking around all the student computer labs and counting the number of available operational computers. At UCT a similar audit had been conducted in 2004. This involved contacting all the lab managers and asking about details with regards to the lab. At Stellenbosch details about each lab were obtained through the e-learning. center whilst at the Technikons central in formation only existed for centrally administered facilities ie Computer and E-Learning centers.

However whilst the information we were able to obtain could tell us about the number of computers available at some of the institutions it didn't contain other contextual information that we were seeking and it wasn't comparable. So at some institutions the information we sought to collect was an updated count of PC's as well as addition

al contextual information whilst at others the information about the number of PC didn't exist and had to be collected by research assistants.

When looking at the student: computer ratio we are looking at only those computers available to students for their use. We are not seeking to examine institutional investment in staff or administrative computers. We have obtained enrolment information from each institution for 2005 and are merely dividing the number of students by the number of computers. We then examined what restrictions were in place for each computer lab eg were they available only to students from a specific faculty, to postgraduate students, for teaching etc. An unrestricted student computer ratio was calculated by dividing the number of students by the number of computers that were available without restrictions so we could get an idea of the number of computers which were accessible to students.

Results

In examining the results we look at four aspect of computer labs namely facilities, support and restrictions.

Facilities

At a quick glance the student computer ratio appears favourable across most institutions. It ranges from 6:1 students for every computer at the Bellville campus of CPUT to 13:1 students for every computer at Stellenbosch. This seems surprising as CPUT, Bellville) is a previously disadvantaged Technikon whilst Stellenbosch is a historically advantaged university with a well established IT policy.

Institution	2005 Student enrolment	Number of student computers	Student computer ratio
CPUT (BL)	10,040	1,654	6
CPUT (CT)	18,523	1,588	11
SU	22082	1631	13
UCT	21716	3042	7
UWC	14873	1455	10

However a closer examination of restrictions at each institution reveals that this picture is not consistent for all students.

Support

Most computer labs had some form of support. We were able to obtain information about Lab support form 3 of the 4 institutions. This ranged from login, user account support during office hours to tutor support during entire opening hours of the facility.

Restrictions

We also examined restrictions on students use of the computer lab facility in terms of when the facility was open, whether or not students had time limits of the use of the facility, whether it was restricted to particular sets of students (eg students from a particular faculty or department or postgraduate students) and whether or not it was used for teaching or was available as a general drop in facility.

Interestingly none of the institutions indicated there was a time limit of computer use in ANY lab although we are aware that at least one institution limits use of computers to 1 hour per student at one time.

Cape Peninsula University of Technology

In 2005 Cape Technikon and Peninsula Technikon merged to form Cape Peninsula University of Technology. CPUT has multiple campuses. However in this report we make the distinction between the Bellville and Cape Town campuses (in which we include Wellington, Mowbray, Granger Bay and Somerset) because at the stage of data collection information on facilities and enrolments was still organised in terms of the former institutions.

Belville campus

Facilities

CPUT (Bellville) formerly Peninsula Technikon is the only institution with a large investment in a central computer center. Their IT center has some 1400 computers available to 10,400 students (a ratio of 6:1 students per computer). Additional faculty restricted computers increase this ratio. Printing facilities are available in the IT Center and Engineering labs as well as scanners and data projectors.

Support

The IT Center offers tutor support during opening hours which includes helpdesk support as well as specialist Lab and It support.

Restrictions

The computers in the IT Center are available 7 days a week on average 16 hours a day during weekdays. The Center is primarily a drop in facility so doesn't require booking although some labs are used for teaching. The Engineering Labs are open by request on weekends and are used for teaching although available to students when not booked for this purpose

Faculty	UG students	PG students	Total students	No computers	Ratio
Business	3756	43	3799	54	
Engineering	3594	87	3681	200	
Science	2518	42	2560		
Central facilities				1400	
Total	**9,868**	**172**	**10,040**	**1,654**	**6**

Cape Town Campus

Facilities

CPUT (Cape Town) formerly has 1588 computers available to their students in 32 labs across 5 campuses which is a ratio of 11:1. The faculties with the highest student computer ratio are Applied Science and Management (28:1 and 25:1) whilst the lowest are Business Informatics and Design (6:1 and 8:1).

Support

We were unable to obtain data on the type of support available to students in theses labs although all labs had an administrator present during office hours and most of the lab use occurred in structured teaching blocks where academic support would have been available.

Restrictions
Most of the computer facilities are faculty based computer labs which are used heavily for teaching and tutorials between 9-5. They are available for drop in when there is no teaching, however this is often only for an hour in the morning and another hour in the afternoon. This suggests that most student computer activities are conducted as part of courses. The generally available computer facilities (200 computers in the e-learning centre) are available without restrictions to students which makes the unrestricted student computer ratio 92:1.

Faculty	UG students	PG students	Total students	No computers	Ratio
Applied Sciences	2207	47	2254	80	**28**
Built Environment & Design	1376	8	1384	169	**8**
Business Informatics	3845	42	3887	590	**6**
Education	2249	110	2359	135	**17**
Engineering	3664	46	3710	223	**16**
Management	4771	158	4929	191	**25**
Central facilities				200	
Total	**18,112**	**411**	**18,523**	**1,588**	**11**

Stellenbosch

Facilities
Stellenbosch Universities' overall student computer ratio is 12:1. They have 1880 computers distributed across 8 labs on 3 campuses. There is some difference in computer student ratio amongst faculties. Arts, Education, Theology and Law have a student computer ration of 12:1 whilst Military Science has a ratio of 4:1 . The range for the other faculties is between 7:1 to 13:1.

