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Integration of Instructional Technology by University Lecturers in Secondary School Teacher Education Programs in Zimbabwe: An Exploratory Study

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ACCEPTANCE

This dissertation, INTEGRATION OF INSTRUCTIONAL TECHNOLOGY BY UNIVERSITY LECTURERS IN SECONDARY SCHOOL TEACHER EDUCATION PROGRAMS IN ZIMBABWE: AN EXPLORATORY STUDY, by RODWELL CHITIYO, was prepared under the direction of the candidate's Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree Doctor of Philosophy in the College of Education, Georgia State University.

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ABSTRACT

INTEGRATION OF INSTRUCTIONAL TECHNOLOGY BY UNIVERSITY LECTURERS IN SECONDARY SCHOOL TEACHER EDUCATION PROGRAMS IN ZIMBABWE: AN EXPLORATORY STUDY

by

Rodwell Chitiyo

In the context of continuous innovations in information and communication technology (ICT) and its impact on higher education, this descriptive study explores the state of instructional technology (IT) integration by university lecturers in pre-service secondary school teacher education programs in Zimbabwe. Specifically, the study examines how the lecturers conceptualize IT integration, how they integrate IT into their instruction, the support given by their institutions, and the constraints they face. The qualitative methodology used is basic or generic in nature (Merriam, 1998). Twenty-one lecturers in the colleges of education at 3 universities participated. The 3 data collection methods used are questionnaires, interviews and analysis of documents. Analysis of data was inductive and Miles and Huberman's (1994) interactive data analysis model was employed.

Findings show that the conceptualization of IT and its integration by the majority of the lecturers was largely as hardware in nature, with focus put on viewing technological tools as audiovisual aids. Lecturers with qualifications in educational technology (ET) viewed IT and its integration from what Schiffman (1995) calls a narrow systems view. Most of the lecturers used technological tools for illustrating key points in their lecture delivery and lecturers who used computers used these for lecture

preparation. Lecturers' computer proficiency and competencies were at the basic level in Internet usage, with little confidence shown in basic productivity software skills and in IT integration tasks and processes. The lecturers' integration of IT was at the Entry and Adoption stages (Dwyer, Ringstaff and Sandholtz, 1991). Institutional support was characterized by poor availability and access to appropriate technological tools by both lecturers and students, and in the context of a hyper-inflationary operating environment, constraints ranged from lack of institutional funding, to the absence of an IT integration policy framework, and lack of appropriate initial and continuous staff development.

This study is part of the genesis of instructional technology research in the Zimbabwean context. It is hoped that insights gleaned will influence policy, practice and future research. From a global perspective, this study will add to the limited knowledge and literature on instructional technology integration in "developing" and/or low-income countries like Zimbabwe.

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Finally, my acknowledgements would be remiss if I do not mention my childhood mentors in rural Zimbabwe – my late grandparents Naume and Silas Mubaiwa Chabwadari “Muvhangeri” Chitiyo. My grandfather, a former catechist and school teacher himself, believed so much in me that at about age ten, he used to call me “professor”. This may very well be the marking of the beginning of that prophecy.

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ABBREVIATIONS

AAU	Association of African Universities
AVA	Audio Visual Aids
Dip Ed Tech	Diploma in Educational Technology
ET	Educational Technology
HEI	Higher Education Institution
ICT	Information and Communication Technology
IT	Instructional Technology

CHAPTER 1

STATEMENT OF THE PROBLEM

Even though Zimbabwe is a developing country, innovations in information and communication technologies (ICT) are impacting the country at a rapid pace. As a result, the education system in general, and teacher education in particular, needs to prepare students with the technological knowledge and skills needed in what today is being referred to as the global knowledge society (Association of African Universities, 2000).

The *Africa University* [a pan-African institution located in Zimbabwe] *Strategic Development Plan 2001 – 2008*, (2002) in its executive summary, for example, asserts that, "The development and application of ICT to African higher education is crucial and urgent if the continent is going to be able to reduce the knowledge, technological and economic gap between itself and the rest of the world" (p. 4). It also observes that institutions in Africa need to prepare themselves to meet technology integration issues and other challenges and demands of the 21st century. The strategic plan then cautions that African tertiary institutions "need to run very fast to avoid falling very far behind" (p. 4).

In this researcher's eight years experience as a secondary school teacher educator at both diploma and degree granting institutions in Zimbabwe, he has observed little if any integration of ICT in these programs. Often, integration is limited to offering basic

computer application courses that are not necessarily related to or integrated into the rest of the teacher education program. Most significantly, the conceptualization of technology integration in an industrialized or high-income country like the United States (US), where technology in education is almost synonymous with computers in all schools, may not be similar to the conceptualization of technology integration in a developing and low-income country like Zimbabwe, where the vast majority of schools do not have computers.

For example, according to the "Teachers' tools for the 21st century" survey, in 1999 almost all (99%) public school teachers in the US reported having computers available somewhere in their schools and 84% of them reported having computers available in their classrooms (US Department of Education, 2000a). It is further reported that there has been a rapid increase in the proportion of schools that are connected to the Internet. In 1994, 35% of US schools were online, compared to 95% in 1999 (US Department of Education, 2000b). However, as already pointed out, the situation regarding computers in schools and institutions of higher learning in Zimbabwe is different.

Explaining this difference, Naidoo and Schutte (1999) acknowledge that there are fundamental differences in the way in which technology integration is approached and implemented between the more developed countries and the developing countries. They point out that for developing countries; the main focus is always on acquiring basic utilities such as telecommunication infrastructure, hardware, software and networks. It is only when these are easily accessible that attention can be given to serious educational and training issues like pre-service teacher education.

In one of the few studies done in Africa, Oyelaran-Oyeyinka and Lal (2003), in a cross-country analysis of Internet diffusion in Sub-Sahara Africa, confirm that current estimates show that Internet use in Africa lags behind that of other regions. In the first quarter of 2002, they point out, there were only 6.31 million users in Africa – about 1 percent of the world total. In Zimbabwe, as well as in the rest of the continent, this scenario is compounded by a dearth of research and published literature on the integration of technology in both school classrooms and teacher education programs.

Given this situation in Zimbabwe and on the African continent in general, the Association of African Universities (AAU) has called for the development and use of ICT in revitalizing African Universities in the 21st century. The AAU also urges African universities to study ICT status in their institutions as well as to study the integration of technology into their curricula (AAU, 2000).

Addressing the situation in Higher Education Institutions (HEIs) in Africa, Naidoo and Schutte (1999) point out most often technology integration activities are limited to the experimentation level or are in the initial stages of implementation because of infrastructure problems, which are a result of "lack of funds and expertise and, in some cases, political instability" (p. 89). The latter explanation would be a classic characterization of the situation in Zimbabwe, where more than five years of political instability have resulted in a backward slide in terms of the country's ICT capabilities. A close analysis of the available literature on IT integration in Sub-Sahara Africa, shows an acknowledgement of the political nature of some of the problems, but also shows the literature, for reasons which could be political, deliberately avoids engaging this sensitive area.

Commenting on their technology integration work on the African continent, Naidoo and Schutte (1999), categorically point out that they do not examine the problems caused by political and other instabilities, “While they [political problems] are very important, they need a separate study” (p. 90). Ojo and Awuah (1998); Jain (2001) and Uys et al. (2004) take the same stance and refer to what they term as strategic constraints. It is this researcher’s belief that findings, conclusions and recommendations from the critical work that all these scholars have done in ICT integration in Sub-Sahara Africa may not be put to optimum use if these political issues and instabilities are not studied and systematically resolved.

Context of the Problem

Since independence from Britain in 1980, there has been a phenomenal increase in enrollments at all levels of educational provision in Zimbabwe. By 1997, enrolment at the primary school level had more than doubled from 1,235,994 to 2,510,605 while at secondary school level, the increase was more than tenfold, from 74,321 to 806,126. However, by 1995, 25% of teachers at primary schools and 13% at secondary schools were still untrained. This was 21% of the entire teaching force. As a result, Zimbabwe has been dependent on untrained and expatriate teachers for a long time (Ministry of Higher Education and Technology, 1998).

Taking into account population growth and a very youthful population, enrolment was projected to increase and teacher demand, especially in particular subjects, was likely to continue. In terms of policy, the Ministry of Education, Sports and Culture has always planned to achieve 100% trained teachers and a lot has been done in terms of achieving

that goal (Ministry of Higher Education and Technology, 1998). Since the democratization of education (defined as access for all) after independence, and the move to expand teacher education, seven additional colleges were established to train teachers, bringing the total to fifteen.

The Ministry of Higher and Tertiary Education (formerly Ministry of Higher Education and Technology) plans and coordinates all the primary and secondary school teacher education programs in Zimbabwe. There are fifteen diploma-granting teachers' colleges (ten for primary school teachers and five for secondary school teachers). Three of the primary school teachers' colleges (Nyadire, Bondolfi and Mogenster) are private and church-related. The rest are state institutions. In addition, there are five universities, which are almost autonomous in their operations in teacher education. Africa University (AU) and Solusi University (SU) are private and church-related and the University of Zimbabwe (UZ), Bindura University of Science Education (BUSE) and Midlands State University (MSU) are state institutions. Whilst BUSE and MSU prepare pre-service secondary school teachers, the UZ offers programs only for in-service teachers. Table 1 shows the institutions in Zimbabwe with teacher training programs.

Table 1.

Primary and Secondary School Teacher Education Institutions in Zimbabwe by 1998.

PRIMARY		SECONDARY			
Teachers' College *(Diploma Granting)*	Year of Opening	Teachers' College *(Diploma Granting)*	Year of Opening	University *(Degree Granting)*	Year of Opening
Morgenster*	1892	Mutare	1956	University of Zimbabwe (UZ)	1958
Nyadire*	1947	Hillside	1962	Africa University (AU)*	1993
Bondolfi*	1963	Gweru	1963	Solusi University	1994

				(SU)*	
United College of Education (UCE)	1968	Belvedere Technical	1982	Bindura University of Science Education (BUSE)	1996
Mkoba	1976	Chinhoyi Technical	1991	Midlands State University (MSU)	1998
Marymount	1981				
Seke	1981				
Masvingo	1981				
Gwanda ZINTEC	1981				
Morgan ZINTEC	1981				
Total	10	Total	5	Total	5

Note. * = Private Institutions (church-related)
ZINTEC = Zimbabwe Integrated Teacher Education Course

By 1998, the newest colleges were the two Zimbabwe Integrated Teacher Education Course (ZINTEC) colleges (namely Gwanda and Morgan), Marymount, Seke, Belvedere, Chinhoyi and Masvingo. According to the Ministry of Higher Education and Technology (1998), with limited numbers of qualified university graduate teachers, the policy to expand university education and especially the devolution (a policy to move degree programs in education [B. Ed and B. Tech.] to colleges) was welcome. This started with Bindura University of Science Education (BUSE) in 1996, Midlands State University (MSU) in 1998, and Masvingo University in 2000. BUSE started as a special program based in Cuba – for preparing graduate secondary school Science and Math teachers – which had been, and are still in short supply. A decision was later made to relocate the program to Bindura, in Zimbabwe, after it had operated in Cuba since 1986. This devolution program saw an increase in the number of new graduate teachers in the country. It was also noted that there was a need to promote research, especially in schools

and teachers' colleges, and a need for highly qualified teachers (Ministry of Higher Education and Technology, 1998).

With the anticipated self-sufficiency in teacher preparation, the focus was seen shifting to teacher quality as a critical area to be addressed in teacher education today. In the case of improvement of quality, the main area of focus identified by the Ministry of Higher Education and Technology (1998) was infrastructure, and this included the refurbishment of some of the colleges, especially the pre-independence institutions and the ZINTEC colleges, which for long have had a poor and dilapidated infrastructure**.** The Ministry of Higher Education and Technology's 1998 study also noted the lack of research and information management both to guide teacher training and implementation of the programs. According to the study, "there was hardly any research being conducted at the institutions, let alone the evaluation of the programs being offered in teachers' colleges" (p 49).

Why is it Desirable to Integrate Instructional Technology?

Roblyer and Edwards (2000), present five benefits of integrating IT as its:

1. motivational capacity – in terms of gaining learner attention, engaging the learner through production work and increasing the learner's perception of control over his or her learning.
2. unique instructional capabilities – like linking learners to information resources, helping learners visualize problems and solutions, tracking learner progress and linking learners to learning tools.

3. support for new instructional approaches – through for example, cooperative learning, shared intelligence and problem solving and higher-order-skills learning.
4. increased instructor productivity – resulting in shortened teaching an learning time.
5. required skills for an information age - necessitating the need for learners to become lifelong learners through competencies in technology literacy, information literacy and visual literacy.

Given its (technology) breaking down of time, distance and geographical location barriers, the benefits of technology are bound to foster a broader dissemination of knowledge and information, and facilitate the positive interdependence of countries, which could benefit countries like Zimbabwe. However, as Romiszowski (1995) observes, educational technology as taught and practiced in the United States for example, has grown up in a context of local culture and values – which have influenced how it is applied and to what purpose.

It is therefore essential to guard against the imposition of other countries' cultural perspectives on the receiving cultures. Part of the solution to this problem is aptly given by Romiszowski (1995), when he points out that, "The true transfer of technology involves helping the receiving culture to perceive what is relevant in another culture's practices, so as to adopt or adapt only what is potentially useful to the local reality" (p. 281). As argued by Romiszowski (1995), it should not be surprising that some general principles used elsewhere may result in somewhat different practical procedures when applied in different cultural contexts.

Readiness for Technology Integration at National Level

In terms of technology integration, and according to the *Financial Gazette Online*, (September 9, 2004), the president of the Computer Society of Zimbabwe (CSZ) announced that the government and stakeholders in the information and communication technologies (ICTs) sector in Zimbabwe had started rolling out a survey, the first meaningful step towards implementation of an ICT policy framework. The CSZ president pointed out that participants in the policy formulation, who included government, private sector and civic society, were mostly taking stock of infrastructure, equipment, skills and barriers to policy implementation. Whilst acknowledging that Zimbabwe had been found lagging behind other regional countries in ICT development due to a number of socio-economic and political issues, the CSZ official also pointed out that government dithering and the challenge of how to adopt fiscal and monetary policies which take into consideration the need to develop ICTs were major challenges (Financial Gazette Online, September 9, 2004).

The executive summary of the Zimbabwe e-Readiness Survey Report (ICTs in Zimbabwe Project, 2005) started by pointing out that, “Zimbabwe does not have an integrated and coherent national Information and Communication Technologies (ICT) policy. The absence of a coherent ICT policy invariably inhibits coordination, harmonization, full utilization of the existing infrastructure and its capacity, and initiatives to implement ICTs by various sectors of the economy” (p. 14).

While acknowledging that there is considerable access to computers and the Internet at universities in Zimbabwe, the Zimbabwe e-Readiness Survey Report (ICTs in Zimbabwe Project, 2005) concludes that bandwidth capacity is still low, ranging from a

high of 1.5 Mbps at the University of Zimbabwe to 64 Kbps at 50% of the universities. The report points out that this bandwidth access should be viewed against an average access of 4 Mbps for South African universities and against the bandwidth indicated by the universities as required. According to the same report, the cost of the bandwidth was said to be high, ranging from US $17.64 per Kbps at one university, to US $1.29 at another. This is against a background were the average cost of bandwidth in Southern Africa is US $4.70 per Kbps whilst in East Africa it is US $4.38 per Kbps and the cost to a university in the USA is US $0.12 per Kbps, according to the Africa Tertiary Institution Connectivity Survey Report (Steiner et al. 2004). The report suggested that the very high cost to some universities is probably due to their use of leased lines.

Table 2.

Level of Access to Computers and the Internet at Some Universities in Zimbabwe by 2005

Institution	AU	BUSE	UZ	MSU	CUT	NUST	WUA
Total no. of computers	300	300	1500	250	250	800	18
No. of network points	1000	350	3000	500	200	4000	22
No. of users	1600	1000	10 000	6200	1560	3000	30
Bandwidth	128Kbps	64Kbps	1.5 Mbps	128Kbps	128Kbps	1Mbps	64Kbps
Required bandwidth	2Mbps	2Mbps	4Mbps	2Mbps	2Mbps	2Mbps	256Kbps
Cost per month (Z$ million)	3	1	18	3	1.8	8	1
Type of link	Leased line	Leased line	Leased line	Leased line	Leased line	Radio link & dial-up	Dial-up
Provider	ComOne	ComOne	ComOne	ComOne	ComOne	ComOne	ComOne
Quality of service	Poor	Very poor	Poor	Poor	Fairly good	Poor	Very poor

Note. AU = Africa University; BUSE = Bindura University of Science Education; UZ = University of Zimbabwe; MSU = Midlands State University; CUT = Chinhoyi University of Technology; NUST = National University of Science and Technology; WUA = Women's University in Africa
Adapted and modified from the Zimbabwe e-Readiness Survey Report, Ministry of Science and Technology Development, (p. 79) May 2005.

Purpose of the Study

The purpose of this study therefore, was to explore the integration of instructional technology by university lecturers in pre-service secondary teacher education programs in Zimbabwe. By conducting this exploration, the study was able to establish what was happening on the ground by establishing how the teacher educators conceptualize instructional technology in their own environments and contexts, as well as how they actually integrate technology into their instruction.

The study also aimed at finding out the support that the lecturers received from their institutions, as well as the possible barriers to their endeavors. The study's findings should provide the opportunity for dialogue on intervention measures aimed at improving instructional technology integration by university lecturers in teacher education programs Zimbabwe.