Support
All labs have a manager and offer students support. In addition the HUMARGA that services Arts, Education, Theology and Law students have support staff and a helpdesk which is available during working hours. The GERGA labs at the Tygerberg campus that service Health Science stunt have an additional technical contractor and the FHARGA lab that services Economics and Management Sciences has additional technical and user support staff available during working hours. The FIRGA labs for engineering students offer support for 16 hours a day.

Restrictions
89% of these computer are available 24 x 7 and restricted to students in the faculty that administers the lab. Other restrictions relate to 95 computers used in Health Science e-classrooms which require booking, 75 computers for Economics and Management Science postgrad students and 20 computers in a specialised lab for

Military Science students. So the faculty computer student ratio are a good reflection of computer availability to students.

Faculty	UG students	PG students	Total students	No computers	Ratio
Arts	2757	1388	4345		
Education	510	1612	2145		
Law	453	353	823		
Theology	99	201	312	623	**12**
Agric & Forestry	841	292	1142		**11**
Science	1392	655	2095	290	**7**
Economics & Mgt	4018	1932	6073	458	**13**
Engineering	1374	423	1822	180	**10**
Health Science	1802	919	2789	225	**12**
Military Science	200	54	426	104	**4**
	13863	**7408**	**22082**	1880	**12**

University of Cape Town

Facilities
UCT has some 3042 computers spread across 88 labs across 5 campuses with an overall student computer ratio of 7:1. However this ratio includes both restricted and non restricted facilities. There are many differences between faculties at UCT.

Support
All the labs offer some form of support. This differs between faculties. In Engineering and the Built Environment support is available in the form of desktop support during working hours. In health science account related and software support is provided during working hours. In Law, limited support is available and these are open for 12 hours weekdays and Saturday mornings. The Commerce faculty offer comprehensive support during lab opening hours through their commerce IT Department. Humanities, tutor support during office hours in some labs and then by arrangement in others and Science, limited network and login support during office hours. The support in central facilities varies from comprehensive support at the libraries Knowledge Commons during office hours to general lab assistance during lab opening house in the Upper Campus Student Learning Centers.

Restrictions
Engineering and the Built Environment uses all their labs for teaching and requires booking however 66% of the computers are available 24x7 and a further 18% available 24 hours during week days. The availability of computers is less than 22:1 during working hours but increases to 7:1 after hours.

The Health Sciences faculty has a computer student ratio of 8:1 but many of the labs are also used for teaching. The ratio of unrestricted computers available to students is about 24:1.

The Law faculty has a computer student ratio of 7:1 although 25% of these are restricted for postgrad students or teaching only.

The Commerce faculty has a computer student ratio of 7:1. 55% of the labs are available 24x7 (which gives students a ratio of 14:1 in terms of unrestricted access). Some require booking and others are for drop in, and some are restricted for teaching or postgraduate students.

The Humanities faculty has a student computer ratio of 15:1 however only 20% of these computers are available without restrictions (offering access 14 hours a day and tutor support) which gives an unrestricted ratio of 55:1 Some departments have labs for specific use of their students ie Fine Arts and Film and Media Studies with negotiated support and opening times.

The Science faculty has the best overall computer student ratio of 4:1 However 75% are restricted to students in specific departments so the unrestricted student computer ratio is closer to 15:1. These unrestricted computers are open for 9-12 hours on weekdays. Departments which have special labs are Computer Science, Geology, Maths, Zoology, Botany, Statistics, Physics, Archaeology. However 76% of these specialised labs are limited to postgraduate students.

UCT has 4 centrally available labs. These vary from the Knowledge Commons located in the library open during library hours (term time 6 days a week 14 hours a day), to Student Learning Centres open for 12 hours a day on weekdays.

Faculty	UG students	PG students	Total students	No computers	Ratio
Commerce	4805	1453	6258	785	**7**
EBE	2581	768	3349	433	**7**
Law	469	456	925	120	**7**
Health Science	1691	1272	2963	338	**8**
Science	1690	955	2645	687	**3**
Humanities	4188	1388	5576	349	**15**
Central facilities				330	
	15424	**6292**	**21716**	3042	**7**

University of the Western Cape

Facilities

UWC has 1433 computers in about 57 labs with an overall computer student ratio of 10:1. However it exhibits the largest differentiation between faculties (Science 4:1 Community and Health Sciences 251:1)

Support

All labs have an administrator who offer some type of support mainly during office hours. In the residences this is even more limited in nature (ability to log a call and get technical help). However in the Community and health science, Pharmacy, Applied herbal science postgrad labs and Economics and management science, computer science and library labs support is available throughout the opening hours of the lab

which extend to 9pm in some cases and are 24x7 in others. In addition the education computer lab is the only one specifically noting comprehensive support.

Restrictions
Many Faculties restrict computer labs to teaching and postgraduate student only. So, undergraduate students in these faculties don't have faculty specific computer access. They only have access to centrally available computers (of which there are 273). In addition over half of these computers are used for teaching or require bookings. They are open for 12 hours and during weekends.

Community and health sciences has a ratio of 251:1 which is restricted for either for teaching purposes or postgraduate students usage

Dentistry has a ratio of 37:1 which is restricted teaching and research students only.

Education has a ratio of 46:1 which is restricted for teaching and research students only.

Law has a ratio of 55:1 for research students only.

The Arts faculty has a student computer ratio of 45:1. However there is only one unrestricted computer lab which is during open office hours. This makes the unrestricted student computer ratio 137:1. Other computer labs are restricted to students from departments of library and information science, geography and linguistics.

Economics and Management Sciences has an overall ratio of 17:1. However most of the labs are restricted to postgraduate students or students from the department of Information Systems, Economics or School of Government which makes the unrestricted student computer ratio 137:1

The overall ratio for the faculty of Science 4:1 however all of these are restricted to students in 10 specific departments of anatomy, botany, earth sciences, pharmacy, medical bio science, physiology, computer science, maths, physics, statistics. Computers available to pharmacy, medical bioscience and computer science are available 24x7. Most of the departmental labs are also used for teaching. Students in zoology, chemistry and biotechnology do not have access to faculty specific labs.

Faculty	UG students	PG students	Total students	No computers	Ratio
Community And Health Sciences	2061	453	2514	10	**251**
Economic & Management Sciences	3079	712	3791	215	**17**
Arts	2334	423	2757	60	**45**
Dentistry	584	279	863	23	**37**
Education	716	552	1268	27	**46**
Law	1538	128	1666	30	**55**
Science	1521	493	2014	445	**4**

Central Facilities				273	
	11833	**3040**	**14873**	**1455**	**10**

Appendix 1: Details of CPUT (Bellville) computer facilities

Appendix 2: Details of CPUT (Cape Town) computer facilities

Appendix 3: Details of Stellenbosch computer facilities

Appendix 4: Details of University of Cape Town) computer facilities

Appendix 5: Details of University of the Western Cape computer facilities

Appendix 1: Details of CPUT (Bellville) computer facilities

Location		**Support**		**Number of Facilities**					**Open Times**		**Restrictions**			
Faculty/ Name	**Lab name**	**Type**	**Time**	**Pcs**	**Print**	**Scan**	**Fax**	**Other**	**Mon-Fri**	**Sat-Sun**	**Time Limit**	**Teaching**	**Faculty/ Dept**	**Booking/ Drop-in**
IT Centre	Several labs	Pure IT support, helpdesk support, Specialist Lab support	Opening hours	1400	8	1	3	5 Data video projectors	8am to 11pm	**Sat** 8am - 6pm **Sun** 2pm - 10pm	No	Some used for teaching	None	Current drop –in only
Engineering		Engineering software	Opening hours	200	3	1	1	3 data projectors		On request	No	Yes		Open unless booked

Appendix 2: Details of CPUT (Bellville) computer facilities

Location		Support		Number of Facilities					Open Times		Restrictions			
Faculty/ Name	**Lab name**	**Type**	**Time**	**Pcs**	**Print**	**Scan**	**Fax**	**Other**	**Mon-Fri**	**Sat-Sun**	**Time Limit**	**Teaching**	**Faculty/ Dept**	**Booking/ Drop-in**
Management	CT Campus Labs 1&2			90	10 stud per				8:30am - 9:30pm			Teaching		Drop in after 4pm
Management & Education	Mowbray 1 Lab Mng & 3 Edu Labs			180	3				6:45am - 4pm			Teaching	Faculty students only	Drop in when no teaching Booking
Management	Granger Bay			40					7am - 9pm (close 5pm Fri)			Teaching	Faculty students only	Booking. Drop in after 4pm
Management	Somerset			16					7am - 5pm (open till 8pm Tue/Wed)					Drop in
Business Informatics	CT Campus 12 Labs			525	1 Print room				6:30am - 10pm			Teaching		Drop in bf 8:30 and af 4pm

Business Informatics	Wellington: 2 Labs								7:30am - 3pm					
Built Environment & Desigh	CT Campus Clothing & Text 1 Lab			21					8am - 9pm			Teaching		Drop in after 4pm
Built Environment & Design	CT Campus Architectural Tech 1 Lab			40					8:30am - 5pm			Teaching		Drop in most days after 12pm
Built Environment & Design	CT Campus Jewellery Dept			28	28x Basic work-stations	1			8:30am - 4:30pm			Teaching		Booking
Applied Science	CT Campus 2 labs			80	2 Printrms	1			8:30am - 4:30pm			Teaching		Drop in when no teaching
Engineering	CT: Civil Engineering Dept 2 Labs			90	1 print room				9am - 7pm	07:00 - 15:00				
Engineering	CT Campus Electr Engineering Dept 3 Labs			93					8am - 3pm and 8am to 8pm	09:00 - 15:00		Teaching		Booking

Engineering	CT Campus Mech Engineering Dept 3 PC Rooms			130	Print facility (mech stu only)			Unique graphic prog mech stu only	*:30am - 4:30 pm (24 hrs Btech Lab)	09:00 - 15:00		Teaching		Drop in when no teaching.
Central	E-Learning Center (3 labs)			200	yes			Video conferencing for staff	24 hours	24 hours		None		drop in

Appendix 3: Details of Stellenbosch computer facilities

Location		Support		Number of Facilities					Open Times		Restrictions			
Faculty/ Name	**Lab name**	**Type**	**Time**	**Pcs**	**Print**	**Scan**	**Fax**	**Other**	**Mon-Fri**	**Sat-Sun**	**Teaching**	**Faculty/ Dept**	**Postgrad**	**Booking/ Drop-in**
Engineering	FIRGA	Yes	7:30 - 10:30pm	180	5	2	0	0	All hrs	All hrs		Yes		NA
Econ & Man Sci	FHARGA	Lab manager & two assistants: Technical & user support.	Daily working hrs	458	12	1	0	0	24 hrs	24 hrs			2 labs (72 PCs)	Booked for lecturers, drop in for non booked areas
Tygerberg Campus	GERGA	Manager and Part-Time technical contractor	Daily working hrs	130 & 225	4	2	0	4 Digital cams	130 PCs (24hrs) e-Classrooms	On request	Non- FHS groups pay for			Booking
Arts, Edu, Law, Theology	Humarga	Helpdesk	Daily working hrs	623	7	1	0	CD/DVD Writer	24 hrs	24 hrs		Card access		Drop -in
Military Sci Saldanha	GIS Centre	Manager	Daily working hrs	23	1	1	0	Digitizingtable	07:30-16:15	On request		Geography students		Booking