Research Questions

The main research question guiding this study was: What is the state of integration of instructional technology by university lecturers in pre-service secondary school teacher education programs in Zimbabwe?

The sub-questions that were used to address this central question are:

1. How is IT conceptualized by lecturers in pre-service secondary school teacher education programs at universities in Zimbabwe?
2. How do the lecturers integrate IT in their instruction?
3. What support do the lecturers get from their institutions in integrating IT?
4. What are the constraints faced by the lecturers in integrating IT?

Significance of Study

This exploratory study is not only a harbinger of empirical research in ICT integration in teacher education in the country, but is also part of the genesis of instructional technology literature in the Zimbabwean context. International projects such as the Second Information Technology in Education Study Module 2 (SITES M2) funded by the International Association for the Evaluation of Educational Achievement have examined technology integration across 28 countries in Europe, North America, Asia, Africa and South America (Kozma, 2003). However, little has been done to examine technology integration efforts in pre-service teacher education programs in developing countries such as Zimbabwe.

From a global perspective, the findings from this research will add to the limited but growing body of knowledge and literature concerning preparing teachers to integrate technology in areas of the world where the digital divide is the greatest. It is also hoped that insights gleaned from the study may influence policy, practice and future research in teacher education in Zimbabwe in general and in instructional technology integration in particular.

Assumptions and Limitations

In research of this nature, it is important to recognize the assumptions and limitations inherent in the study in order to clarify the focus of the study and to show its potential weaknesses. These include:

1. The concept or operational term “instructional technology integration” assumes that the technology is available or accessible and needs to be integrated or used in the curriculum. This may not be the case in Zimbabwe, which is a “developing” or more precisely, low-income country.
2. The relative absence of research and related literature on IT integration in the Zimbabwean context and on the African continent in general is a major challenge to research that needs to be done.
3. The possibility that since the researcher had previously worked with some of the participants and was familiar with the programs and instructional activities going on in their programs, the researcher may have possessed certain preconceived notions of how, why and when lecturers integrate instructional technologies. The use of several data collection tools and strategies, for example, maintaining a memo with daily reflections, triangulating data sources, and engaging in peer debriefings helped in minimizing bias.
4. The fact that English is a second language to both the researcher and the participants and the technical nature of the area of inquiry (instructional technology) could have presented challenges relating to accuracy of technical data

to be collected. To alleviate that possible weakness, questionnaires were used to help focus on some technical data and to back up the rest of the field work.

5. The long distance between the sites used in the study and the limited time (three months) in which data was to be collected, created logistical challenges in a country that was conducting a long-awaited presidential election in March 2005. The researcher's familiarity with the socio-economic, political and educational environments at these sites helped in mitigating these challenges.

Definition of Terms

The terms educational technology (ET) and instructional technology (IT) are used interchangeably, especially in Zimbabwe. It is essential to try and look at the meanings of these terms since an understanding of these perspectives would help in looking at information and communication technologies (ICTs) and their integration.

Educational Technology (ET)

A close look at attempts at defining educational technology persuades one to agree with Gentry's (1995) observation that it is possible to see that "meaning depends considerably on what part of the elephant is being touched and by whom!" (p. 4). From an educator's point of view and more specifically from a teacher education perspective, the definition by the AECT Task Force, (1977) seems to provide a good starting point. Thus educational technology is defined as:

> a complex, integrated process involving people, procedures, ideas, devices and organization, for analyzing and managing solutions to those problems, involved in all aspects of human learning. (p. 164)

In synthesizing various definitions, Gentry (1995) comes up with a streamlined definition of educational technology as, “The combination of instructional, learning, developmental, managerial, and other technologies as applied to the solution of educational problems” (p. 8). In the current study and on the basis of the above definition, focus is on educational technology as the all encompassing entity, with instructional technology being one of the several components of educational technology.

Instructional Technology (IT)

In order to be consistent with the definition of educational technology adopted above, Gentry’s (1995) synthesized definition of instructional technology is used in this study. Thus instructional technology is seen as a systemic and systematic application of strategies and techniques derived from behavior and physical sciences concepts and other knowledge to the solution of instructional problems.

Information and Communication Technology (ICT)

Given the context in which this study is done and in considering the perspectives of African universities, this study is guided by the definition given by the Technical Experts Meeting on the Use and Application of Information and Communication Technologies in Higher Education Institutions in Africa. According to their report, “Information and communication technologies are a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information” (AAU, 2000 p. 2).

Summary

With continuous innovations in ICT, teacher education programs at universities in Africa are faced with the challenge of transforming the preparation of teachers so that they are capable of effectively integrating IT into their day-to-day instruction. Against a background of insufficient access to ICTs, research, and published literature, this qualitative study, which is interpretive and descriptive in nature, aims to explore what is happening in terms of the integration of IT by university lecturers in pre-service secondary school teacher education programs in Zimbabwe. The essential process of understanding what is happening helps in establishing possible intervention measures that may need to be put in place for successful technology integration to take place.

It is hoped that findings from the study may influence policy, practice and future research in teacher education in Zimbabwe and particularly in IT integration. From a global perspective, insights from the study will add to the limited but growing body of knowledge and literature relating to IT integration in developing and/or low-income countries

CHAPTER 2

REVIEW OF THE LITERATURE

This literature review provides a theoretical basis for the study and starts by exploring the context of IT integration in the African and in particular Zimbabwean context. It then examines the nature of educational technology and the concept of technology integration in education, and particularly into teacher education programs. A review of some perspectives and research findings in technology preparedness in pre-service teacher education is presented in order to inform the rest of the study. The review then looks at a possible approach to IT integration as a basis for establishing the stage at which the lecturers are integrating IT. Lastly, the review looks at the transformative approach to IT integration.

Context of IT Integration in Zimbabwe and Africa

A review of the literature on technology integration in developing or low-income countries (AAU, 2000; Kozma, 2003; Uys, Nleya & Molelu, 2004) shows, for instance, the wide use of the more generic term Information and Communication Technology (ICT) instead of instructional technology, which in the US technology integration literature and context, increasingly refers to the computer and its related technologies. The use of the term ICT seems to be an attempt to be inclusive in addressing the diverse developmental and technological capabilities in these developing countries.

Discussing the issues relevant to IT integration in the context of African higher education, Nwuke (2003), among several clusters, includes cost and financing, infrastructure, capacity building (staff development) and content. The other crucial cluster to emerge from the literature review is leadership and policy framework formulation. Each is briefly examined below.

Cost and Financing

The problem of cost and financing of ICT at universities in Zimbabwe and most of Africa immediately becomes apparent in reviewing the available literature. Presenting the obstacles faced by the Zimbabwean ICT sector, Machacha (2004) highlights the "Inadequate and irregular funding of ICT initiatives and prohibitive importation costs of ICT equipment, often compounded by high national import tariff levels" (p. 2). In a study of the application of ICT in higher education in Zimbabwe, Zinyeka (2005) says, "Cost is the main constraint which has resulted in the lack of resources and undesirable institutional environments" (p. 1). Arguing that cost has an adverse effect on the context in which IT integration is supposed to take place, Zinyeka (2005) says the impact of high costs and limited financing are reflected in the slow speed of the Internet, intermittent power supply, foreign-currency-denominated licensing fees and huge telephone costs. Nwuke (2003) says that while donors are currently playing an active role in enabling access to ICT in most institutions of higher education in Africa, at some time, "[these] institutions must assume funding and maintenance of the networks" (p. 37).

Infrastructure

According to Nwuke (2003), "The main challenge for Africa in this area [infrastructure] is to set up a system that is both reliable and efficient" (p. 37). He

explains that some of the issues that need to be addressed are access to technologies and expertise, and the need to improve network connectivity and interoperability, not only within individual countries, but also across countries in the region. Machacha, (2004) in a paper presented to the Zimbabwe National ICT Policy Formulation Team writes that while Zimbabwe has grown steadily to embrace ICT, it has yet to build the basic infrastructure needed to take advantage of the information age. In a study on availability of ICT resources in Zimbabwean universities, Zinyeka (2005) found out that these are not sufficient. For example, he notes that in some cases 7 to 12 lecturers share an ICT tool (e.g. Internet) and on average 70 students share a computer connected to the Internet, while some students have no access to the Internet.

According to the AAU (2000), the status of ICTs in Africa shows that the continent is at a growing disadvantage with respect to the global information and technological revolution. More critically, universities in Africa, which should be in the forefront of ensuring that Africa participates in the revolution, are themselves unable and ill-prepared to play such a leadership role – largely because the information infrastructure is poorly developed and inequitably distributed. These universities are thus poorly positioned, compared with their counterparts in Europe, North America and non-African developing regions, to effectively benefit from the global information economy and knowledge systems (AAU, 2000).

The AAU (2000) goes on to say universities in Africa are already addressing some of these issues, but will need to assess the present state of ICTs, especially regarding the existing capacity, the short-term and long-term needs, and the nature of the enabling environment in which integration can take place. Critical to this study, the AAU

(2000) points out, “the integration of technology into learning, research and management is still at its infancy” (p. 9) at most of the African universities. The Association then calls for research into the adequacy or otherwise of the ICT infrastructure to the enhancement of teaching, curricula reform and improvement of learning.

Whilst acknowledging that ICT experiences of African universities are limited and varied and that many remain at various stages of planning and infrastructural development, the AAU (2000) notes that some have achieved Internet connectivity although none have access to adequate bandwidth. It is pointed out that the development cycle from conceptualization through funding, installation, and operation has taken different turns in the institutions and with varied success. Specifically addressing the issue of technology integration, the AAU (2000) points out, “If (expensive) ICT tools are to improve the HEI’s [Higher Education Institution’s] effectiveness and efficiency, it is obvious that their application in support of teaching and learning should be seriously considered” (p. 11). The association notes the absence of systematized skills for integrating technology into teaching and learning and then urges for research to be done on whether these ICTs exist, or their availability, quality, and extent of use by students and faculty.

The executive summary of the African Tertiary Institution Connectivity Survey Report (Steiner et al. 2004) starts by pointing out that, “The state of Internet connectivity in tertiary institutions in Africa can be summarized by three characteristics – too little, too expensive and poorly managed” (p. iii). The report goes on to explain that the average African university has bandwidth capacity equivalent to a broadband residential connection available in Europe, pays 50 times more for their bandwidth than their

educational counterparts elsewhere and fails to manage and monitor the existing bandwidth.

Discussing Internet traffic congestion due to limited bandwidth, Machacha (2004) says bandwidth in Zimbabwe is expensive and the amount of bandwidth available to organizations is inadequate. He suggests that more affordable access could be achieved by controlling costs and improving access through the state opening up the telecommunications market, joining forces with other countries to negotiate better connectivity deals and by encouraging local Internet service providers to set up country or regional Internet exchange points – that route traffic within the country or region instead of through Europe and North America.

Capacity Building

Acknowledging the fact that information technology is an instrument, not a goal, and calling for capacity building in higher education institutions in Africa, Nwuke (2003) says that without training, the implementation of new technologies could result in reductions in efficiency. “Higher education may be worse off if resources that would have been used to purchase new books for university libraries or new chemicals for laboratories are expended on information technology that has minimal impact on access and quality because of the lack of complementary labour” (p. 38). Machacha (2004) writes that inadequate external and internal training programs for critical skills to manage and support ICT functions in Zimbabwe are compounded by organizational inability to retain skilled ICT staff and faculty due to poor remuneration. He adds that ICT is a continuously changing field which needs continuous training, but this training is expensive and companies and organizations in Zimbabwe have not adequately invested in

this constant retraining and upgrading of ICT professionals. In a study of the availability of experts, Zinyeka (2005) found out that there are no ICT experts for teaching and learning at three universities established in Zimbabwe in the last 15 years and that there is only one expert per 100 professionals at the oldest and biggest university in the country.

Content

It is quite clear that there is need to attend to higher education content in Africa. Arguing that the degree to which information technology can contribute to higher education will, to a significant extend depend on the quality of the content, Nwuke (2003) observes that content development has been a major issue in North America and Europe and it is likely to be a major issue in Africa. He explains:

> The predominance of English and other inherited languages such as French and Portuguese as the means of conveying scientific knowledge has been a barrier to access to [and quality of] education, and this barrier is likely to be reinforced by information technology if early action is not taken. There is a need to develop content in indigenous African languages (pp. 36-37).

Commenting on a study he carried out in Zimbabwe, Zinyeka (2005) says that on the issue of relevance, one major obstacle is the limited amount of local content. He notes that the current heavy dependence on external content brings in the problems of suitability and relevance to solving problems at home.

Leadership and Policy Framework Formulation

Uys, Nleya and Molelu (2004), writing on technology integration in Africa, say that there are many aspects of the socio-economic and technological environment taken for granted in developed countries that need to be seriously addressed in African countries. They point out that some factors are of a common nature, such as the need to address stakeholders' interest and government policy. Uys et al. (2004) believe that,

"These factors are critical in Africa where there is a high sense of community and where social factors play a key role in sanctioning strategic initiatives and even allocation of funds" (p. 75). Whilst Botswana is cited as having an international reputation for being relatively neutral in its policy-making, the same cannot be said of Zimbabwe, where government policies have tended to be strongly driven by local politics and sentiments.

As suggested for Botswana by Uys et al. (2004), Zimbabwe also needs government policy that will positively influence strategic initiatives such as the technological transformation of universities. Such a policy would, they suggest, "determine the parameters of such initiatives through laws, regulations, and allocation of funds and the support and guidance of its various ministries" (p. 75).

To that effect, the government and stakeholders in the (ICT) sector in Zimbabwe rolled out an e-readiness survey, the first meaningful step towards the formulation and implementation of an ICT policy framework. Besides acknowledging the absence of an integrated and coherent national ICT policy, the Zimbabwe e-Readiness Survey Report (ICTs in Zimbabwe Project, 2005) concludes that the lack of a comprehensive policy on ICTs in the education sector has impeded wide use of ICTs in teaching and learning. Specifically, the report says "There is limited use of ICTs in facilitating or enhancing learning, even at university level outside specialist ICTs courses" (p. 85). The report also notes that, "Zimbabwe … has limited access to ICTs and its applications due to, among other factors, inadequate infrastructure, little or no local production of application software for the different sectors of the economy and lack of skilled ICT personnel in all sectors" (p. 14).

Addressing the same issues, Ojo and Awuah (1998) and Jain (2001) have suggested that there are several multi-faceted challenges that militate against the effective diffusion and adoption of ICT in developing countries such as Zimbabwe. They have grouped these challenges as being operational, contextual, and strategic constraints. Uys et al. (2004) characterize these categories as follows:

> The *operational* pertain to the resources needed before using ICT (i.e. human resources, political will, sufficient communication structure, finance, adequate implementation of ICT projects, etc) *Contextual* constraints relate to issues such as model mismatch. For example, ICT facilities used to solve some problem in the developed world might not necessarily be compatible with the context in the developing world. The *strategic* constraints refer to notions such as national policies, mission statements and values (p. 75).

Ojo and Awuah (1998) and Jain (2001) conclude that these challenges need to be carefully addressed in order to effectively adopt and integrate ICT in developing countries. Although all the studies were done in Botswana, these constraints are not peculiar to that country. As Uys et al. (2004) and Jain (2001) point out these constraints could be generalized to the different contexts in the developing countries in Africa, including Zimbabwe.

Analysis of research done in Botswana (Ojo & Awuah, 1998; Jain, 2001; Uys et al. 2004) shows that instructional technology integration in African countries needs to be carefully and strategically planned for based on an understanding of the technological innovations and how they can be effectively used in local contexts. Naidoo and Schutte (1999) argue that one of the main problems is that people who formulate policy are not adequately informed about general aspects of the information, computing, and telecommunications ages and therefore are not in a position to develop a new vision. This

point is supported by Machacha (2004), who argues that the crop of company and organization executives charged with ICT policy formulation in Zimbabwe, because of their training and background, are generally not very conversant with ICT issues.

Pointing to the need for effective leadership in technological transformation in Africa, the 1995 World Bank Report, “Increasing Internet Connectivity in Sub-Sahara Africa: Issues, Options, and World Bank Group Role” observes, “If African countries cannot take advantage of the information revolution and surf this great wave of technological change, they may be crushed by it … Catching this wave will require visionary leadership in Africa.”

Explaining the barriers to IT integration in higher education in Africa, Nwuke (2003) says that in many countries, there is a lack of leadership and senior management support for IT initiatives. This point is supported by Machacha (2004) who writes that the low-level priority accorded by institutional leadership to ICT development and application, is evidenced by lack of realistic ICT budget, compounded by the lack of a national budget for ICT.

In the case of Zimbabwe, (Machacha, 2004) says the problem of leadership is closely linked to the “absence of a national ICT policy” and the “lack of coherent and coordinated inter-organizational plans, policies and strategies for introducing and developing ICT” (p. 2). He argues that it is apparent that the majority of organizations in Zimbabwe have not designed ICT policies or ICT strategies to guide ICT development and implementation. One of the implications of this scenario is that educators and institutions of higher learning in Zimbabwe, particularly universities preparing teachers,

need to demonstrate new levels of leadership in the area of instructional technology integration.