Military Sci	CIS Centre		Daily working hrs	61	1	0	0	0	07:15-22:00	8:00-20:00	None			Booking
Military Sci		Manager	Daily working hrs	20	0	1	0	0	07:30-16:30	On request	None			Booking
Libraries														
Science Faculty	NARGA	Lab manager	Daily working hrs	290	9	1	0	3 CD/DVD RW	24 hrs	24 hrs		Undergrad, postgrad, residence students		Drop-in

Appendix 4: Details of University of Cape Town computer facilities

Location		Support		Number of Facilities					Open Times		Restrictions			
Faculty/ Name	**Lab name**	**Type**	**Time**	**Pcs**	**Print**	**Scan**	**Fax**	**Other**	**Mon-Fri**	**Sat-Sun**	**Teaching**	**Faculty/ Dept**	**Postgrad**	**Booking/ Drop-in**
		Desktop		81	0	0	0	0		Closed				
EBE		Desktop		25	0	0	0	0		Closed				
EBE	Green Lab	Desktop	24hrs	80	0	0	0	0	24hrs	Closed	Teaching			Booking
EBE	White Lab	Desktop	08:30-16:30	15	0	0	0	0	08:30-16:30	Closed	Teaching			Booking
EBE	CAD Lab 1	Desktop	07:30-21:30	25	0	0	0	0	24hrs	24hrs	Teaching			Booking
EBE	CAD Lab 2	Desktop		15	5	0	0	0	24hrs	24hrs	Teaching			Booking
EBE	CAD Lab 3	Desktop	07:30-21:30	15	0	1	0	0	24hrs	24hrs	Teaching			Booking

EBE	Chem Lab Engineering	Desktop	24hrs	55	5	0	0	0	24hrs	24hrs	Teaching			Booking
EBE		Desktop		20	1	0	0	0		Closed	Teaching			Booking
EBE		Desktop		25	1	0	0	0		Closed	Teaching			Booking
EBE	Centlivres Lofts	Desktop	24 hrs	40	4	2	0	0	24 hrs	24 hrs	Teaching			Booking
EBE	GIS LAB	Desktop		3	0	0	0	0		Closed	Teaching			Booking
EBE		Desktop		10	0	0	0	0		Closed	Teaching			Booking
EBE		Desktop		24	1	0	0	0		Closed	Teaching			Booking
Health Sci	Health Lab	Account-related and software	Office Hours	122	1	n/a	0	0	8:30am - 10pm	Closed				
Health Sci	Health Lab	Account-related and software	Office Hours	200	1	n/a	0	0	6am - 6pm	8:30-5pm	Teaching			
Health Sci	ICH	Account-related and software	Office Hours	16	1	0	0	0	9am - 5pm	Closed	Some teaching			

Central:	Student Societies Lab	Comprehensive & also to SRC, RAG, UCT radio, Varsity Newspaper.	13:00-16:30	20	3	0	0	0	13:00-16:30 (May-Nov)	Closed		Only recognised student organisations		Drop -in
Central: CHED	Upper Campus SLC	Lab admin and or lab assisitant	100% of open time	80	1	1	0	1 Video	8:00-20:00	Closed	Teaching			Booking
Central: CHED	Forest SLC	Jnr Lab admin. at prescribed times	25% of open time	40	1	0	0	0	12-2pm and 10pm Fri	10am - 10pm	Discretionary			Drop in
Central: CHED	Baxter SLC	Lab admin and or lab assisitant	100% of open time	79	1	0	0	0	12-2pm and 10pm Fri	10am - 10pm	Discretionary			Drop in
Central: CHED	Numeracy Lab	Faculty tutor with lab admin on call.	As per arrangement	6	1	0	0	0	8am to 4:30pm	Closed	Instructional			Per appointment
Faculty: Law	Law libraries Lab	Image building		80	1	0	0	0	8.30-22.00	8.30-13.00				
Law	Law Training Lab	Image building		12	1	0	0	0	8.30-22.00	8.30-13.00	teaching			Booking
Law	Sch 4 legal practice lab	All types of support	Log a call	16	1	0	0	0	8:30-16:00	Closed			Postgraduates only	Drop in

Law	'Protem 2" Lab	All types of support	Log a call	12	1	0	0	1 copier	8:30-16:00	Closed			Postgraduates only	Drop in
Residence: Student Housing	Rochester House Lab1	Hardware & Account - related	4 hours during Lab Hours	35	1	0	0	0	12-2pm	10am - 10pm		Only Residence		Discretionary
Student Housing	Liesbeeck Lab	Hardware & Account - related	4 hours during Lab Hours	20	1	0	0	0	12-2pm	10am - 10pm		Only Residence		Discretionary
Student Housing	Clarinus Lab	Hardware & Account - related	4 hours during Lab Hours	35	1	0	0	0	12-1pm	10am - 10pm		Only Residence		Discretionary
Central: Library	Knowledge Commons	Comprehensive	08:00-17:00	105	4	1	0	0	8am-22pm	9-10pm (sat)	no			
Commerce	GSB (seminar rooms)	All types - comprehensive	24/7	44	several	0	0	1 CD Writer	24/7	Closed				Access to Campus wide wireless network
Commerce	GSB Lab	All types - comprehensive	24/7	31	several	2	0	1 DVD RW	24/7	Closed				Access to Campus wide wireless network
Commerce	GSB lecture theatres	All types - comprehensive	24/7	7	several	0	0	DVD	24/7	Closed	Bookings.			Access to Campus wide wireless network
Commerce	GSB Library	Desktop	8:30-16:30	15	1	1	0	0	8:30am - 9pm	9-5 Sat & 2-7		GSB students only		Access to Campus wide