Understanding the Nature of Educational/Instructional Technology

The struggle for an identity and a conventional and universally acceptable name in the field of ET is a major issue with many scholars and writers. Many foundational text books in the field start by trying to address this question, since to have a proper identity will, it is believed, help in identifying the purposes and boundaries of the field. Gentry (1995), says that members of the profession recognize that while educational technology is a dynamic emerging field, it is still sadly seeking definition, since over the years the field has taken a wide range of meanings. Roblyer and Edwards (2000) further engaging in a similar discussion, write that perhaps no other topics are the focus of so much new development in so many content areas, yet no single acceptable definition for these terms dominates the field.

Perhaps one may want to start by looking at some of the terms that are more commonly and usually used in naming or defining the field. Some of these are Educational Technology, Instructional Technology, Educational Systems Technology and Instructional Systems Design. Without referring to the other definitions at this stage, it is quite clear that the term “technology” is a key word in the first 3 terms and the term “systems” features in the last two. This is a reflection of the movement or evolution that has taken place, from merely focusing on technology, to viewing the field from a systems perspective.

Winner, (1990) noted that the term technology has come to mean everything and everything has come to mean technology and so the term technology threatens to become a cliché' or to mean nothing. Though this observation is made from a general perspective, the problem of having a good handle on what is technology has had its effects on the naming, defining and conceptualizing of the field of ET. Gentry (1995) expresses the same observation when he writes, "*Technology*, the root word of interest, is almost as confused in the public mind as *educational or instructional technology* is in that of the profession" (p. 2). The fluidity of technology and its nature of continuous innovation have made defining it a moving target. Muffoletto (1994) observes that technology is commonly thought of in terms of gadgets, instruments, machines, devices and that many educators will defer to technology as computers.

Each of these gadgets has had an effect on the naming and defining of the field since, definition of latest forms of instruction usually mention the most recently developed tools. For this reason, this writer believes Gentry's (1995) classical quote that the meaning of ET "depends considerably on what part of the elephant is being touched and by whom!" (p. 4) stands the test of both context and time. Saettler (1990) urges those looking for precision to remember that the historical function of technology in educational technology is more of a *process* rather that a product. Based on this perspective, it could therefore be said that useful definitions in the field ought to focus on the process of applying tools for educational purposes, as well as on the tools and the materials (hardware) used. Given this background, Roblyer and Edwards (2000) define educational technology as, "a combination of the processes and tools used in addressing

educational needs and problems, with an emphasis on applying the most current tools: computers and their related technologies" (p. 6).

Writing on his study of the meanings of IT, Engler (1972) says IT is defined in two different ways. "First, and most commonly, it is defined as hardware – television, motion pictures, audiotapes and discs, textbooks, blackboards, and so on; essentially these are the implements and media of communication. Second, and more significantly, it is defined as a process by means of which we apply the research findings of the behavioral sciences to the problem of instruction" (p. 5). An exploration of the literature shows a pervasiveness of these two parallel but necessarily intertwined conceptualizations of ET and IT as either "hardware" or a "process."

Roblyer and Edwards (2000) say that if technology is viewed as both process and tools (hardware), it is important to begin by examining four different historical perspectives on these processes and tools. These are technology as media, as instructional systems, as vocational training and as computers. They write that the earliest purpose of educational technology and one that continues today emphasizes technology as media. Also referred to as the audiovisual movement in the past, it focuses on ways of delivering information as alternatives to lectures and books. This developed into the audiovisual communications movement which was (is) a branch of educational theory and practice concerned with the design and use of messages which is supposed to help the teaching and learning process.

According to Roblyer and Edwards (2000), the view of technology as instructional systems is one held by the instructional design or instructional systems movement. They go on to explain that this view added another dimension to the media-

communications purpose of technology in education, by introducing the systems approach in solving educational approach. The systems approach is based on the thinking that education and instruction are systems that are made up of many parts that are supposed to work together for the benefit of the whole. The success of the whole system will depend on the effective function of each and every one of the parts making up that whole system.

This view is influenced by the belief that both human and nonhuman resources can be parts of a system for addressing instructional need. In this view, educational technology in not just seen as a way of communicating instructional information, but as a systematic approach to analyze, design, develop, implement and evaluate instruction. As pointed out by Roblyer and Edwards (2000), it should be noted here that the application of systems approaches to instruction is heavily influenced and shaped by learning theories from educational psychology. They explain that initially behavioral psychology, with its focus on stimulus and response was the main influence, and later on the information processing theories of cognitivists had some greater impact, followed by the current focus on constructivist theories. ADDIE models of instructional and performance design like the Dick and Carey (2001) model are typical examples of the systems approach to technology in education. Roblyer and Edwards (2000) go on to explain that just like the Association for Educational Communications and Technology (AECT) had its origins in the media systems view of educational technology, the International Society for Performance Improvement (ISPI) grew out of the systems approach view of educational technology.

Explaining what he describes as the five views of the field of Instructional Systems Design (ISD), Schiffman (1995) says among other points, ISD is criticized for being concerned primarily with the use of hardware and the production of materials and argues that these criticisms can be traced to, for example, the media view. He explains that people with the media view of ISD see the field primarily as aimed at media selection and that they consider ISD professionals as audiovisual specialists who know about the characteristics and effects of different kinds of media. Schiffman (1995) asserts that, "The media view is particularly prevalent in higher education because ISD evolved from audiovisual education in many colleges and universities" (p.132).

Schiffman (1995) goes on to explain four more views, all of which are essentially based on a continuum of the systems approach to instructional design. First, the *embryonic system view* is said to be similar to the media view but with emphasis on media production, and the *narrow systems view* is said to look more like a real systems approach, with needs assessment and formative evaluation noticeably absent. Third, the *standard systems view* is said to reflect a fair representation of instructional systems design, with needs assessment first and formative evaluation at the end. Lastly, the *instructional systems design view* is said to show, "a synthesis of theory and research related to (a) how humans perceive and give meaning to the stimuli in their environments, (b) the nature of information and how it is composed and transmitted (c) the concept of systems and interrelationships among factors promoting or deterring efficient and effective accomplishment of the desired outcomes and (d) the consulting and managerial skills necessary to meld points a through c into a coherent whole" (p. 136).

According to Roblyer and Edwards (2000), the view of technology in education as vocational training developed from the perspective of technology as tools used in business and industry. “Generally referred to as *technology education*, this view originated with industry trainers and vocational educators in the 1980s and reflects the need for technology to enhance training in specific job skills” (p. 7). It is explained that this perspective is premised on the belief that an important function of school learning is to prepare students for the world of work and that vocational education can be a practical means of teaching all content subject areas in the school.

Roblyer and Edwards (2000) write that the forth perspective of technology in education as computers and computer-based systems originated with the advent of computers in the 1950s. They point out that the potential of computers as instructional tools was recognized by those in the military, industry, business and then those in higher education with the movement spreading to K-12 education. This view, Roblyer and Edwards add, was known as educational computing and included both the instructional and support applications of computers. According to Roblyer and Edwards (2000), by the 1990s, these educators began to see computers as part of a combination of technology resources, including media, instructional systems, and computer-based support systems. Educational computing became known as educational technology and the organization that represents this view is the International Society for Technology in Education (ISTE) (Roblyer & Edwards, 2000).

Given the historical origins of some of the terms used to describe or name the field, it could be said that the field does have a distinct identity, but that identity has to be viewed from different perspectives. Educational technology, instructional technology,

instructional systems design or what ever name is used, serves very wide purposes across all and different sectors of an economy from the military, business and industry to higher education and K-12 education. Given this diversity in fields of application and in the diversity of technological innovations at hand, it is understandable that the field, as an area of study, continues to seek an identity across the board.

What is Technology Integration?

In order to establish a common understanding of the main focus of this study, it is imperative to look at what is technology integration. According to the Panel on Educational Technology (1997), "The greatest promise of educational technology lies in the possibility of utilizing computers and networks as an integral part of virtually all aspects of the curriculum" (p. 116). Swan et al. (2002) note that national standards for educational technology (International Society for Technology in Education, 1998) information literacy (American Association of School Librarians, 1998) and electronic literacy (Swan, 2000) agree on the need to integrate technology into the school curriculum. Arguably, technology integration has moved from being equated with merely placing computing equipment in schools, to being able to use an array of techniques to gather information and communicate with others and should be integrated across the curriculum.

Grabe and Grabe (2004) define technology integration as the use of technology as a powerful tool in helping students acquire the knowledge and skills of the content area or areas they are learning. They emphasize what they refer to as meaningful student learning in which technology-facilitated classroom activities are in an active learning

environment that engages the thinking, decision-making, problem-solving, and reasoning behaviors of students. They say technology should be used to explore course content and whatever the students learn about how to operate the technology is secondary to that main focus. Furthermore, Grabe and Grabe point out, many of the skills associated with the manipulation of hardware and software could be easily applied or transferred to new content areas.

Morrison and Lowther (2002) say technology integration involves having students use the computer as a tool rather than a delivery system for drill-and practice of basic skills. They point out that when the computer is integrated as a tool, students apply the same skills used to analyze and manipulate information in the workplace. The argument is that by using the computers in this manner, students learn lesson objectives as well as develop real-life knowledge and skills. Morrison and Lowther (2002) maintain that this type of integration supports teaching practices that emphasize a student-centered, open-ended leaning environment in which realistic contexts for leaning are used.

Viewing technology integration as a process of recreating and reorganizing the learning environment, Mills and Tincher (2003), argue that computers and technology must be viewed in terms of function rather than application, process rather than approach. In their conclusion, they view technology integration in the classroom as being more about teaching and learning than it is about technology. Put in other words, integrating technology is not so much about helping students to operate computers as it is about helping students learn more effectively through the use of technology.

Highlighting the link between learning theories and technology use, Roblyer and Edwards (2000) emphasize the need to go beyond the “nuts” and “bolts” of how

technology resources work. They argue that technology integration requires a connection between how people learn and how teachers employ technology to facilitate and enhance learning. Assuming a vision of technology integration that she calls both curriculum-based and future-oriented (one that emphasizes preparation of students for the future), Ertmer (1999) says technology adds value to the curriculum not by effecting quantitative changes (doing more of the same in less time), but by facilitating qualitative ones (accomplishing more authentic and complex goals).

In a publication preceding the definitions above, Means and Olson (1997) describe some authentic and complex instructional goals as "promoting student learning through collaborative involvement in authentic, challenging, multidisciplinary tasks by providing realistic complex environments for student inquiry, furnishing information and tools to support investigation (collecting, analyzing, displaying, and communicating information), and linking classrooms for joint investigations" (p. 9).

As Ertmer (1999) confirms, educators' definitions of technology integration have evolved over the past 30 years in the US, from teaching programming, to using drill-and-practice applications, to developing computer literacy and taking part in electronic learning communities. As can be seen, these definitions, as is the case in the conceptualizations of technology itself, are influenced by the technology of the day. Thus, the conceptualization of instructional technology integration is influenced by the definitions of instructional technology and is bound to differ in different contexts.

This review of literature in the US shows that instructional technology integration is now synonymous with and almost exclusive to the use of the computer (and related information and communication technologies) in the teaching and learning process

(Roblyer & Edwards, 2000; Grabe & Grabe, 2004). The rapid and continuous innovations in ICT in developed countries like the US, coupled with ready access to networked computers and efficient connectivity and bandwidth, have resulted in the merging of different technology forms into the multi-media capabilities of one entity – the computer.

Technology Preparedness in Pre-Service Teacher Education

For successful technology integration to take place in schools, teacher education programs will need to play a crucial role by making technology integration an integral part of their programs. Research suggests that teachers tend to teach the way they were taught (Ball, 1990; Lortie, 2002). It could therefore be said that if school teachers are to be expected to teach in a constructivist way using technology, teacher educators or lecturers in teacher education need to teach the pre-service teachers in constructivist ways using technology. The goal, as Charalambos and Marina (2001) point out, should be for teacher educators to provide their student teachers with opportunities to think like experts in making instructional decisions, selecting media for appropriate use, structuring learning activities and employing sound pedagogical strategies in real-life contexts.

Albee (2003), in pointing out the need for “teacher training” in the use of technology, observes that millions of dollars are being poured into the purchase of technological equipment for today’s classrooms, but the hardware is worthless if teachers are not familiar with the educational application of the technology. According to Heinich (1995), many pre-service and in-service teachers do not feel prepared to use new technologies, and express concerns and fears regarding the integration of technology into their instruction. Perelman (1992) warned that failure to teach the necessary technological

skills at teachers' colleges may result in a lack of preparedness that cannot be corrected in subsequent in-service training. Taking the same position as the above scholars, Langone et al. (1998) suggest also that a teacher preparation program may be the first effort toward graduating teachers who are at the beginning stages of integrating technology.

Flake's (1990) study emphasizes the importance of effective hands-on technology models for pre-service teachers. In that study, Flake reported that student teachers who were initially resistant to the use of computers overcame this resistance due to the instructor's seamless integration of computer practice into instruction. The study goes on to indicate that not only did the students overcome resistance, but they also became advocates for the integration of technology through the curriculum.

Further studies by Beaver (1990) and Roblyer (1994) have shown that pre-service teachers are not adequately prepared to use instructional technology and effectively integrate technology into the curriculum. A survey of New York State computer-using teachers by Hurteaus (1990) revealed that only 20% of the teachers felt they had received sufficient pre-service training in computer use and integration into the curriculum. Commenting on schools' and students' unprecedented level of access to internet-connected computers today in the United States, Ertmer (2003), writes that despite this increased access, concern has been raised about the level of preparedness of new and future teachers to use technology in their teaching. The National Center for Education Statistics (NCES) for example, in its 2000 report says that only 44% of new teachers (three or fewer years in the classroom) feel well prepared to use technology in their teaching.

Probably most significant to this study is Moursund and Bielefeldt's (1999) national survey of US schools, colleges and departments of education to establish how these institutions prepared teachers to use information technology in their work. The study found that faculty information technology skills tend to be comparable to the information technology skills of the students they teach, although it was noted that most faculty did not model use of the instructional technology skills in teaching. The survey findings also identify "the integration factor" (p. 28), composed of items that are said to address pre-service teachers' classroom skills and the actual use of instructional technology during training, which is said to be the predictor of basic technology proficiency. Consequently, the study goes on to conclude that in order "to increase the technology proficiency of new teachers in K-12 classrooms, training institutions should increase the level of technology integration in their own academic programs" (p. 10).

In a study of pre-service elementary teachers' technology skills, Albee (2003) observes that numerous courses in teacher education are not preparing pre-service teachers to use technology because specific technology skill needs have not been identified, and there is a lack of technology integration modeled by professors in teacher education courses.

From the evidence above, one can conclude that, in general pre-service teachers believe they are not adequately prepared for the important role of integrating instructional technology into their practice and into the curriculum. This scenario has strong implications on teacher education and pre-service teachers' integration of technology into their classrooms. Most importantly, and particularly so for this study, is the fact that the extent to which faculty, or lecturers in teacher education programs integrate IT has got a

direct bearing on the pre-service teachers' integration of IT in their own school classrooms.

An Approach to Instructional Technology Integration

In its proposal for determining what it refers to as an institution's ICT maturity (the effectiveness of a higher education institution to identify its ICT profile, to define its objectives for integrating ICT in teaching and learning and to plan for them accordingly), the Association of African Universities (2000) suggests the use of "stages of technology development" (p. 3) - which are the Entry, Adoption, Adaptation, Appropriation and the Invention stage.

This evolutionary and widely used model of technology integration, (Dwyer, Ringstaff, and Sandholtz, 1991) was used in the Apple Classrooms of Tomorrow (ACOT) project and identifies the Entry phase as when the computers and related technologies are installed and teachers start using the technology. The educators are initially unsure of the technology and when they gain confidence, they mainly use the technology for text-based work. The method of teaching remains what it was in a traditional school – mainly lectures, recitation and individual or seatwork.

According to Dwyer et al. (1991), in the second phase of the model, Adoption, the technology is used to support traditional text-based instruction using drill-and-practice or word-processing applications. There is high computer access but the students receive whole group instruction through lecture, recitation and individual or seatwork.

During the third phase, Adaptation, Dwyer et al. (1991) explain, the technology has been integrated into the teaching and learning. There is high computer access and

exposure to different programs such as word processors, databases, spreadsheets, and graphic applications. Classroom teaching is still in the form of lecture, recitation and seatwork instruction. There has been a change in the social and cognitive outcome of instruction as students use the computer for play and experimentation. While the lecture, recitation and seatwork mode of instruction continues, the technology is used to support instruction while students are encouraged to be creative.

Dwyer et al. (1991) say that the Appropriation stage sees changes hinged on the teachers' mastery of technological skills. Instruction is supported by high technology access and the teachers' technology experience facilitates creative activities in collaborative work. Cooperative interdisciplinary projects are created, as well as multimodal, self-paced and individualized work.

Invention is the final phase in the model. Students will have intensive computer access and learning is something the students create. At this stage, teachers and students interact and collaborate in the solving of problems and construction of knowledge (Dwyer et al. 1991).

The Transformative Approach to Instructional Technology Integration

Proposing technology as a transformative innovation for teacher education, White (1999) suggests that the transformative approach in technology integration begins in teacher education, through the empowering nature of technology and constructivist integration. According to the National Council for the Social Studies (1995), the transformative approach to teacher education needs to include modeling "powerful"

pedagogy that envisages teaching and learning that is meaningful, integrative, value-based, challenging and active.