										Sun				wireless network
Commerce	Comlab A	All types - comprehensive	24/7	32	2	0	0	0	24/7	24/7	Tutorials	Undergrads		Booking
Commerce	Comlab B	All types - comprehensive	24/7	24	0	0	0	0	24/7	24/7	Tutorials	Undergrads		Booking
		All types - comprehensive									Tutorials	Undergrads		
		All types - comprehensive									Tutorials	Undergrads		
Commerce	Comlab C	All types - comprehensive	24/7	24	0	0	0	0	24/7	24/7	Tutorials	Undergrads		Booking
Commerce	Comlab D	All types - comprehensive	24/7	24	0	0	0	0	24/7	24/7	Tutorials	Undergrads		Booking
Commerce	Comlab E	All types - comprehensive	24/7	24	0	0	0	0	24/7	24/7	Tutorials	Undergrads		Booking
Commerce	Comlab F	All types - comprehensive	24/7	24	0	0	0	0	24/7	24/7	Tutorials	Undergrads		Booking
Commerce	Comlab G	All types - comprehensive	24/7	70	0	0	0	0	24/7	24/7				Drop in, booking by special arrangement

Commerce	Comlab H	All types - comprehensive	24/7	69	0	0	0	0	24/7	24/7				Drop in, booking by special arrangement
Commerce	Comlab I	All types - comprehensive	24/7	68	0	0	0	0	24/7	24/7				Drop in, booking by special arrangement
Commerce	Comlab J	All types - comprehensive	08:00-17:00	24	0	0	0	0	08:00-17:00	Closed			Hons & postgrads only	Booking
Commerce	Comlab K	All types - comprehensive	08:00-17:00	24	0	0	0	0	08:00-17:00	Closed			Hons & postgrads only	Booking
Commerce	Lewis Lab	All types - comprehensive	24/7	85	0	0	0	0	24/7	24/7			Information Systems hons & postgrads only	
Commerce	Alumni 1	All types - comprehensive	Opening hours	40	2	0	0	Audio visual points	8am - 5pm	Closed	Teaching		Postgraduates only	Booking
Commerce	Alumni 2	All types - comprehensive	Opening hours	40	2	0	0	Audio visual points	8am - 5pm	Closed	Teaching		Postgraduates only	Booking
Commerce	Alumni 3	All types - comprehensive	Opening hours	116	0	0	0	Audio visual points	8am - 5pm	Closed		2nd year +		Booking
Humanities	Southside 1&2	Tutors	08h00 – 22h30	76	1	0	0	VDP	08h00 – 22h30	08h00 – 20h00		Undergrads		

Humanities	Graduate School Lab	Tutors		80	1	1	0	VDPs	24 hrs	24 hrs			Postgraduates only	
Humanities	Language Lab	Tutors	08h00 – 17h00	20	1	0	0	Audiotape, etc	08h00 – 17h00	Closed				
Humanities	Music Lab	Tutors / lab assistant	08h30 – 16h30	30	1	0	0	Midi keyboards, etc	24 hrs	24 hrs				
Humanities	Hiddingh PC Lab	Tutors	13h00 – 17h00	10	1	0	0	0	08h00 – 22h30	08h00 – 22h30				
Humanities	Hiddingh Apple MAC Lab	Tutors	08h30 – 16h30	10	1	1	0	0	08h00 – 22h30	08h00 – 22h30			Masters in Fine Arts	
Humanities	Bessie Head Lab	Tutors	Booked classes	80	0	0	0	VDPs, PA	Booked classes	Booked classes	Teaching			
Humanities	Mendi Main Film & media Lab	Tutors	By arrangement	30	2	0	0	VDP	Varies by arrangement	Varies by arrangement		Film & media students only		
Humanities	Mendi Edit Lab	Tutors	By arrangement	5	0	0	0	DV decks etc.	Varies by arrangement	Varies by arrangement		Film & media students only		
Humanities	Mendi Sound Lab	Tutors	By arrangement	3	0	0	0	Sound edit facilities	Varies by arrangement	Varies by arrangement		Film & media students only		

Humanities	Hum TV Film & media Lab	Tutors	By arrangement	5	0	0	0	Cams, video, edit suit etc.	08:00-16:30	Closed		Film & media students only		Booking
Faculty: Science	SciLab A - Computer Sci	User / network	9 hrs	88	1	0	0	0	8.00am	8.00am	?			Booking
Science	SciLab B - Computer Sci	User / network	9 hrs	32	1	0	0	0	8.00am	8.00am	Teaching in am			Booking
Science	SciLab C- Computer Sci	User / network	9 hrs	60	1	0	0	0	8.00am	Closed	Teaching in pm			Booking
Science	SciLab D- PD Hahn	User / network	9 hrs	88	1	0	0	0	8.00am	Closed	?			Drop in
Science	SciLab D- Annex	User / network	9 hrs	32	1	0	0	0	8.00am	Closed	Teaching			Booking
Science	Computer Sci 2nd & 3rd year Lab	User/ network	9 hrs	86	1	0	0	0	24 hrs	24 hrs	?			Drop in
Science	Computer Sci Honours	User/ network	9 hrs	38	1	0	0	0	24 hrs	24 hrs			Postgrads only	?
Science	Computer Sci Master/ PHD Lab	User / network	9 hrs	65	1	0	0	0	24 hrs	24 hrs			Postgrads only	?