White (1995) writes that related components to be integrated include aspects of constructivism that incorporate modeling, reflecting, involving students actively, and developing a community of learners. Reinforcing this approach, Brooks and Brooks (1993) say that constructivism empowers students to ask their own questions and seek their own answers. As evident in this review, there is room for transformative instructional technology integration and modeling of constructivist ideas by pre-service teacher educators. Boling (2003) neatly summarizes the position taken in this study by asserting, “If teacher education programs hope to keep up with the changes that are occurring as a result of this new digital society, then it is imperative that we take a closer look at the role that technology can have in transforming teacher preparation” (p. 72).

It could therefore be said that instructional technology integration can be seen as referring to the use of information and communication technologies in the day-to-day teaching and learning activities across the curriculum. Notably, instructional technology integration in teacher education needs to focus on learning with technology and not learning about technology, and the need to focus on content and pedagogy and not just hardware. In support of this view, the need to distinguish isolated computer courses in teacher education from the integration of meaningful and creative application of technology in the curriculum is highlighted. It is suggested that technology and constructivism can empower instructional technology integration.

It should be noted that this literature review on integration of technology into the curriculum refers to the American context. A search for technology integration literature and research relating to Africa and particularly on Zimbabwe yields limited results.

Summary

Technology integration has been conceptualized as the use of technology as a powerful tool in helping students learn in different content areas as well as helping them analyze and solve problems using skills and knowledge they will be able to transfer to real-life situations. It has also been characterized as promoting student learning through collaborative involvement in authentic, challenging, multidisciplinary tasks by providing realistically complex environments for student inquiry and activity. A constructivist approach to the integration of instructional technology has been noted as providing ideal opportunities for a transformative approach to teacher education.

The categorization of the multi-faceted challenges that militate against the effective integration of ICTs in developing countries into operational, contextual and strategic constraints provides a framework from which to further analyze and attempt to address these challenges. The review has also helped to establish the evolutionary IT integration model used in the ACOT project - with its five phases; Entry, Adoption, Adaptation, Appropriation and Invention - as a model from which the integration of IT by university lecturers in pre-service teacher education programs in Zimbabwe can be examined.

CHAPTER 3

RESEARCH METHODOLOGY

The overall purpose of this study, which is descriptive in nature, is to explore the integration of instructional technology by university lecturers in secondary school teacher education programs in Zimbabwe. To find out the state of instructional technology integration at their institutions, the following research questions were used:

1. How is IT conceptualized by lecturers in pre-service secondary teacher education programs at universities in Zimbabwe?
2. How do the lecturers integrate IT in their instruction?
3. What support do the lecturers get from their institutions in integrating IT?
4. What are the constraints faced by the lecturers in integrating IT?

Research Design

This qualitative study, in which interest is in understanding the phenomenon of technology integration and the meaning constructed by university lecturers in pre-service secondary teacher education programs in Zimbabwe, was influenced by the philosophical view that reality is constructed by individuals interacting with their social worlds. More specifically, this is what Merriam (1998) refers to as basic or generic qualitative study. Explaining the purposes and prevalence of basic qualitative research, she writes:

> Many qualitative studies in education do not focus on culture or building a grounded theory; nor are they intensive case studies of a single unit or bounded system. Rather, researchers who conduct these studies, which are probably the most common form of qualitative research in education, simply seek to discover and understand a phenomenon, a process, or the perspective and worldviews of the people involved (p. 11).

Qualitative inquiry is naturalistic, which means it is the study of human situations in a natural setting. Naturalistic inquiry is carried out by the human instrument, who, through such instruments as interviews and documents analysis, "build upon his or her tacit knowledge" of the subject area (Lincoln & Guba, 1985, p. 187). This implies that the researcher studies participants, events, programs, communities, and relationships as they unfold naturally and in such a way as to avoid manipulating or controlling the research setting. In addition, the advantage of qualitative portrayals of holistic settings is that greater attention can be given to nuance, setting, complexities, idiosyncrasies, and context (Patton, 1990). In further support of this methodology for this study, Miles and Huberman (1994) claim that qualitative research has often been advocated as the best strategy for discovering or exploring a new area.

Role of the Researcher

The role of the researcher in qualitative research is critical in that the researcher is the research instrument (Lincoln & Guba, 1985). According to Janesick, (1994) the researcher is the primary tool in qualitative research and must therefore establish a rapport and trust with each of the participants if the research is to be successful. Carefully gaining access and entry into a community sets the stage for reliable and effective communication patterns with the participants. To that effect, this researcher deliberately interacted in a personal way with each one of the participants in the study.

Patton (1990) says that the conduct and outcomes of a study are affected by the professional and academic experience of the researcher. This researcher has been a teacher education lecturer at a teacher education college as well as at a university for a total of eight years in Zimbabwe. The researcher is also one of the few holders of the post-graduate diploma in educational technology (Dip Ed Tech) from the University of Zimbabwe.

Teacher education activities undertaken by the researcher during that eight years included teaching general teaching methodology and instructional technology courses to pre-service secondary school teachers, doing some basic research on teaching methods and working as an instructional technology external examiner at several teacher education institutions. These experiences exposed the researcher not only to the different teacher education programs in Zimbabwe, but also to the different institutions and to the fellow teacher educators in those institutions.

The researcher's familiarity with the participants and sites in which they worked assisted in the critical process of negotiating access and entry. Being known and having experience as a teacher education lecturer in the same environment from which participants were selected enabled the researcher to be accepted as an authentic member of that community. That acceptance was beneficial in building rapport with and gaining the trust of the lecturers during the study. The researcher's experiences studying instructional technology in the US for the last four years also provided an opportunity for building relationships and exchanging information between the researcher and the participants.

Reeves (1995) points out that the researcher must be socially responsible. Instead of just focusing on the researcher's academic pursuit, the researcher must have an interest in the well being of the participants as well as the context in which they are working. Besides relationship building and exchanging general information, the findings of the study will also be shared with the participants and they will have the benefit of having access to the publications that may arise from the study.

Researcher Bias

According to Solutes (1990) and Hara (1995), in qualitative research, the experiences, viewpoints and biases of the researcher must be acknowledged and taken into account. These aspects of the researcher's role need to be clearly stated and revisited in the course of the inquiry in order to ensure that the study will be trustworthy, credible, and transferable. Thus, when biases or "standpoints" are identified, the reader is more able to make informed judgments of the researcher's interpretation of the data.

The researcher's professional and academic experience as a teacher educator and instructional technologist in Zimbabwe, as well as his familiarity with the research environment, whilst advantageous to the research process, expose him to biases which needed to be taken into consideration. The researcher realized that his conceptualization of IT and its integration were influenced by his experiences as a graduate student at an American university. This meant the researcher had to reflect on his views in an attempt to identify his subjectivity concerning the conceptualization and integration of IT in Zimbabwean context.

First, the researcher was aware that he felt it would be difficult for lecturers to effectively conceptualize IT and its integration without reasonable access to the multi-

media capacity of Internet-connected computers and related technologies. The researcher was able to control this bias or standpoint by constantly reminding himself of the context in which the study was carried out, as well as of the fact that a large part of the meaning sought was in the context.

Second, and influenced by the standpoint discussed above, the researcher was aware that he had urges to offer information or "correct" lecturers who were thought to be having difficulty in answering questions. The researcher suppressed the urge to offer information during the course of the interviews.

Third, when interviewing lecturers with the post-graduate Dip Ed Tech, some of whom were the researcher's former classmates at the University of Zimbabwe, the researcher became aware of the need to focus on questions relating to the study and avoided engaging in discussions on the different IT perspectives held several years after the Dip Ed Tech course. In order to maintain a good working rapport with the researcher's colleagues, further academic discussions of interest were done after the interviews.

Selection of Sites

Criterion-based selection (LeCompte & Preissle, 1993) was used for selecting the sites studied. Three criteria or attributes were considered in the selection of sites for this study. First, the teacher education program had to be at a university. Second, the program was supposed to be preparing pre-service teachers and lastly, it was supposed to be preparing secondary school teachers. All the three institutions offering such programs, and which happen to be located in three different provinces of Zimbabwe, were selected.

The location of the programs in towns or urban areas ensured that the institutions in which the programs are housed were easily accessible by road and had basic and reliable infrastructure and services such as computer laboratories, electricity, and telephone services. The choice of pre-service programs enabled the study to focus on initial teacher preparation, from which the majority of teachers graduate to join the teaching profession in Zimbabwe. Since the average secondary school was better positioned in terms of infrastructure, skilled personnel, and support services to integrate technology into their classrooms than the average primary school in Zimbabwe, the information-rich sites for this study were teacher education programs preparing teachers who will teach in these secondary schools.

Using the criteria laid out above, the three pre-service secondary school teacher education programs, given pseudonyms; institution A, institution B and institution C, were chosen as sites for this study.

Access to Participants

First, the researcher gained access to participants by being able to explain the importance and significance of the proposed research as a fellow teacher educator in Zimbabwe. To that effect, using a letter of introduction from the researcher's department, (see Appendix A) permission to conduct research at the three universities in Zimbabwe was sought through letters to the registrars of the respective universities (see Appendix B).

When written permission was granted by each of the three institutions, the researcher then made appointments to meet with the respective registrars of the

institutions at which the study was to be conducted. This enabled the researcher to gain entry to the sites by explaining the importance and significance of the proposed study to the university authorities. Once entry was gained at the institutional level, it became easier for the researcher to have access to the potential participants through the active support, (for example being introduced to the respective Deans), of the university officials. Given that it is culturally and institutionally imperative that such personal introductions take place, the researcher was then introduced to the lecturers in the faculties of education.

At this stage, to make sure that lecturers would participate voluntarily, or would not participate because they thought the officials wanted them to, the participants were assured that their refusal to participate in the study would not result in sanctions against them and that their jobs would not be jeopardized if they declined the invitation to participate.

All the twenty-six lecturers in the faculties (colleges) of education at these three institutions were potential participants in the study. A letter of self introduction (see Appendix C) was given to all the potential participants. Lecturers who offered to participate had to be currently teaching at least one course in the faculty (college), and had to sign a consent form (see Appendix D) confirming their willingness to voluntarily take part in the study, complete a questionnaire, and agree to being interviewed and to being tape-recorded. Based on these criteria, 4 lecturers at institution A, 10 at institution B and 7 lecturers at institution C offered to participate in the study. This brought the total number of lecturers selected to participate in the study to twenty-one.

Context of IT Integration by the Lecturers

Miles and Huberman (1994) point out that, “Careful description of settings, people, and events is one of the main contributions of qualitative research” (p. 301). To establish the context of instructional technology integration by the lecturers at the three institutions located in three different provinces of Zimbabwe, the researcher presents a background to the universities, based on their prospectuses and strategic development plans covering the period 2001 to 2015.

First, given the American setting in which the study is written, the description looks at the definition of “lecturer” in the Zimbabwean context, followed by the universities’ environmental analyses, with a particular focus on internal and external operating environments as they relate to technology integration. This is followed by a brief background description (excluding identifiers) of each institution and the participating lecturers.

Definition of Lecturer Position

According to Kubler and Roberts (2006) universities in commonwealth countries like Zimbabwe use the following academic staff titles: lecturer, senior lecturer, associate professor and professor. The lecturer position is the entry level to university teaching and in normal circumstances a lecturer needs to have some teaching or lecturing experience and a minimum of a master’s degree.

Internal Operating Environments

All the three institutions identified weaknesses in their internal environments as including inadequate funding, characterized by static and inadequate income and limited income generating capacity. This was said to result in the institutions’ high dependency

on state or in the case of the private university, external funding. At state institutions, currently over 95% of the income for the universities came from the state, and the remainder was came from specific funds, that is, the Zimbabwe Manpower Development Fund (ZIMDEF) (2%) and fees and other levies (3%).

With the three institutions between 10 and 15 years old, and with two of the institutions still housed at temporary sites, there was inadequate infrastructure at these institutions or, as institution B's strategic development plan 2002 – 2008 puts it, "lack of the requisite physical infrastructure," (p. 2) including lecture rooms and laboratories. In its strategic development plan 2001 - 2015, institution C indicates that the state had not, as of now, been able to fully provide the infrastructure necessary for the operation of the university. The plan notes that the situation was likely to worsen with the emergence of more universities competing for the same state support.

The lack of adequate teaching equipment and facilities was also identified. At institution C, for example, the available laboratories were described in the strategic development plan as ill-equipped and the library as not sufficiently stocked. Institution A's strategic development plan 2001 – 2008, highlighted the inadequate telecommunication facilities, ineffective ICT networking and poor access to personal computers, as limiting the opportunities for computerization of key functions, research and integration of technology by staff and students.

In terms of human resources, the three institutions noted that due to poor compensation and the prevailing economic climate, the universities were confronted by difficulties in the recruitment and retention of suitably qualified lecturers and staff. Institution C, in its strategic development plan, conceded that although staff recruited by

the university is qualified, they largely were inexperienced and lacked necessary teaching and research experience. The universities also noted in their strategic development plans that they were simultaneously faced with problems in their efforts to staff develop, largely due to the lack of financial resources.

External Operating Environments

The political instability in Zimbabwe and the deteriorating relationship between Zimbabwe and key donors were presented by the three institutions' strategic development plans, as having compromised potential investment in the universities. The socio-economic situation, the analyses in the plans at the three institutions note, had also resulted in a hyper-inflationary operating environment which made it difficult for the institutions to run their programs effectively.

Context of Instructional Technology Integration at Institution A

Institution A, which was established in the last 15 years, is a private university which has a faculty (college) of education that prepares pre-service secondary school teachers. The student teachers largely specialize in arts subject areas, with a few majoring in agriculture and business education.

Lecturers' Teacher Education Experience

All the four male lecturers aged 50 to 58 years were interviewed at institution A. Three of the lecturers had between 20 and 25 years experience of preparing pre-service teachers and the forth one had 5 years. Three of the lecturers had between 5 and 7 seven years of teaching at their current institution and the forth one had one. Two lecturers had

spent between 11 and 15 years teaching in high school and the other 2 had taught in high school for 5 years or less.

Lecturer Qualifications

Two of the lecturers had two masters in education degrees each, one had a doctorate in education and the forth had a masters in science education. Although they had all done some audio-visual aids courses (AVA), as it was called then, in their initial teacher education,, three of the lecturers indicated that they did not have any special training or qualification in educational technology, while the forth one had done the diploma in educational technology (Dip Ed Tech). This is a two-year graduate diploma in educational technology offered on a part-time basis by the University of Zimbabwe.

Prior Use Of or Experience with Computers

Only one of the four lecturers indicated that he had used computers, for word processing only, during his teacher education. The reason given by the three lecturers for not having used computers then was that there were no computers in their institutions at that time.

Table 3.

Lecturers' Background Information - Institution A

Lecturer	Gender	Age Group	Highest Degree	ET Course(s) Taken in Initial Teacher Education	Special Qualification(s) in ET	No. of years in Teacher Education	No. of years Teaching at Current Institution
1	M	50-54	Ph D	AVA	Dip Ed Tech	20	1
2	M	55-60	M Sc Ed	AVA	None	5	5
3	M	50-54	M Ed	AVA	None	20	4
4	M	55-60	M Ed	AVA	None	25	7

Note. Ph D = Doctor of Philosophy; M Sc Ed = Master of Science Education; M Ed = Master of Education; Dip Ed Tech = Diploma in Educational Technology; AVA = Audio-Visual Aids

Context of Instructional Technology Integration at Institution B

Established within the last 10 years to address the problem of the shortage of secondary school (science) teachers, institution B is a state university. Since its inception, the university is still operating from a temporary site – the premises of a former state institution. In the meantime, the university has been given some land on which to build, the master plan for the new campus has been prepared and some preliminary structures have been put up.

Lecturers' Teacher Education Experience

Ten out of twelve lecturers were interviewed at institution B. The majority of the lecturers – six, were aged between 40 and 50 years. Two lecturers were over 50 and the other 2 were below 35 years of age. Of the 8 male and 2 female lecturers, four had between 10 and 15 years experience of preparing pre-service teachers, two had between 2 and 5 years and the remaining 4 lecturers had less than a year of experience in teacher education.

Three lecturers had been teaching at their current institution for 2 to 5 years, 4 lecturers for 1 year each and three lecturers for less than a year. Three lecturers had 10 to 20 years of teaching experience in high school and 7 lecturers had taught in high school for between 5 and 10 years.

Lecturer Qualifications

Nine of the 10 lecturers had master in education degrees in areas ranging from theory of education disciplines like philosophy and sociology of education to curriculum

studies and content subject areas like Mathematics and Physics. The tenth lecturer had a doctorate in education, with specialization in teacher education. Whilst all the lecturers had done some audio-visual aids (AVA) courses in their initial teacher education, only one had special training or qualification in educational technology. The lecturer-in-charge of educational technology had a post-graduate diploma in educational technology from the University of Zimbabwe.

Prior Use Of or Experience with Computers

Four lecturers indicated that they used computers mostly for word processing, data analysis in research and for accessing the Internet during their own teacher education. All the other six lecturers said they had not used computers during their own teacher education because computers were not available at their institutions then.

Table 4.

Lecturers' Background Information - Institution B

Lecturer	Gender	Age Group	Highest Degree	ET Course(s) Taken in Initial Teacher Education	Special Qualification in ET	No. of years in Teacher Education	No. of years Teaching at Current Institution
1	M	40-45	M Ed	AVA	None	13	5
2	M	40-45	M Ed	AVA	Dip Ed Tech	13	3
3	F	55-60	M Ed	AVA	None	5	1
4	M	40-45	M Ed	AVA	None	2	1.5
5	M	40-45	M Ed	AVA	None	15	8 months
6	F	40-45	M Ed	AVA	None	3 months	3 months
7	M	40-45	M Ed	AVA	None	1	1
8	M	25-30	M Ed	None	None	1	1
9	M	65-70	Ed D	AVA	None	10	8 months
10	M	30-35	M Ed	None	None	1	1

Note. Ed D = Doctor of Education; M Ed = Master of Education; Dip Ed Tech = Diploma in Educational Technology; AVA = Audio-Visual Aids

Context of Instructional Technology Integration at Institution C

Institution C is also a state university established within the last 10 years. The university's faculty (college) of education prepares pre-service secondary school teachers in a variety of academic and vocational subjects. Although the university has acquired land and some preliminary buildings have gone up at the proposed new site, it is currently housed at the premises of a former state institution.

Lecturers' Teacher Education Experience

Seven out of a possible 10 lecturers were interviewed at institution C. Four lecturers were aged between 30 and 35 years and the other 3 were between 40 and 50 years old. Six of the lecturers are male and one is female. Two lecturers had 15 years experience each in pre-service teacher education and the remaining 5 lecturers had 2 to 5 years experience. Two lecturers had been teaching at their current institution for one year or less. Five lecturers had spent between 8 and 11 years teaching in high school, one lecturer had 23 years and the other one had one and a half years of such experience.

Lecturer Qualifications

Four of the lecturers had masters degrees in education and the remaining three were holders of bachelor's degrees in accounting education. All the lecturers indicated that they had taken some audio-visual aids (AVA) courses in their initial teacher education or training and only 2 of these lecturers had special training or qualifications in educational technology. Both lecturers are holders of the post-graduate diploma in educational technology from the University of Zimbabwe.

Prior Use Of or Experience with Computers

Five lecturers indicated that they had used computers for typing assignments, word processing, and to a lesser extent, doing spread sheets, surfing the Internet and analyzing research data using the Statistical Package for Social Sciences (SPSS) software. Two lecturers said they had not used computers during their initial teacher education because there were no computers in their colleges at that time.

Table 5.

Lecturers' Background Information - Institution C

Lecturer	Gender	Age Group	Highest Degree	ET Course(s) Taken in Initial Teacher Education	Special Qualification(s) in ET	No. of years in Teacher Education	No. of years Teaching at Current Institution
1	M	30-34	M A	AVA	None	1	1
2	F	50-54	M Ed	AVA	None	15	5
3	M	45-49	M Ed	AVA	Dip Ed ET	15	1
4	M	30-34	M Ed	AVA	Dip Ed ET	2.5	1
5	M	30-34	B A	None	None	1	1
6	M	45-49	B Acc	AVA	None	4.5	4.5
7	M	30-34	B Com	AVA	None	2	1

Note. M A = Master of Arts; M Ed = Master of Education; B A = Bachelor of Arts; B Acc = Bachelor of Accounting; B Com = Bachelor of Commerce; Dip Ed Tech = Diploma in Educational Technology; AVA = Audio-Visual Aids.

Data Collection Methods

Three commonly used data collection methods in qualitative research - interviews, analysis of documents and questionnaires - were used in this study. Patton (1990, p. 10) says that qualitative data consist of "direct quotations from people about their experiences, opinions, feelings, and knowledge" obtained through interviews; "detailed descriptions of people's activities, behaviors, actions" recorded in observations;

and “excerpts, quotations, or entire passages” extracted from the various types of documents. These methods were able to provide the data that lead to an understanding of the phenomenon at issue in this study. Table 2 below shows the data collection methods that were employed for each of the central questions of the study.

Table 6.

Data Collection Methods

Research Question	Data Collection Method		
	Interview	Questionnaire	Documents
1. How is IT conceptualized by lecturers in pre-service secondary teacher education programs at universities in Zimbabwe?	X		X
2. How do the lecturers integrate IT in their instruction?	X	X	X
3. What support do the lecturers get from their institutions in integrating IT?	X		X
4. What are the constraints faced by the lecturers in integrating IT?	X	X	X

Interviews

The interview is one of the most commonly used data collection methods in qualitative research. As Merriam (1998) puts it, “interviewing is necessary when we cannot observe behavior, feelings or how people interpret the world around them” (p. 72). We may also interview when we are interested in past events that cannot be replicated. The purpose of using interviews in this study was to collect information on the lecturers’ perspectives in terms of their conceptualizations, practices and experiences and on their thoughts on instructional technology integration at their institutions.

Interviews range from structured, where the participant is asked the same questions and there is little room for adaption, to completely open-ended, informal interviews where the questions depend on the particular situation or participant. This

study made use of semi-structured interviews, which had a mix of more and less structured questions. Less structured questions assumed that different lecturers, for example, conceptualized technology integration in different ways, and so the questions asked were more open-ended.

The first part of the interview (see Appendix E) was exploratory in nature and sought to collect demographic and background information relating to the lecturers' teacher education experience, their qualifications and their prior use of or experience with computers. The subsequent sections of the interview focused on: the lecturers' conceptualization of instructional technology integration; how they integrate IT in their day-to-day instruction; what support the lecturers get from their institutions; and the constraints they face in integrating IT.

While portions of the interview solicited specific information from all the respondents, the interview was also guided by questions or issues to be explored. A guiding interview schedule was used and content, wording or order of questions changed due to the emergent nature of the study. This format enabled the researcher to respond to the situation at hand and to the emerging worldview of the respondent, as well as to new ideas on the topic.

Although the participants were asked to choose the most suitable time and location for the interview, each face-to-face interview took between 45 and 100 minutes, depending on the amount of disturbances that were experienced. Some lecturers (especially those with additional responsibilities in their institutions) tended to have more frequent interruptions from telephone calls or the occasional student trying to register for classes. The tape recording of the interviews allowed the researcher to concentrate less on

transcribing as the interview was in progress and to focus more on following up on key issues relating to the research questions.

Questionnaires

The researcher decided to use questionnaires for collecting data of a technical nature relating to the research questions. Such information would have been difficult to collect accurately using the other data collection methods. Bell (1987) observes that questionnaires are a good way of collecting certain types of information quickly and relatively cheaply as long as the participants are sufficiently literate and the researcher sufficiently disciplined to avoid questions that are superfluous to the main task.

To that effect, the researcher designed the Computer Technology Proficiency and Competency Questionnaire (CTPCQ), (See Appendix F) made up of likert-type questions written in clear and simple English. The instrument was adapted and modified from two instruments, namely; "Technology Proficiency Self-Assessment" (TPSA), (Margaret, 2000) and "Technology in Education Competency Survey," (International Society for Technology in Education, 1998). The CTPCQ had two parts and the first part, with 20 questions, sought to determine the lecturers' proficiency in some basic and common computer tasks in their day-to-day teaching. The second part of the questionnaire, with 8 questions, sought to find out the lecturers' competencies in some common technology integration processes.

Based on self-assessment, the CTPCQ requested lecturers to indicate whether they strongly agreed (SA), agreed (A), were undecided (U), disagreed (D) or strongly disagreed (SD) with the following: (a) the statement that they felt confident that they could do a particular task using computer technology; and (b) the statement that they felt

competent that they could do a particular technology integration process. Besides giving the respondents more time to think and respond to the questions, the CTPCQ enabled respondents to provide responses to computer technology proficiency and competency questions which would otherwise have not been easy to accurately provide, for example, in an interview.

Before getting into the field, the questionnaires were administered to eight lecturers in the department of education at a university where the researcher once taught, but which was not participating in the study, in a pilot or trial run. Leedy (1989) suggests that every researcher should give the questionnaire to at least half a dozen friends or neighbors, to test whether there are any items they (participants) may have difficulty in understanding or in understanding exactly what the researcher is seeking to determine. Minor adjustments to the questionnaire were then made where participants in the trial run had problems answering the questions.

Documents

The third method of data collection was analysis of documents. Documents, as the term is used in this study, are an "umbrella term to refer to a wide range of written, visual, and physical materials relevant to the study at hand" (Merriam, 1998, p. 112). As pointed out by Hodder (1994), material traces of behavior give an important and different insight from that provided by other data collection methods. For often "what people say" is different from "what people do."

The documents that were collected for this study included institutional strategic development plans, university catalogues and course outlines. Document analysis assisted in providing data relating to the context in which instructional technology integration

took place, how the lecturers planned (in course outlines) to integrate IT, the support that the lecturers got from their institutions as well as the constraints that they faced. Data collected from documents was also used for triangulating data collected from interviews and questionnaires. Tables 3 and 4 below respectively show the flowchart and timeline used for data collection activities in the study.

Table 7.

Data Collection Flowchart

Event	Purpose	Location	Comments
Administer Questionnaire	To collect data on lecturers' computer technology proficiency & competence.	Faculty offices or alternative chosen by participant.	Collecting data of a technical nature
Interview	To collect data on all the four research questions.	Conducive location chosen by participant	Collecting data on lecturers' perspectives etc.
Peer review 1	To help the researcher understand how his methods and views may affect the initial findings.	Conducive location chosen by participant	Initial review
Member check 1	To verify data transcribed from audiotapes of Interviews	Conducive location chosen by participant	Initial check
Document Analysis	To collect data on all the four research questions	Faculty Offices	Helpful in triangulation.
Peer review 2	To help the researcher understand how his views and beliefs may affect the initial and concluding findings.	Conducive location chosen by participant	Final review
Member check 2	Ask clarifying & follow-up questions about documents analyzed and verify data transcribed from interviews.	Conducive location chosen by participant	Final check

Table 8.

Data Collection Timeline

Month	Institution	Activity	Participants
1	A	Administered Questionnaires	FOE lecturers
		Conducted Interviews	FOE lecturers
		Collected Documents	FOE lecturers Dean, FOE Head, Comp. Dept.
2	B	Administered Questionnaires	FOE lecturers
		Conducted Interviews	FOE lecturers
		Collected Documents	FOE lecturers Dean, FOE Head, Comp. Dept.
2-3	C	Administered Questionnaires	FOE lecturers
		Conducted Interviews	FOE lecturers
		Collected Documents	FOE lecturers Dean, FOE Head, Comp. Dept.

Note. FOE = Faculty (College) of Education; Comp. Dept = Computer Department

Data Analysis

This study analyzed data inductively. The essence of inductive analysis is that categories, themes, and patterns emerge from the data collected during open-ended observations, interviews, and examination of artifacts (Janesick, 1994; Patton, 1990). In inductive analysis, “Although categories and ‘variables’ initially guide the study, others are allowed and expected to emerge throughout the study” (Altheide, 1987, p. 68). The benefit of this thematic approach to analysis is that it directly represents the perspective

of the participants (emic view) rather than that of the researcher (etic view). In qualitative inquiry, analysis is ongoing and in this study, it involved the simultaneous coding of raw data and the construction of categories that captured relevant characteristics of the data being collected.

As a means to interpret the data, Miles and Huberman's (1994) data analysis was used. In this approach, analysis consisted of three concurrent flows of activity which started with data reduction, followed by data display and the drawing up of conclusions or verification. These streams of activity, as Miles and Huberman (1994) point out, form an interactive model in which the activities are "interwoven before, during and after data collection in parallel form, to make up the general domain called analysis" (p. 12).

Data reduction - which was a continuous process from the beginning of the research right up to the writing up of the report – included the process of selecting, focusing, simplifying, abstracting, and transforming the data in written-up field notes or transcripts. As Miles and Huberman (1994) maintain, data reduction enabled the researcher to sharpen, sort, focus, discard and organize data in such a way that conclusions drawn from the analysis could be verified. However, they also warn, "It is important not to strip the data at hand from the context in which they occur" (p. 11). This was particularly true in this study where considerable emphasis was on understanding the context, since much of the meaning was in understanding the realities of the given situations.

According to Miles and Huberman (1994), codes are efficient data-labeling and data-retrieval devices that empower and speed up analysis. The researcher started by creating a list of codes for each of the data sources that were used in the study. The list of

codes helped the researcher to tie the research questions directly to the data. In this selective process of handling all this information from interviews, documents and questionnaires, which came in the form of words, some words and phrases had to be "hung on to throughout data analysis" (Miles & Huberman, 1994 p. 56) because they rendered more meaning to given situations and contexts.

Initially, descriptive codes, that is, ones that entailed little interpretation were used. Here, a class of a phenomenon (code), for example, "lecturers' qualifications," was attributed or attached to a segment of text. The same segment of text could also be interpretatively coded by, for example, looking at whether the lecturers' qualification included any special training in educational technology and naming that code "lecturers' special ET training."

As data collection commenced, and working more inductively by waiting for codes to emerge from the collected data, the researcher redefined and discarded codes that were not applicable or those that were ill-fitting. He persistently made sure the codes related to one another and to the structure of the research questions and that they were distinct from others in meaning (Miles & Huberman, 1994). Data analysis was largely done manually, and with partial aid from a word processor. Notebooks and file folders (Miles & Huberman, 1994) were used to systematically store the coded field data for easy retrieval during analysis.

Data display enabled the researcher to organize a compressed assembly of the data collected and facilitate the drawing up of conclusions. Miles and Huberman (1994) say that by display, they mean a visual format that presents information systematically, so that the user can draw valid conclusions. This study used matrices and charts to display

data from the mass of text that was written or transcribed. As with data reduction, the process of displaying data was part of the interactive nature of the data analysis.

Conclusion drawing and verification, activities which took place from the start of data collection, involved the noting of regularities, patterns, explanations, possible configurations, causal flows and propositions. To achieve this, the researcher used the exploratory data displays that he created, as well as the analytical memos he wrote on the information being gathered. In most cases, the convention used was to mark off the reflective remark or note "with double parentheses to signal that it is of a different order from the data it comments on" (Miles & Huberman, 1994, p. 66). These reflective writings included reactions, feelings and insights (Lincoln & Guba, 1985; Patton, 1990) concerning the attitudes and opinions expressed by the participants, questions that developed as a result of the interviews and reflection, and formal field notes.

Bogdan and Biklen (1998) give three advantages of using reflective notes or memos. First, reflecting on personal field experiences provided the researcher with additional insights into understanding the phenomenon that he was studying. Second, the use of memos while coding assisted the researcher in tying together and triangulating different pieces of data during the analysis and identification of emergent themes. Last, reflective notes of fieldwork techniques and research strategies enabled me to write an account of what was done as well as to document how those experiences may have affected the data. The researcher maintained an open and skeptical mind to the formative conclusions and drew the "final" conclusions only after data collection was over.

In order to maintain anonymity and the confidentiality of the participants, names of institutions and those of lecturers were not used. The three institutions were referred to

as institution A, institution B and institution C and the participant lecturers were identified by their numerical code references, for example lecturer 1 or lecturer 6.

Rigor or Trustworthiness

The traditional measures of quality in quantitative study – reliability and validity – have very different meaning in the context of qualitative research. To a large extent the procedures designed to ensure reliability and validity in positivistic research were also designed to distance the researcher from the participants (Kincheloe & McLaren, 1994). Since the main focus of qualitative research is interaction between the researcher and the participants, these quantitative techniques are inappropriate measures of rigor.

However, there are other techniques that could be used as measures for quality in qualitative inquiry. According to Rubin (2000), rigor in qualitative research can be defined as measures and procedures employed to address concerns about objectivity, reliability, validity and representativeness of findings. Morse (1994) suggests that all qualitative research must be both adequate and appropriate. Adequacy refers here not to a particular number of subjects, but to the amount of data collected. According to Morse (1994, p. 230), “adequacy is attained when sufficient data have been collected that saturation occurs and variation is both accounted for and understood.” Appropriateness, on the other hand, refers to the selection of information according to the needs of the study. Lincoln and Guba (1985) suggest credibility and transferability amongst other techniques, as measures appropriate for the judgment of the trustworthiness of a study.

Credibility

The issue at stake here is what Miles and Huberman (1994) refer to as truth value. Do the findings of the study make sense? Has the researcher produced a plausible picture of what was being studied? Are the findings credible to the participants in the study and to outside readers? Lincoln and Guba (1985) suggested several techniques for establishing credibility, including triangulation, peer review, and member checks. These three techniques were used in this study.

Triangulation

Triangulation is the process of gathering data from multiple sources for collaboration, and it promotes credibility and minimizes the risk of distortion inherent in the use of only one type of data source (Maxwell, 1996). While reliance on any one source of data may lead to a distorted interpretation of the subject under enquiry, multiple sources reduce the risks by offering differing perspectives. In this study, the researcher triangulated the findings using data from the analysis of the universities' strategic development plans, course outlines, lecturer interviews and lecturer questionnaires.

Peer review

Peer review, also known as "peer debriefing," which was done with the researcher's colleague who is a teacher educator at a university not participating in the study, enabled the researcher to have a sounding board for his ideas and interpretations. Lincoln and Guba (1985) describe peer debriefing as sharing all aspects of the research with an impartial peer in an analytical manner and for the purpose of exploring aspects of the inquiry that might otherwise remain only clear within the researcher's mind.

Put in other words, peer review could be seen as the review of the research process and findings by someone who is knowledgeable but external to the problem being explored. Two peer review sessions were held; the initial one, after interviews with lecturers at institution A, and the second after interviews with lecturers at institution B. During the debriefing sessions, methodology, findings and progress of the study were discussed in the context of the researcher's views and beliefs and this helped the researcher to identify his biases and discover how these could affect the interpretation of the data.