Science	Geological Sci Postgrad Lab	User / network	9 hrs	6	1	0	0	0	08:00am	Closed			Postgrads only	?
Science			9 hrs						08:00am	Closed				
Science	Geological Sci Goldfields	Software	9 hrs	10	1	0	0	0	08:00am	Closed	?			Drop in
Science	Molecular and Cell Biology Lab	User / network	9 hrs	20	1	0	0	0	08:00am	Closed	?			Drop in
Science	Maths Lab - room 110.1	User / network	9 hrs	14	1	0	0	0	08:00am	Closed			Postgrads only	?
Science	Maths Lab - room 404	User / network	9hrs	18	1	0	0	0	08:00am	Closed			Postgrads only	?
Science	Maths Lab - room 408	User / network		8	1	0	0	0					Postgrads only	?
Science	Fitzpatrick Conservation Biology Lab	User / network	9hrs	15	1	0	0	0	08:00am	Closed	Teaching		Postgrads only	
Science	Zoology Applied Marine	User / network	9hrs	6	1	0	0	0	08:00am	Closed	Teaching		Postgrads only	?

	Sci Lab													
Science	Zoology Honours Lab	User / network	9hrs	3	1	0	0	0	08:00am	Closed			Postgrads only	?
Science	Botany Postgrads Lab	User / network	9hrs	10	1	0	0	0	08:00am	Closed			Postgrads only	?
Science	Enviro GIS Teaching Lab	User / network	9hrs	16	1	0	0	0	08:00am	Closed	Teaching		Postgrads only	?
Science	Enviro Lab	User / network	9hrs	6	1	0	0	0	08:00am	Closed			Postgrads only	Booking
	Statistics Honours Lab	User / network	8 hrs	20	1	0	0	0	9.00am	Closed			Postgrads only	Booking
Science	Physics Lab	User / hardware	9hrs	24	1	0	0	0	08:00am	Closed	Teaching		Postgrads only	Booking
Science	Astronomy Lab	Software	9hrs	9	1	0	0	0	08:00am	Closed			Postgrads only	Drop in
Science	Archeology 3rd year Lab	User/ network	9hrs	5	1	0	0	0	08:00am	Closed	?			Drop in
Science	Archeology Postgrad Lab	User/ network	9hrs	8	1	0	0	0	08:00am	Closed			Postgrads only	Drop in

Appendix 5: Details of University of the Western Cape computer facilities

Location		Support		Number of Facilities					Open Times		Restrictions			
Faculty/ Name	**Lab name**	**Type**	**Time**	**Pcs**	**Print**	**Scan**	**Fax**	**Other**	**Mon-Fri**	**Sat-Sun**	**Teaching**	**Faculty/ Dept**	**Postgrad**	**Booking/ Drop-in**
Arts	Thintana LIS room 1. 605		8h30 - 17h00	20	P	S	0	0	8h30 - 17h00		All UWC students			Drop-in
LIS Dept	Undergrad LIS D.O.E/E.U		8h30 - 17h00	18	0	0	0	0	8h30 - 17h00				Teaching & LIS undergrads only	
LIS Dept	Postgrad LIS D.O.E / E.U		8h30 - 17h00	5	0	0	0	0	8h30 - 17h00				Teaching & LIS postgrads only	
Geography Dept	Postgradute		8:30 – 16:30	7	0	0	0	0	8:30 – 16:30			Research Geog	postgrad only	
Geography Dept	GIS L 106		8:30 – 16:30	8	0	0	0	0	8:30 – 16:30			Teaching, Arts & Science only		
Earth Sciences Dept	Lab L 59		8:30 – 16:30	8	0	0	0	0	8:30 – 16:30			Teaching, Research & Earth Sci only		
Linguistics Dept	Postgrad		08:30 – 16:00	1	0	0	0	0	08:30 – 16:00				Postgrad	

Linguistics Dept	Linguistics Doc postgrad room18		08:30 - Flexible	1	0	0	0	0	08:30 - Flexible			Linguistics only	Research & Doc	
CHS	CHS Postgrad B207		08:30 – 21:00	10	P	S	0	C	08:30 – 21:00		Teaching	CHS	postgrads only	Drop-in
Dentistry	Lib Resource Centre		08:30 – 16:30	9	P	0	0	0	08:30 – 16:30		Teaching			
Dentistry	Dentistry Teaching		08:30 – 16:30	14	P	0	0	0	08:30 – 16:30			Dentistry	Research	
EMS	Inform Syst Dept		08:30- 22:00	50	P	0	0	0	08:30- 22:00		Teaching	IS students only		Drop-in
EMS	IS Posgrad Lab Room 4		24/7	11	P	0	0	0	24/7		Teaching		postgrads only	
Ems	4th Floor Post Graduate	Tech/Mng	08:30- 21:00	30	0	0	0	0	08:30- 21:00	09:00 - 15:00			All postgrad students	Booking
EMS	4th Floor Peer Learning	Technical	Weekday hrs	14	0	0	0	0	08:30- a/hrs			IS students only	Hon Oracle students	
EMS	School of Govt		08:30- 20:00	25	0	0	0	0	08:30- 20:00			School of govt	postgrad only	
Economics Dept	USAID Postgrad Lab		08:30 – 17:00	30	P	0	0	0	08:30 – 17:00		Teaching			