Member check

Lincoln and Guba (1985) say that member checking is "the most crucial technique for establishing credibility in a study" (p. 314). Member checking affords participants the opportunity for them to ask questions, clarify issues and to verify that the findings accurately reflect the participants' views. In this study, the technique of member checks involved presenting transcriptions and interpretations of the face-to-face interviews to the participants and seeking confirmation from them (participants) that the interpretations were valid. The first member checks were done after interviews at each institution and after the initial peer review. The second member checks were carried out after the researcher had had further chances of analyzing both the interviews and collected documents and after the second peer review.

Transferability

Transferability is the level to which a researcher's findings, and conclusions can be applied to a group that is external to the actual participants in the study, and according

to LeCompte (2000) the rigor of a study is affected by the level of transferability of the research results. Transferability in qualitative research is not based simply on extrapolating results from a representative sample to the general population. According to Lincoln and Guba (1985), neither is it the responsibility of the researcher to demonstrate particular transferability, rather it is his or her responsibility to provide adequate description of the situation so that others may make judgments on the transferability of the findings based on how close their situation of interest is to the one reported.

Transferability is based on providing rich description and clearly understandable results. This researcher was able to create the best opportunity for successful transferability judgments to be made by using rich description. This entailed providing details of the setting or context of the study, characteristics of the participants and detailed accounts of findings from each institution, followed by summaries of findings from the three institutions.

Summary

This chapter presented the research methodology used, which was a basic or generic qualitative study. Twenty-one lecturers in the faculties of education at three universities preparing pre-service secondary school teachers in Zimbabwe were participants. Three data collection methods were used: questionnaires, interviews, and analysis of documents. Data collected were organized and analyzed inductively and Miles and Huberman’s (1994) three concurrent flows of activity consisting of data reduction, data display and conclusion or verification were followed.

To ensure rigor and trustworthiness of the research, the researcher ensured that there was adequate and appropriate collection and analysis of data. In order to ensure credibility of the study, triangulation, peer briefing, and member check techniques were used and rich or “thick” description ensured that readers can evaluate the transferability of the research findings to situations similar to the ones studied.

CHAPTER 4

PRESENTATION OF FINDINGS

This chapter looks first at the background of the lecturers at the three institutions in terms of their teacher education experience, their qualifications and their prior use of or experience with computers. In seeking to establish the state of instructional technology integration by university lecturers in pre-service secondary school teacher education programs in Zimbabwe, findings are presented in response to the following guiding questions:

1. How is instructional technology conceptualized by lecturers in pre-service secondary teacher education program at universities in Zimbabwe?
2. How do the lecturers integrate instructional technology in their instruction?
3. What support do the lecturers get from their institutions in integrating instructional technology?
4. What are the constraints faced by the lecturers in integrating instructional technology?

Data was collected from semi-structured interviews with 21 lecturers (see Appendix E) at the 3 universities with pre-service secondary teacher education programs, located in three different provinces of Zimbabwe. Structured questionnaires (see

Appendix F) were administered to the lecturers and documents relating to the context of instructional technology integration at these institutions were collected.

The researcher analyzed the data using the inductive analysis method in which open coding, grouping data into categories and use of matrices and flow charts helped in identifying and checking emerging themes and patterns as the verbal, text and questionnaire data were studied. This coding of raw data and the construction of categories that captured the relevant characteristics of the collected data was a simultaneous process.

In answering the guiding questions of this study, the researcher reports the themes emerging from findings from each of the three institutions first, followed by a summary of the findings from all the three institutions. This approach, as Lincoln and Guba (1985) suggest, will provide adequate description of the situations, which would enable others to make judgments on the transferability of the findings based on how close their situations of interest are to the ones presented.

In reporting the findings, narratives in the form of “verbal tapestry,” meant to provide a rich description of the lecturers’ responses to questions relating to instructional technology integration are provided. Verbal tapestry consists of different threads woven together to make a whole (Many, 2002). In order to provide a detailed depiction of the basis on which conclusions were drawn, “telling quotes from interviews” (Firestone, 1987, p. 19) were used, to ensure that, “details are convincing, because they create a gestalt that makes sense to the reader.” In simpler terms, the researcher hoped that readers would be able to view his description as both rich and thick enough to gain an

understanding of the state of integration of instructional technology by lecturers in pre-service secondary teacher education programs in Zimbabwe.

Background of the Lecturers at the Three Institutions

Lecturers' Teacher Education Experience

A total of 18 male lecturers and 3 female lecturers, giving a grand total of 21 lecturers were interviewed at the three institutions. Six of the lecturers were fifty or more years old, 9 were between 40 and 50 years old and the other 6 were less than 35 years old.

Three lecturers had more than 20 years teacher education experience, 6 had between 10 and 15 years experience, 8 had 2 to 7 years experience and the remaining 4 lecturers had 1 year or less of teacher education experience. A total of 13 lecturers or 65% of the lecturers had been teaching at their current institution for about a year or less, and the remaining 8 lecturers (35%), had between 2 and 7 years teaching experience at their current institutions. Eleven lecturers or 51% of the lecturers had spent more than 10 years teaching in high school, 7 lecturers had spent between 5 and 10 years and 3 lecturers had spent less than 5 years.

Lecturers Qualifications

Sixteen lecturers or 80% of the 21 lecturers interviewed have masters' degrees in theory of education disciplines, applied education and various content subject areas. Two lecturers have doctorates in education and the remaining 3 lecturers hold bachelors degrees in accounting education. Although all the 21 lecturers had taken some audio-visual aids (AVA) courses in their initial teacher education or training, only 4 lecturers

had some special training or qualifications in educational technology. Three lecturers from the 3 different institutions, who are also in charge of educational technology at their respective institutions, hold the post-graduate diploma in educational technology from the University of Zimbabwe.

Lecturers' Prior Use of or Experience with Computers

Ten or 49% of the lecturers indicated that they had used computers for typing assignments and word processing, and to a lesser extent, accessing the Internet and doing some data analysis using SPSS, during their own teacher education or training. Eleven or 51% of the lecturers said they had not used computers during their teacher education because there simply were no computers at their teachers' colleges then.

Conceptualization of Instructional Technology by the Lecturers

In order to find out how instructional technology (IT) is conceptualized by lecturers in pre-service secondary teacher education programs in Zimbabwe, the researcher interviewed (see Appendix E) 21 lecturers from the faculties (colleges) of education at the three institutions located in 3 provinces of the country. The researcher asked how the lecturers would define educational technology (ET), whether in their own view there was a difference between educational technology and instructional technology, and if so, what the difference was. The lecturers were then asked to explain what they understand by the term instructional technology integration.

Conceptualization of Instructional Technology by Lecturers at Institution A

An analysis of the definitions of ET given by the four lecturers at Institution A reveals four main aspects emerging. The first aspect is what the researcher will refer to as the spectrum (a broad sequence or range of related qualities, ideas, values or activities) of ET. Lecturer 1 said ET is "a very broad area." Lecturer 3 indicated that it is, "That science of teaching" with the third one, Lecturer 4 saying ET "is about the use of technology in promoting education." Lecturer 2 did not address this aspect in his definition.

The second aspect addressed is what ET involves or encompasses. Lecturer 1 said that ET, "involves designing, developing, implementing and evaluation of teaching and learning aids" and Lecturer 3 indicated that ET involves the use of teaching and learning aids, such as computers and charts. The last two lecturers respectively said ET "involves some aspects of using technology" and that it is, "teaching to facilitate learning from the point of the learner."

The third aspect that came out of these definitions is descriptions or examples of the technology used in ET. The main description given by three of the four lecturers who addressed this aspect was that ET was about "teaching and learning aids." Examples of teaching and learning aids given by two of the lecturers were flip-charts, computers, PowerPoint, eLearning and charts.

The forth aspect identified in these definitions of ET was the purpose of ET. Lecturer 1 said ET activities were "to make it easy for the process of human learning" and Lecturer 4 added "to make the instructor's activities simpler." Lecturer 2 complimented the first two by saying "to enable teaching and learning to take place."

When asked if, in their own view, there was a difference between ET and IT and if so, what the difference was, two lecturers said there was a difference between ET and IT, with the second lecturer indicating that the difference was small. Lecturer 3 indicated that IT was confined to instructing and teaching and referred to the means one uses when teaching or giving instruction and that ET was broader and included the equipment that helps one to acquire education. In an almost complete reversal of the differences given by lecturer 3, lecturer 4 said IT was wider and not necessarily specific to education, and that it involved many more people. He added that ET focused on teaching done by the teacher, and that "all [ET and IT] are involved in communicating ideas to the next person."

Lecturer 1 said there was "not really" a difference, an expression which perhaps showed doubt as to the existence of a difference, as he went on to point out that ET "encompasses everything" and that IT is "pertinent to a particular field, for example, instructing engineers, historians or theologians." The forth lecturer, lecturer 2 said he honestly did not know if there was a difference between ET and IT, and had "not put thought to it."

When asked what they understand by the term IT integration, Lecturer 1 said, "technology is a part and parcel of any program in education," and Lecturer 2 agreed by pointing out that, "It [IT]should be part and parcel of all instruction," and that it is needed as a matter of course.

The third lecturer, Lecturer 3 said IT integration is "using technology in order to assist a learner understand the concept you want to teach in an instructional set-up" with

Lecturer 4 saying IT integration was the "use of modern gadgetry to enhance the *process* of instruction."

The understanding of the term IT integration by lecturers at institution A falls into two views. The first perspective of viewing it [IT integration] as "technology as a component of all instruction," was given by two lecturers. The other perspective, of viewing IT integration as a *process* of determining which tools and which methods for implementing them are appropriate for a given classroom situation and problems (Roblyer & Edwards, 2000), was less precisely given by the other two lecturers.

The two attempts at defining IT integration are consistent with the view of "IT as hardware" and the notion of using technology in order to "assist" the teaching and learning process in a given classroom situation, but they do not address IT integration as including the "process of determining" how this will best be done.

Conceptualization of Instructional Technology by Lecturers at Institution B

A breakdown of the definitions of ET given by the ten lecturers at institution B reveals three main aspects of the definition. The first aspect is the "spectrum" of ET, which was described with terms ranging from "something that helps students' knowledge," and "creating a learning environment," to viewing ET as "tools and gadgets," "the use of multimedia" and "modern technology," and as "something to do with computers."

Addressing the second aspect of what ET involves or encompasses, Lecturer 2 said ET was a system of planning, a system of designing a learning environment. Another

lecturer, Lecturer 3 said ET was another means of making your ideas come to reality – using ET to bring things to life.

The other aspect addressed in these definitions was that of purposes of ET. The main purpose pointed out was that these tools, gadgets or technologies, “enhance,” “assist,” “further,” “facilitate” or “are an aid to” the teaching and learning process. Lecturer 2 saw ET as a form of curriculum development in which emphasis was on methods to be used and another one saw ET as “new ways of research where computers are used so that you go deeper.”

When asked if, in their own view, there was a difference between ET and IT and if so, what the difference was, six lecturers said there was a difference between ET and IT with varying degrees of convictions in terms of the extent of the differences. Some of the responses given were, “difference is small,” “difference is quite narrow,” “there should be a difference,” “I think they are more or less the same” and “there is a major difference.” Two lecturers said there was no difference between ET and IT and one said there was an overlap between the two. The tenth lecturer said he was “not very sure” if there was a difference.

Three of the lecturers said ET was “wider’ or “broader” than IT, or “an expansion” of IT, with one adding that ET, “… can be anything from IT to other aspects of education.” Lecturer 1 said IT was “specific for instructional purposes” and Lecturer 3 added that it was, “instruction centered.” Lecturer 7, who was, “not very sure” if there was a difference between ET and IT, however pointed out that “technology” encompassed both ET and IT.

When asked what they understood by the term IT integration, the initial response of all the lecturers at Institution B was that of not being familiar with the term. Typical responses were “not very conversant with the term,” “not familiar with the term or concept,” “don’t know,” “have not heard that term being used before,” and “not sure about that one.” One lecturer said he did not know whether he would be able to answer the question and another one said it was difficult for him to explain the term.

Six of the lecturers, using terms like “in layman’s language,” ‘if I am to infer,” and “I think here we are talking of …,” went on to explain IT integration by inference. The main inference to come out was that of IT integration - as the use of technology in “teaching and learning” and “across the disciplines.” One lecturer suggested, “using various means” and the another one added “use of different technologies.”

Conceptualization of Instructional Technology by Lecturers at Institution C

The spectrum of ET given in the definitions by 5 of the 7 lecturers at institution C was quite broad, ranging from viewing ET as “methods of teaching,” “use of technology in delivering instructional materials,” to seeing ET as “apparatus and machines that assist in delivering lectures,” “the tools made up of things like …” and “the use of computers as a source of information.” Lecturer 4 said he tended to have two views; ET as meaning “the hardware and software used in education” and, ET as “a system or process involving the planning, utilization and evaluation of the technological tools used in education.” The seventh lecturer, lecturer 1, gave what he described as an “old fashioned definition.” He said, “It [ET] has to do with the use of mass or objects as opposed to just conception in education, the transformation of conception or ideas into real or animate objects.” This

rather philosophical definition tends to defy closer scrutiny by using the unusual terms "mass" and "object" in describing day-to-day teaching and learning processes.

Examples of ET given by three of the lecturers were over head projector (OHP), word-processing, PowerPoint Presentations, visual charts and "these days, computers." Lecturer 7 summarized this by describing these as "apparatus and machines – from the traditional to the modern – from the OHP to PowerPoint presentations."

In terms of the purposes of ET, the lecturers at institution C indicated that ET involves the use of technology in education. Examples of comments made were that it [ET] is used "in the teaching and learning process," "to facilitate teaching" and "to assist lecturers in delivering lectures."

When asked if, in their view, there was a difference between ET and IT and if so, what the difference/s was/were, four of the seven lecturers indicated that there was a difference. The main observation made was that ET "is broader" and that it was about "empowering the learner to learn." Lecturer 4 consolidated this view by saying, "educational technology is aimed at enhancing all the technologies that are used in education in general," with Lecturer 6 adding, "Educational technology does not have to be in the classroom." On the other hand, Lecturers 3, 4 and 5 respectively said, "instructional technology would be limited to the teacher using technology in teaching," "instructional technology refers to technologies in the classroom to enhance teaching and learning," and that "instructional technology uses computers as a component of educational technology."

Three lecturers indicated that there was no difference between ET and IT. However, a closer look at their responses; "No, I think there isn't [a difference], they are

almost the same," "I don't think there is a difference" and "I will take them [ET and IT] as the same," tends to indicate an uncertainty in their answers.

When asked what they understood by the term IT integration, five of the seven lecturers (except the 2 who hold the post-graduate Dip Ed ET) at institution C said they were not familiar with the term IT integration. The responses from all the five lecturers were that they had not heard of the term or concept before.

All the five lecturers, using terms like, "I could hazard a guess," "I can only infer" and "By inference …" went on to explain IT integration. Two lecturers saw IT integration as, "how instructional technology and related technologies are used in the teaching and learning process," and "the introduction of modern technology." The other three said IT integration was, "a mixture or combination of different instructional techniques which can be used at the same time," "how we are going to combine the various forms of communication capacity to effect teaching and learning" and that IT "involves putting together all the instructional technology we have, from computers to the Internet, and using these for purposes of instruction."

Two lecturers (both holders of the post-graduate Dip Ed ET) indicated that they were familiar with the term. Lecturer 4 said we could refer to that (IT integration) as the process of *applying* technology in the teaching and learning process. Lecturer 3 said IT integration was about empowering the learner to learn and went on to ask rhetorically, "For the learner, is the technology of any use?" Can the student use technology to enhance his learning and problem-solving?"

Conceptualization of Instructional Technology by Lecturers at the Three Institutions

In this section, the researcher will present the summary of findings on the conceptualization of instructional technology by faculty (college) of education lecturers at the three institutions in the study. The presentation will first look at the definitions of educational technology, whether the lecturers thought there was a difference/s between IT and ET and if so, what the difference or differences were. The lecturers' understanding of the term instructional technology integration will then be presented.

Lecturers' Definitions of Educational Technology

All the lecturers presented what this study will refer to as the spectrum of educational technology, or put in other words, and consistent with Gentry's (1995) view, the boundaries of the field (ET) and what is it is all about. The spectrum of ET given by 5 of the 21 lecturers is quite wide, ranging from viewing ET as "a very broad area," "that science of teaching" or "the use of technology in promoting education," to viewing ET as something more specific. Some of the lecturers with the latter view saw ET as "methods of teaching," "use of technology in delivering instructional materials," "apparatus and machines that assist in delivering lectures" and as "the use of computers as a source of information."

The other 5 lecturers with this specific view saw ET as "creating a learning environment," "tools and gadgets," the use of "multimedia" and "modern technology" and as "something to do with computers."

It should be noted that besides the lecturer who saw ET as "creating a learning environment," all the lecturers with the latter and more specific view defined ET as *hardware*. In other words, all these lecturers had a hardware approach to their definition

of ET. One lecturer (holder of the post-graduate Dip Ed Tech) said he tended to have two views: ET as meaning the hardware and software used in education and; ET as "a system or process involving the planning, utilization and evaluation of the technological tools used in education."

Two lecturers from 2 different institutions gave what can be seen as philosophical definitions. One lecturer gave what he termed an "old fashioned definition" in which he said ET, "has to do with the use of mass (objects) as apposed to just conception in education – the transformation of conception (ideas) into real or animate objects." Although quite philosophical in outlook, this definition was based on a hardware approach as it focused on the use of the objects (technology) and not necessarily on the transformation of ideas (processes). The other one said ET was another means of making "your ideas come to reality" – using ET to bring things to life. These two definitions tend to defy or insulate themselves from closer scrutiny by being rhetorical and avoiding specifics or the use of day-to-day teaching and learning terminology.

The second aspect addressed by the lecturers' definitions was what ET involves or encompasses. Two lecturers (both holders of the post-graduate Dip Ed Tech) out of the 21 lecturers said ET involved the design, development, implementation and evaluation of teaching and learning materials or aids. The stages given in this definition were consistent with those of the popular ADDIE model of institutional design, as well as Gentry's (1995) observation that ET was also defined as a process. However, in this case the lecturers' definitions were limited and hardware in approach because they mentioned the instructional design stages as they specifically relate to teaching and learning materials, without including or addressing the totality of the instructional set-up. The instructional

set-up goes beyond the design, development, implementation and evaluation of teaching and learning materials and aids.

One lecturer said ET was “a system of planning, a system of designing a learning environment.” Although the lecturer did not include all the processes that may be included in designing an instructional environment, he stated that ET is systematic or based on the systems approach. It should be noted that the 3 lecturers who defined ET as a system or as involving processes like planning, designing, developing, implementation and evaluating had special training in ET. (All are holders of the post-graduate Dip Ed ET.) Consistent with the hardware approach to defining ET, one lecturer indicated that ET involved the use of teaching and learning aids, with the other one concurring that it [ET], involved using technology.

The third aspect that came out of the lecturers’ definitions was descriptions or examples of the technology used in ET. The main description given by the lecturers who addressed this aspect was that ET was about teaching and learning aids. Examples of the teaching and learning aids given, in their order of popularity are overhead projectors, PowerPoint presentations, computers, charts and flip-charts.

The purposes of ET were the fourth aspect to be identified in the definitions given by the lecturers. The main purpose to emerge from the lecturers’ responses is that ET activities made it easier or simplified the process of human teaching and learning. More specifically, most of the lecturers saw ET tools, gadgets or technologies as “enhancing,” “furthering,” or “facilitating” the teaching and learning process, or as an aid in teaching.

Use of the term “aids” was prevalent in responses by all the lecturers and this was perhaps a reflection of the influence of the basic Audio Visual Aids (AVA) courses that

all the lecturers had taken (according to the interview data) at some time in their initial teacher education.

Lecturers' Views on IT and ET

On whether, in the lecturers' own view, there was a difference between IT and ET and if so, what the difference was, twelve lecturers or 60% of the lecturers from the three institutions said that there was a difference between ET and IT. The responses were given with varying degrees of conviction in terms of the degree or extent of the difference. Typical responses included, "there is a difference," "the difference is small," "the difference is quite narrow," "there should be a difference," "they are more or less the same," and "there is a major difference."

Six or 30 % of the lecturers indicated that there was no difference between ET and IT. One lecturer said he did not know if there was a difference, the other one said there was an overlap between ET and IT and the last one was not sure if there was a difference or not.

Table 9.

Lecturers' Views on Whether There Was a Difference between ET and IT

Lecturers' Views	No. of Lecturers
There is a difference between ET and IT	12
There is no difference between ET and IT	6
Do not know whether there is a difference between ET and IT	1
There is an overlap between ET and IT	1
Not sure whether there is difference between ET and IT	1
Total	21

The main difference between ET and IT given by the 12 lecturers was that ET was "wider," "broader," or "an expansion of IT," with some explaining that ET "can be anything from instructional technology to other aspects of education," and that

"educational technology encompasses everything" and IT "is pertinent to a particular field." It was felt that IT was "specific for instructional purposes" or "is confined to instructing and teaching" with one lecturer describing it as "instruction centered."

Secondly, the findings show that there was a general belief that ET was broad and referred to technology in education in general, whilst IT was viewed as more of a component of ET and limited to the teacher using technology to enhance teaching and learning in the classroom.

Lecturers' Understanding of the Term Instructional Technology Integration

In terms of the lecturers' understanding of the term IT integration, fifteen lecturers or 75% of the lecturers at the three institutions initially indicated that they were not familiar with the term IT integration. Six of these lecturers said they had not heard of the term or concept before. The other lecturers said they were not "conversant" or "familiar" with the term or concept or were "not sure" what it [IT integration] is.

However, all the lecturers, using phrases like "I could hazard a guess," "in layman's terms" or "I think we are looking at" went on to explain IT integration by inference. The main inference to come out was that of IT integration as the use of technology in "teaching and learning" and doing so, "across the disciplines," using "various means and different technologies." The lecturers also saw IT integration as "how IT and related technologies are used in the teaching and learning process" and as "the introduction of modern technology." IT integration was also seen by three other lecturers as "a mixture" or "combination" of different instructional techniques, as "how … to combine the various forms of communication capacity to effect teaching and

learning" and as involving "putting together all the IT we have, from computers to the Internet, and using these for purposes of instruction."

Lecturers' Integration of IT in Their Instruction

To find out how the 21 lecturers from the three institutions integrate instructional technology on a day-to-day basis, two sources of data; interviews and questionnaires were used. In the interviews, (see Appendix E) the researcher asked the lecturers which courses they taught, which technological gadgets or tools they used and for what purpose they used these tools. He then asked if the lecturers were currently using computers for instructional purposes and if so, for what and/or how they used the computers, and if not, what the reason(s) for not using computers was/were.

Using the first part of the Computer Technology Proficiency and Competency Questionnaire (CTPCQ), with 20 questions (see Appendix F) the researcher sought to determine the lecturers' proficiency in some basic and common computer tasks in their day-to-day teaching. The second part of the questionnaire, with 8 questions, sought to find out the lecturers' competencies in some common technology integration processes.

Based on self-assessment, the lecturers were asked to indicate whether they strongly agreed (SA), agreed (A), were undecided (U), disagreed (D) or strongly disagreed (SD) with, in part A; the statement that they felt confident that they could do a particular task using computer technology, and in part B; the statement that they felt competent that they could do a particular technology integration process.

Integration of Instructional Technology by Lecturers at Institution A

Day-to-Day Integration

The lecturers interviewed at institution A said they taught courses that range from theory of education courses like Educational Psychology and Sociology of Education, to more applied education courses which included General Methods of Instruction and Methods of Teaching Specific Subject Content areas, for example Geography and History. The other applied courses they taught were Contexts of Education, Comparative Education, and Guidance and Counseling. One lecturer was in charge of teaching Instructional Technology.

When asked which technological gadgets or tools they use, all the 4 lecturers interviewed indicated that they used the overhead projector (OHP) and transparencies, with one adding, “the OHP is my instrument of choice.” Three of the lecturers said they used video cassette recorders (VCRs) and TV screens. Three lecturers also said they used the chalkboard although one of them noted that he did not agree that the chalkboard was media. He felt there was need for the creation of media, not “just using some existing board.” In addition to these, one lecturer said he sometimes used films, radio and television and the other one indicated that he occasionally used charts and flip-charts. It should be noted that there was no mention of computers and related technologies by all of the lecturers.

Two lecturers indicated that they used these gadgets or tools for lesson or lecture introductions, with one saying, “showing of images and visuals is very important” and the other one noting, “beaming picture codes provokes discussion.” These two also talked of using the gadgets to structure presentations, with one explaining, “for developing as

well as summarizing lectures and presentations." The third lecturer said he used the gadgets for "concept development" and the forth said for "lesson or lecture delivery."

When asked if they currently use computers for instructional purposes, three of the four lecturers answered to the affirmative. Asked how or what they used the computers for, one said for "lecture preparation, for example, word-processing." The other two gave more detailed responses with one saying he used the computer, "to prepare materials and keeping a running record of what I have done," as well as, "using the Internet to download materials and saving them as word documents."

The third lecturer said he used the Internet, "to research for teaching materials" and for, "downloading and printing materials." The forth lecturer said he did not currently use computers for instructional purposes because of the "question of access." He explained that computers were generally not available and that there were no instructional rooms with computers.

Computer Technology Proficiency and Competencies

Based on the CTPCQ and in terms of proficiency in some basic and common computer tasks, all the 4 lecturers at institution A indicated that they either agreed or strongly agreed that they felt confident that they could send an e-mail to a friend, send a document as an attachment to an e-mail message, use an Internet search engine to find web pages relevant to their specific subject areas as well as find primary sources of information on the Internet, that they could use in their teaching. They also indicated that they were confident that they could use the computer to do a slideshow presentation as well as use technology to collaborate with fellow lecturers or student teachers who were distant from their lecture rooms.

With the lecturers indicating that they either agreed or were undecided (on whether they felt confident), the 4 lecturers showed less confidence in the next set of simple e-mail and Internet tasks, which included subscribing to a discussion list (listserv), keeping copies of outgoing messages, keeping track of websites visited and saving documents in different formats.

Less confidence was also shown by the lecturers in the use of productivity or tool-based software like spreadsheets, databases or PowerPoint presentations. Seven responses from the 4 lecturers indicated that they either strongly disagreed, disagreed or were not decided on whether they felt confident that they could use a spread sheet to create a pie-chart, create a newsletter with graphics and 3 columns and create a database of information about important authors in a specific subject area.

The 4 lecturers showed little or no confidence in some basic but key technology integration tasks. These tasks included writing a paper describing how they would use instructional technology in their classrooms, creating a lecture or teaching unit that incorporates subject matter software, using technology to collaborate with fellow lecturers or student teachers and writing a technology integration plan with a budget to buy technology for their classrooms.

One of the most revealing findings in terms of proficiency was that all the 4 lecturers indicated that they strongly disagreed, disagreed, or were undecided on whether they felt confident that they could create their own WWW home pages or describe 5 software programs that they could use in their teaching.

All the 4 lecturers indicated that they either strongly agreed or agreed that they felt competent in using e-mail to communicate with colleagues as well as using the

WWW to find educational resources. However, at least half of these lecturers were undecided on whether they felt competent in planning and implementing projects in which students use a range of information technologies and in helping students learn to solve problems, accomplish complex tasks, and use higher-order thinking skills in an information technology environment. Two lecturers also disagreed or were undecided on whether they felt competent about teaching student teachers appropriate information technology skills and knowledge and whether they could work with students in various information technology environments, for example, standalone and networked computers, one-computer classrooms, labs, etc. The uncertainty shown by the lecturers in response to questions relating to these processes tended to suggest or point to the lack of confidence in their competences in executing these processes.

Integration of Instructional Technology by Lecturers at Institution B

Day-to-Day Integration

Five of the ten lecturers interviewed said they taught general theory of education courses like Philosophy and Sociology of Education, as well as History and Philosophy of Science. Five lecturers taught Curriculum Development or Curriculum Issues in Science Education and two teach Citizenship Education. One lecturer taught Research Methods in Education, one – Science Education General and Specific Subject Teaching Methods and the other – Educational Leadership and Management. One lecturer was in charge of teaching Educational Technology courses.

When asked which technological gadgets or tools they used, all the 10 lecturers interviewed indicated that they used the overhead projector (OHP) and transparencies,

with two saying they, “mainly” or “mostly” used these. Five lecturers said they used the chalkboard and four said they use charts or flip-charts. One lecturer (Lecturer 2) indicated that he used the slide projector and Lecturer 4 said he used T1 85, 83 and 92 handheld devices which, he added, “we use to integrate graphics or pictorial presentations of course calculations during instruction.” Lecturer 6 said she used pamphlets and newspaper cuttings for sharing current affairs information. Only Lecturers 1, 2 and 10 indicated that they used computers and the Internet.

Eight of the ten lecturers indicated that they use the technological gadgets for “presentation” or “delivery” of lectures and three elaborated by saying they used the gadgets for “illustrating,” “highlighting” or “developing” concepts or key points in a lecture. Two lecturers said they used the tools for preparing teaching and learning materials, for example, OHP transparencies and worksheets. Lecturer 2 specifically addressed the use of the computer and the Internet, “as a resource or replacement of the library,” where he searched for information and referred to, and asked students to visit some websites. He added, once in a while, “I use e-mail for purposes of communicating with one or two students.”

When asked if they currently use computers for instructional purposes, eight of the ten lecturers indicated that they currently did not, and this was dramatized in the words of Lecturer 2 who said, “I do not teach through the computer.” However, six of these lecturers went on to add that they used computers for purposes of preparing lectures through their research, typing, computing marks and grades, accessing the Internet and referring students to check out, in their own spare time, certain information on the Internet.

The two lecturers who indicated that they used computers for instructional purposes said they use the computers to “get something on the Internet” or “for typing exercises, exams, etc,” in preparation for their lectures.

The findings above show that whilst six of the lecturers indicated that they used computers for preparing their lectures (typing, computing marks and grades and searching for information on the Internet), none of the ten lecturers used computers for purposes of (to use the terms used by the lecturers) “presentation” or “delivery” of lectures.

The main reason given for not using computers for day-to-day instructional purposes was that they (lecturers) were not capable of using the computers for that purpose. As lecturer 6 put it, “I have no knowledge of how to use the computer for purposes of instructing a class of students.” Lecturer 10 highlighted this point by explaining, “I do not have enough expertise to enable me to use the computer, and especially the Internet, more effectively with my students.” Lecturer 2, who indicated that he did “not teach through the computer,” said, “one need first to be able to put materials on the computer, but web-publishing skills are not there.” This problem is also linked to the other problem raised by two lecturers; that of lack of training and the need to learn more before they can use computers in their day-to-day instruction.

Poor access to computers and the Internet and slow Internet speed were cited by five lecturers. Describing the slow Internet speed, lecturer 2 said, “Most of the time is spent trying to open a [single] web page. One out of five times you try to access [a webpage] and succeed once.” Lecturer 2 also pointed out the lack of appropriate software, preferably what he called “home grown software.”

Computer Technology Proficiency and Competencies

All the 10 lecturers at institution B indicated that they strongly agreed or agreed that they felt confident that they could send e-mail to a friend as well as use an Internet search engine to find Web pages related to their specific subject area. However, about half the lecturers indicated that they strongly disagreed, disagreed or were undecided on whether they felt confident that they could subscribe to a discussion list (listserv), send a document as an attachment to an e-mail message or keep copies of outgoing messages.

More than half of the 10 lecturers showed little or no confidence by indicating that they strongly disagreed, disagreed or were undecided on whether they felt confident in the slightly higher-order skill e-mail and Internet tasks. These included searching for and finding the Smithsonian Institute Website, keeping track of websites visited and finding primary sources of information on the Internet, that they could use in their teaching.

The majority of the lecturers either strongly disagreed, disagreed or were undecided on whether they were confident that they could use spread sheets to create a pie-chart of the proportions of students' scores on a revision test, create a newsletter with graphics and text in 3 columns, use the computer to do a slideshow presentation or to create a database of information about important authors in a specific subject area.

Most of the lecturers also indicated that they disagreed or were not decided on whether they felt confident that they could write a paper describing how they would use instructional technology in their classrooms, create a lecture or teaching unit that incorporates subject matter software or write a technology integration plan with a budget to buy technology for their classrooms.

All the 10 lecturers indicated that they strongly disagreed, disagreed or were undecided on whether they felt confident that they could create their own WWW homepages or describe 5 software programs that they could use in their teaching.

In terms of competencies, more than half of the 10 lecturers indicated that they strongly agreed or agreed that they felt competent using a word processor and graphics to develop teaching materials and using e-mail to communicate with colleagues. However, at least 70% of the lecturers (7 lecturers) indicated that they disagreed or were undecided on whether they felt competent doing particular technology integration processes. These processes include planning and implementing projects in which student teachers use a range of instructional technologies, helping students to learn to solve problems, accomplishing complex tasks and using higher-order thinking skills in an information technology environment. The lecturers also strongly disagreed, disagreed or were undecided on whether they felt competent about teaching students appropriate instructional technology skills and knowledge and working with students in various information technology environments, for example, standalone and networked computers, one-computer classrooms, labs, etc.

Integration of Instructional Technology by Lecturers at Institution C

Day-to-Day Integration

Five of the seven lecturers interviewed in this department said they taught applied education courses in the specific subject areas of English Literature, Mathematics, Accounting, Economics, Educational Research and Fashion and Fabrics. Some of the courses taught by the lecturers are Trends in Linguistics, Contemporary Issues in

Education, Methods of Teaching Accounting, Principles of Economics and Costing and Management Accounting. Two lecturers were in charge of technology. Lecturer 4 (holder of postgraduate Dip Ed Tech) was in charge of educational technology, with a particular responsibility for teaching the educational component of IT. Lecturer 5 was responsible for the information technology (practical) aspect.

When asked which technological gadgets or tools they used, five of the seven lecturers interviewed indicated that they used the overhead projector (OHP) and transparencies and/or the electronic or LCD projector. One lecturer said he occasionally used a film projector, “Last semester we showed a film on Jane Eyre,” as part of out literature class.” Four lecturers said they mostly used the chalkboard and two indicated that they sometimes prepared for their lectures using the using computer. Whilst five of the lecturers used all or a minimum of two of the above gadgets or tools, one lecturer indicated that he used the chalkboard only. Lecturer 7 said he did not use any of these gadgets or tools.

All the five lecturers indicated that they used the technological gadgets or tools for lecture delivery. Specifically, the lecturers said they used the gadgets for, “illustrating what I am teaching,” “showing the concept,” and “giving students lecture materials” or “demonstrating instruction.” As lecturer 4 explained, “Most of my lectures are on PowerPoint and I also use a module which is online, on my personal website.” Two of these lecturers indicated that they used these technological gadgets for lecture preparation.