Economics Dept	EMS		08:30 – 21:00	45	P	0	0	0	08:30 – 21:00	09:00 - 15:00 Sat	All students			Drop-in
Economics Dept	Econ Postgrad		08:30 – 17:00	10	P	0	0	0	08:30 – 17:00			Econ	postgrads only	Drop-in
Education	Education Computer Lab	All types, comprehe n-sive												
Didactics Dept			08:30 – 16:30	22	1	0	0	0	08:30 – 16:30	Closed	Teaching			Drop-in
Education	Resource Lab		09:00-18:00	3	p	0	0	0	09:00-18:00	Closed	Teaching	Education	postgrads only	Drop-in
Education	Languages		09:00 – 16:30	2	0	0	0	0	09:00 – 16:30	Closed	Teaching	Education	postgrads only	
Law	LRSC		Op hrs	30	P	0	0	0	Op hrs			Law	Researchs tudents only	Drop-in
Science	Anatomy		08:30 – 16:30	18	P	0	0	0	08:30 – 16:30		Teaching	Anatomy	Research	
Science	Botany / Z29		08:30 – 17:00	30	P	0	0	M - Media	08:30 – 17:00		Teaching	BCB	Research	Flexible class booking
Science	Earth Sciences													
	Pharmacy Postgrad Lab		24/7	8	P	0	0	0	24/7		Teaching	Pharmacy	Research	Private access
Pharmacy dept	Adcock Ingram Lab		08:30 – 17:30	48	P	0	0	0	08:30 – 17:30		Teaching	Pharmacy	Research	

Medical Bio Sciences Dept	Appl. Herbal Sci postgrad		24/7	5	P	0	0	0	24/7		Teaching	herbal science	Research	Private access
Physiological Sciences Dept	CB Lab		08:30 – 17:00	14	P	0	0	0	08:30 – 17:00		Teaching	Medical Bioscience	Research	
Computer Science Dept	COE		24/7	8	P	0	0	0	24/7			Compu Sci	postgrads only	Private electr access
Computer Science Dept	Winlab		08:30 – 17:00	61	0	0	0	0	08:30 – 17:00		Teaching	Compu Sci	postgrads only	
Computer Science Dept	Honours Lab		24/7	20	P	0	0	0	24/7		Teaching	Compu Sci	postgrads only	Private electr access
Computer Science Dept	Yellow Submarine		24/7	10	P	0	0	0	24/7			Compu Sci	postgrads only	Private electr access
Computer Science Dept	Ice Box		24/7	6	P	0	0	0	24/7			Compu Sci	postgrads only	Private electr access
Computer Science Dept	Post Doc. Lab		24/7	10	P	0	0	0	24/7			Compu Sci	postgrads only	Private electr access
Computer Science Dept	Netlab		08:30 – 16:30	17	P	0	0	0	08:30 – 16:00		Teaching	Compu Sci	postgrads only	Private electr access
Computer Science Dept	Sunlab		08:30 – 17:00	56	0	0	0	0	08:30 – 17:00		Teaching	Compu Sci	Undergraduate	Private electr access
	Maths Lab		08:30 – 16:30	50	0	0	0	0	08:30 – 16:30		Teaching	Maths, Comp sci and Physics		
	Physics Lab		08:30 – 16:30	9	P	0	0	0	08:30 – 16:30		Teaching	Physcis	research	

	Statistics Undergrad – ADM Lab		08:30 – 22:00	52	P	0	0	0	08:30 – 22:00		Teaching	Stats	Undergrad and part time
Statistics Dept	Statistics Postgrad		09:00 – 16:30	15	P	0	0	0	09:00 – 16:30		Teaching		Senior students
Central	Thintana Walk-in		08:30-21:00	70	p	0	0	0	08:30-21:00			All	Drop-in
Central	Thintana Walk-in		08:30-21:00	55	p	0	0	0	08:30-21:00		Teaching	All	Faculty booking
Central	TLTU B20		08:30 - Flexible	14	0	0	0	0	08:30 - Flexible		Teaching	All	Booking
Central	TLTU B18		08:30 – 16:30	13	P	0	0	0	08:30 – 16:30			Comp Lit Tutors only	
Central: Library	Thintana Library training Room L6		09:00-Request	35	0	0	0	0	09:00-Request		Teaching		Booking
Library	Level 5		09:00-21:00	15	0	0	0	0	09:00-21:00			All	Drop-in
Library	Level 6		09:00-21:00	38	0	0	0	0	09:00-21:00			All	Drop-in
Library	Level 13	Technical	Lib hrs	33	0	0	0	0	Lib hrs	Lib hrs			Only PG students	Booking
residence	HPR Posgrad Lab	Log a call & Technical	Thu 6-9pm & Sat 11am-3pm	12	0	0	0	0	24/7	24/7		HPR students		Drop-in

residence	Dos Santos	Technical		15	0	0	0	0	24/7	24/7		Residence only		Drop-in
residence	Scassinga Hal Nashua Tec Digital	Tech/Mng	Weekdays & after hrs	145	6	0	0	0	08:30-21:00	N/A	Teaching		Undergraduate	Booking
residence	SVE Nashua Tec Digital	Tech/Mng	Weekdays & after hrs	200	9	0	0	0	08:30-21:00	N/A	Postgrad only		Postgrad only	Booking

Appendix 11

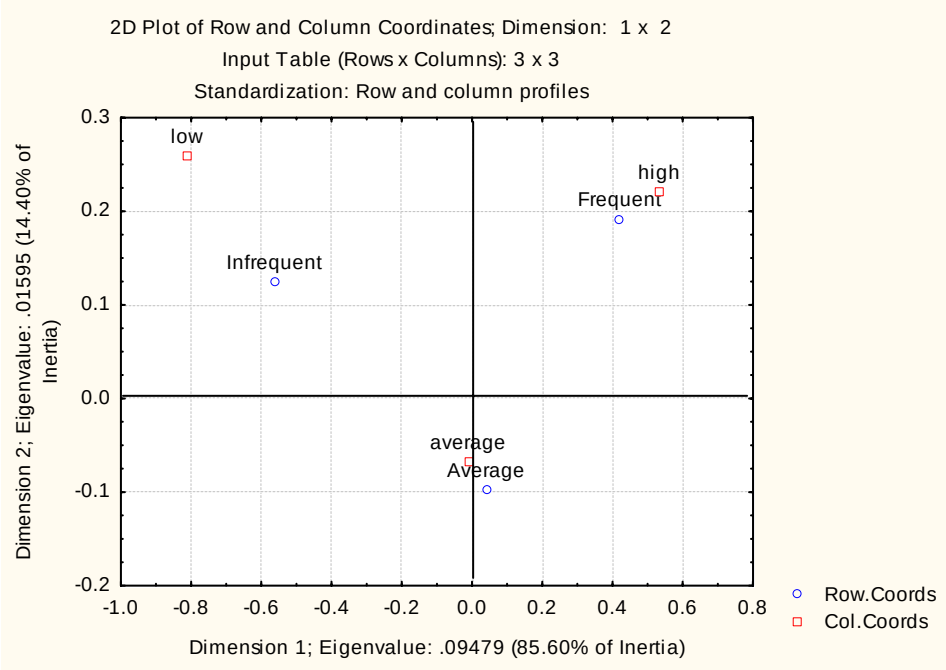
Details of correspondence analysis

Details of correspondence analysis

We explored this relationship further using correspondence analysis (a perceptual mapping technique that produces a graphical display of the relationship between different variables or indexes). [1]

Specifically we examined the relationship between infrequent, average and frequent use of ICTs for learning AND low, average and high overall access to ICTs.

This relationship is plotted on a graph. To read the graph it is important to look at where the shapes that represent one cluster (eg circles which represent use) are found in relation to another cluster (squares which represent access). So these graphs should be read by looking at the proximity of the different clusters to each other. Focus on either the horizontal or vertical axes that separate the graph into upper or lower quadrants. If two shapes are located in close proximity on the same side of the graph this tells us there is a strong correlation between these two clusters.



The above graph shows a strong correlation between use of ICT for teaching and learning and level of access. High Access and frequent use are clustered together in the top right quadrant and low access and infrequent use are clustered together in the top left quadrant of the graph.

[1] Correspondence analysis is a descriptive/exploratory technique designed to analyze simple two-way and multi-way tables containing some measure of correspondence between the rows and columns. The results provide information which is similar in nature to those produced by Factor Analysis techniques, and they allow one to explore the structure of categorical variables included in the table

Dimension 1 (plotted on the x axis) is the most reliable indicator of the associations in the data with an inertia of 85%. In other words it accounts for 85% of the variation in the data.

A closer look at dimension 1 (in the tables below) shows that it distinguishes between infrequent and frequent use AND low and high access thus highlighting the differences between low access and infrequent use (which both fall on the negative side of the axis at a high level of magnitude) and high access and frequent use (which fall on the positive side of the axis also to a high level of magnitude).

Dimension 2 (whilst only capturing 14% of the variation does seem to be distinguishing between the extremes of access and use (high and low and frequent and infrequent) and average access and use. However average access and average use are located close to the point of origin and therefore do not account for much of the variation in the data.

The quality value of 1 indicates that with 2 dimensions are capturing the associations between the indexes of use and access very well.

	Row Coordinates and Contributions to Inertia (studentjan2006) Input Table (Rows x Columns): 3 x 3 Standardization: Row and column profiles									
Row Name	Row Number	Coordin. Dim.1	Coordin. Dim.2	Mass	Quality	Relative Inertia	Inertia Dim.1	Cosine² Dim.1	Inertia Dim.2	Cosine² Dim.2
Infrequent	1	-0.562866	0.124383	0.188237	1.000000	0.564850	0.629173	0.953441	0.182590	0.046559
Average	2	0.039892	-0.097854	0.618375	1.000000	0.062358	0.010382	0.142507	0.371243	0.857493
Frequent	3	0.420318	0.191827	0.193388	1.000000	0.372792	0.360445	0.827617	0.446167	0.172383

	Column Coordinates and Contributions to Inertia (studentjan2006) Input Table (Rows x Columns): 3 x 3 Standardization: Row and column profiles									
Column Name	Column Number	Coordin. Dim.1	Coordin. Dim.2	Mass	Quality	Relative Inertia	Inertia Dim.1	Cosine² Dim.1	Inertia Dim.2	Cosine² Dim.2
low	1	-0.813502	0.258894	0.082073	1.000000	0.540168	0.573026	0.908034	0.344901	0.091966
average	2	-0.011546	-0.067712	0.775876	1.000000	0.033058	0.001091	0.028253	0.223032	0.971747
high	3	0.533086	0.220258	0.142050	1.000000	0.426774	0.425883	0.854180	0.432067	0.145820

A high Chi square with a low p value (see table below Chi sq 666.52 p=0.00) is also evidence of a strong relationship between use for T&L and access.

	Eigenvalues and Inertia for all Dimensions (studentjan200 Input Table (Rows x Columns): 3 x 3 Total Inertia=.11074 Chi²=666.52 df=4 p=0.0000				
Number of Dims.	Singular Values	Eigen-Values	Perc. of Inertia	Cumulatv Percent	Chi Squares
1	0.307874	0.094786	85.59663	85.5966	570.5184
2	0.126292	0.015950	14.40337	100.0000	96.0013

We can try to determine what aspect of use and access have the strongest relationship by looking at each components (row and columns) contribution to the overall chi square statistic. If we explore each individual cell we see that two noticeably high cell contributions to the chi square. That of low access and infrequent use and that of high access and frequent use.

	Contributions to Chi-Square (studentjan2006) Row variables: T&LUse3level(3) Column variables: AccessOverall3level(3)			
	low	average	high	Total
Infrequent	282.2639	1.82630	92.3934	376.4837
Average	28.6044	7.50199	5.4564	41.5628
Frequent	49.1643	12.70564	186.6033	248.4733
Total	360.0327	22.03393	284.4531	666.5197