When asked if they currently used computers for instructional purposes, four of the seven lecturers said they currently did not. The three lecturers who said they used

computers indicated that they used these for “lecture preparation,” “researching on the World Wide Web” and “giving students lecture materials.” Only lecturer 4 said he used the computer “for demonstrating instruction on the screen,” through his web publication on the International Education and Resource Network (IERN) website, a collaborative learning project.

The findings above show that whilst three of the lecturers indicated that they used computers for preparing for their lectures, only lecturer 4 used the computer for purposes of *presentation* or *delivery* of lectures.

The lack of resources, both hardware and appropriate software, was the main reason given by lecturers for not using computers. As one lecturer explained, “appropriate software programs for use in Accounting are not available.” The limited numbers of computers belonging to the computer department was also explained as leading to limited access to computers. An insightful explanation of another reason for lecturers’ not using computers currently was given by lecturer 3 who said, “People who come up with the curriculum may not see the value of using computers.”

Computer Technology Proficiency and Competencies

Based on the CTPCQ, the 7 lecturers at institution C indicated that they strongly agreed or agreed that they felt confident that they could send e-mail to a friend as well as send a document as an attachment to an e-mail message. However, about half these lecturers indicated that they strongly disagreed or were undecided on whether they felt confident that they could subscribe to a discussion list or keep copies of outgoing messages.

In terms of Internet use, all the 7 lecturers indicated that they strongly agreed or agreed that they felt confident that they could use an Internet search engine to find web pages related to their specific subject area, as well as find primary sources of information on the Internet. More than half the lecturers indicated that they strongly disagreed, disagreed or were undecided on whether they felt confident that they could search and find the Smithsonian Institute Website or keep track of websites they would have visited.

Slightly less than half the number of lecturers indicated that they strongly disagreed, disagreed or were undecided on whether they felt confident that they could use a spreadsheet to create a pie-chart of proportions of students' scores on a revision test, create a newsletter with graphics and text in 3 columns, use the computer to do a slide show presentation or create a database of information about important authors in a specific subject area.

At least 4 lecturers indicated that they strongly agreed or agreed that they felt confident that they could write a paper describing how they would use instructional technology in their classrooms, create a lecture or teaching unit that incorporates subject matter software or write a technology integration plan with a budget to buy technology for their classrooms.

All the 7 lecturers indicated that they strongly disagreed, disagreed or were undecided on whether they felt confident that they could create their own WWW home pages, or describe 5 software programs they would use in their teaching.

Most of the lecturers indicated that they either strongly agreed or agreed on whether they felt competent using word processors and graphics to develop teaching materials, using e-mail to communicate with colleagues, as well as using the WWW to

find educational resources. However, at least 4 of the 7 lecturers indicated that they strongly disagreed or were undecided on whether they felt competent in executing technology integration processes like planning and implementing projects in which student teachers use a range of information technologies, helping students learn to solve problems, accomplish complex tasks, and use higher-order thinking skills in an information technology environment, as well as working with students in various information technology environments.

Summary of Integration of IT by Lecturers at the Three Institutions

In this section, the researcher presents the summary of findings from interviews in terms of the day-to-day integration of instructional technology by faculty (college) of education lecturers at the three institutions in the study. The summary will first look at which courses the lecturers taught, which technological gadgets or tools they used and for what purpose they used the tools. The researcher will then look at whether the lecturers were currently using computers for instructional purposes and if so, for what and/or how they use the computers, and if not, what the reasons for not using computers are.

In the second part of this section, a summary of findings from questionnaires is presented. This summary will focus on lecturers' proficiency and competencies in some basic computer tasks and technology integration processes.

Day-to-Day Integration

Seven lecturers or 50% of the 14 lecturers at institution A and institution B taught theory of education courses, namely, Philosophy of Education, Sociology of Education and Educational Psychology. The remaining 7 lecturers at these two institutions and all

the lecturers interviewed at institution C taught applied education courses. Examples of courses they taught were the following: specific subject content areas, for example Mathematics, English Literature etc; General and Specific Subject Area Teaching Methods; Contemporary Issues in Education; Educational Research; Curriculum Development; Comparative Education and Guidance and Counseling.

Three lecturers – who were located one at each institution – and who were holders of the post-graduate Dip Ed Tech from the University of Zimbabwe, were in charge of the teaching of ET or IT courses at the three institutions. Institution C has an additional lecturer-in-charge of the information technology component or practicals.

Table 10.

Courses Taught by Lecturers at the Three Institutions

Type of Courses	Main Courses Taught	No. of Lecturers
Theory of Education	Philosophy of Education, Educational Psychology, Sociology of Education	7
Applied Education	Specific Subject Content Subjects e.g. Mathematics, English, Accounts, History and Geography. General Teaching Methods, Specific Subject Teaching Methods, Research Methods, Contemporary Issues in Education, Curriculum Development, Comparative Education and Guidance and Counseling.	11
	Educational Technology Instructional Technology	3
Total		21

All 14 lecturers combined from institutions A and B and 5 of the 7 lecturers at institution C, giving a total 19 out of the 21 lecturers (or about 90 percent of all the lecturers) interviewed indicated that they used the OHP and transparencies in their day-to-day instruction. Twelve lecturers or 60 percent of all the lecturers from the three

institutions said they mostly used the chalkboard and the others said they used VCRs and TV screens, film and projector, electronic/LCD projector and charts and flip-charts. Three lecturers at institution B and three at institution C indicated that they used computers in their day-to-day instruction. There was no mention of use of computers and related technologies by lecturers at institution A.

Table 11.

Technological Tools Used by Lecturers in Their Day-To-Day Instruction

Technological Tool(s)	No. of Lecturers Using It/Them Frequently
Overhead Projector (OHP) and transparencies.	19
Chalk board Video Cassette Recorder (VCR) Television (TV) screen/monitor Film and Projector Electronic (LCD) Projector Chart and Flip-chart	12
Computers	6

Nineteen lecturers or 90 percent of the 21 lecturers at the three institutions indicated that they used technological gadgets/tools (which do not include computers) for "illustrating," "highlighting," "developing" or "showing" concepts or key points in their lecture delivery. One lecturer said he did not use any technological gadgets/tools and the other one did not address the question in his response.

The six lecturers who indicated that they used computers and in one case, the Internet, said they used the tools for preparing teaching and learning materials, for example handouts, OHP transparencies and worksheets. The lecturer who indicated that he used the computer and Internet, said he used these "as a resource or replacement of the library," where he searches for information on the Internet for his lectures and for his

students. This lecturer also said he used e-mail once in a while to communicate with one or two students.

Table 12.

Purposes for Which Technological Tools Are Used By the Lecturers

Purpose(s)	No. of Lecturers
Illustrating, highlighting, developing or showing key points in lecture delivery	19
Preparing teaching and learning materials	6
As a resource for looking up information on the Internet, Communicating with 1 or 2 students	1

The researcher then looked at whether the lecturers were currently using computers for instructional purposes and if so, for what and/or how they used the computers, and if not, what the reasons for not using computers were. Thirteen interviewees or 65 % of the lecturers at the three institutions indicated that they were currently not using computers for instructional purposes. However, six of these lecturers went on to add that they used computers for purposes of preparing lectures through their research, typing or word-processing, computing marks and grades, accessing the Internet and referring students to look up, in their free time, certain information on the Internet.

The remaining eight lecturers said that they currently used computers for instructional purposes. They indicated that they used computers, for example, for word-processing in the form of typing exercises and examinations, researching for teaching materials on the Internet, and downloading and printing the materials. A look at these activities done by the lecturers using computers shows that they all are lecture preparation activities.

Only one lecturer, Lecturer 4 at institution C indicated that he used the computer, "for demonstrating instruction on the screen," through his web publication on the International Education and Resource Network (IERN) website. Using the computer for "demonstrating instruction on the screen," represents a situation where the lecturer uses the computer during the course of the presentation or delivery of the lecture to show or illustrate and/or demonstrate what he wants the students to learn.

From the findings above, it can be said that 7 lecturers, (that is 13 lecturers who said they did not currently use computers for instructional purposes, less 6 lecturers who indicated that they use computers for lecture preparation) did not currently use computers for instructional purposes and 14 lecturers used computers for lecture preparation. Only one lecturer indicated that he used the computer and the Internet, in his lecture presentation or delivery.

The main reason given by lecturers for not currently using computers for instructional purposes was the lack of resources - both hardware and software – which led to poor or limited access to offices or computer laboratories which may not have adequate numbers of computers, appropriate application software or Internet connection. Slow Internet speed was also cited as a limitation in using the available Internet-connected computers for instructional purposes.

The other critical reason given by the lecturers for not using computers for instructional technology purposes was that they (lecturers) were not capable of using the computers for that purpose. It was indicated that they did not have the knowledge of *how* to use the computer for purposes of instructing a class of students. As one lecturer put it, "I do not have enough expertise to enable me to use the computer, and especially the

Internet, more effectively *with* my students." The dearth of web-publishing knowledge and skills amongst the lecturers was given as an example. The problem of lecturers not being capable of using computers for instructional purposes is linked to that pointed out by some lecturers as lack of training, since the lecturers need to learn how they can use the computers in lecture presentation and/or delivery. An insightful reason given by one lecturer, for not currently using computers for instructional purposes is that curriculum planners "may not see the value of using computers."

Computer Technology Proficiency and Competencies

All the 21 lecturers at the 3 institutions indicated that they strongly agreed or agreed that they felt confident that they could do the basic and common e-mail and Internet tasks of sending e-mail to a friend, sending a document as an attachment to an e-mail, as well as using an Internet search engine to find Web pages related to their specific subject area. However, more than half the 21 lecturers showed less confidence in the next set of slightly higher-order skills in e-mail and Internet use. They indicated that they strongly disagreed, disagreed or were undecided on whether they (felt confident that they) could, for example, subscribe to a discussion list, keep copies of outgoing messages, keep track of websites visited or search and find the Smithsonian Institute Website.

Little or no confidence was shown by some lecturers in the use and application of productivity software in their day-today instructional activities. About half the number of lecturers indicated that they either strongly disagreed, disagreed or were undecided on whether they felt confident that they could use a spreadsheet to create a pie-chart of the proportions of students' scores on a revision test, create a newsletter with graphics and

text in 3 columns, use the computer to do a slideshow presentation or create a database of information about important authors in a specific subject area.

There is a mixture of disagreement, agreement and uncertainty in terms of the lecturers' confidence that they could do some of the basic but key technology integration tasks. A majority of the 21 lecturers strongly disagreed, disagreed or were undecided on whether they felt competent to write a paper describing how they would use instructional technology in their classrooms, create a lecture or teaching unit that incorporates subject matter software or write a plan with a budget to buy technology for their classrooms.

In a duplication of findings at the 3 institutions, and quite revealingly, all the 21 lecturers strongly disagreed, disagreed or were undecided (on whether they felt confident) that they could create their own WWW home pages or describe 5 software programs they would use in their teaching.

In terms of competencies in doing particular technology integration processes, more than half the lecturers indicated that they felt competent using word processors and graphics to develop teaching materials, using e-mail to communicate with colleagues and using the WWW to find educational resources. However, 13 lecturers or 65% of the lecturers (indicated that they) strongly disagreed, disagreed or were undecided on whether they felt competent in executing some technology integration processes. These processes included planning and implementing projects in which student teachers use a range of information technologies, helping students learn to solve problems, accomplish complex tasks, and use higher-order thinking skills in an information technology environment, as well as working with students in various information technology environments.

IT Integration by Lecturers at the Three Institutions: Findings from Document Analysis

Specific Subject Course Outlines

The 18 course outlines collected from the lecturers of different disciplines at the 3 institutions, probably influenced by course-outline traditions at the respective institutions, made no reference to instructional technology integration. Besides the inclusion of such aspects as the pre-amble, aims, objectives and content, the instructional methods or strategies sections at the end of the documents consisted of methods and assessment approaches.

Instructional methods

Under the methods sub-heading, all of the 18 course outlines listed at least 4 approaches, in one terminology or the other, from lectures, tutorials, group discussions, individual and group project work and presentations. A few (6) outlines included presentations by invited guests. As can be noted, the instructional methods or strategies did not specifically make reference to any form of technology integration.

Course assessment

In all of the 18 outlines, assessment of students was based on a weighting of some form of written assignments(s), some written examination(s) and some coursework. Whilst coursework assessment was not specified, it is likely this did not involve technology integration, given the absence of prior reference to IT in the course outline. It could therefore be concluded that, based on the lecturers' course outlines, or their statements of intention as far as instruction is concerned, the lecturers did not specifically plan for IT integration and this was reflected in their instructional strategies, as well as in their assessment approaches.

ET and IT Course Outlines

Three course outlines from the three lecturers in charge of teaching ET (2) and IT (1) at the three institutions were analyzed. The first point to note is that two of the courses were titled “Educational Technology” and the third “Instructional Technology.” Analysis of the preambles, aims and objectives of the 2 ET outlines revealed that there was an emphasis on applying technological tools or hardware associated with what one outline referred to as “the infusion of Educational Media and Technology (EMT).” The other outline declares that its focus is on “the application of media and technologies as tools and resources used to enrich teaching and learning” The IT course outline mentions “the design, development and utilization of instructional media for effective teaching and learning.” In its aims, it refers to the need to enhance students’ understanding of theories of instruction as well as to the need to expose students to systematic approaches to instructional design and development.

Course content

An analysis of the content of the course outlines shows that the 2 ET outlines primarily list the use of technological hardware (and software) and do not include theoretical background content relating to areas like perception, communication and teaching and learning theories. Although one of the outlines includes the “systematic planning for media use,” the emphasis seems to be on *media use*, rather than the process or systematic approach to the instructional design. One outline mentions, almost in passing, the use of the ASSURE (Heinich, Molenda, Russell and Smaldino, 1996) model. Although there was a good coverage of most of the hardware technology used for

instructional purposes, computers and related instructional technologies were conspicuous by their absence in these two course outlines.

The IT course outline appeared to be more holistic in terms of its approach to content. Besides listing the use of the various hardware technologies, it includes explorations of prerequisite theory on aspects like perception, communication and teaching and learning theory. The systematic approach to instructional design, starting with design, development and then implementation and evaluation are mentioned along the lines of the Analyze, Design, Develop, Implement and Evaluate (ADDIE) model. However, the analysis stage, which is the prerequisite stage in the ADDIE model, is not mentioned. The last content topic in this outline is on computer-based teaching and learning, with focus on introductory and basic computer technology concepts and discussions on the Internet and its functions in education.

Instructional methods

Two outlines list the "generic" approaches of using lectures, tutorials, discussions and presentation. In addition to these, the IT outline includes multimedia presentations, hands-on applications, collaborative learning and electronic communications. It should be noted, however, that there was not much in this course content, to corroborate with these instructional methods.

Course assessment

Assessment of students in the three course outlines was also based on some weighting of written assignments(s) and examinations(s), as well as some coursework. Coursework was not specified in all cases and it could only be inferred that assessment of

students' coursework in the IT course outline would also reflect the instructional methods listed in that course outline.

Institutional Support to Lecturers' Integration of IT

In order to establish what support the 21 lecturers got from their three institutions in their integration of IT, the researcher asked a series of questions aimed at finding out the availability, accessibility and functional condition of technological gadgets/tools at each institution. Questions were also asked to find out the lecturers' students' access to computers and the Internet, the availability of computer hardware and software support and to find out the lecturers' opportunities for staff or professional development in IT integration.

Institutional Support to Lecturers' Integration of IT at Institution A

Availability of Technological Gadgets/Tools

When asked what technological gadgets/tools were available for their use in their instructing, all the 4 lecturers stated overhead projectors (OHPs), video cassette recorders (VCRs) and computers. One lecturer mentioned chalkboards and flip-charts, with the other one pointing out that the faculty (college) of education VCR had been "stolen from the faculty and never replaced."

Access of Technological Gadgets/Tools for Instructional Purposes

One lecturer said the gadgets were "quite easily" accessible and the other said the gadgets are "extremely accessible," adding, "TV monitors in the labs and [lecture]

theatres are not used. The library has lots of videos, largely underutilized." Two lecturers said the gadgets are either poorly accessible or very difficult to access.

Functional Condition of the Technological Gadgets/Tools

All the four lecturers said there were problems in the functional condition of these gadgets/tools, with all of the lecturers citing "blown-up bulbs" of OHPs. All but one of the lecturers noted, in the words of one of them, "Such little parts were not quickly replaced." Another lecture explained, "There are delays in replacing simple things like toners on computer printers, which are caused by failure to purchase or secure spare parts." One lecturer mentioned the problem of electricity black-outs while using electronic gadgets.

Access to Computers and the Internet in the Lecturers' Offices, in the Faculty of Education and in the University

Three of the lecturers said they had computers in their offices and that these computers were connected to the Internet. One lecturer said he did not have a computer in his office.

All the four lecturers said they had access to the secretary's Internet-connected computer in the Faculty of Education. In terms of how long per day they had access to the computer, two lecturers said it depended on "needs in the faculty" and on "how busy it is and what needs to be done."

Three of the four lecturers said they had access to a computer in the university staff computer room and that the computers were connected to the Internet. The fourth lecturer said he did not have access to a computer in the university. On probing this lecturer, it turned out that he in fact had access to computers in the university, but that he

seemed to lack interest or the desire to access the computers. It was pointed out by one lecturer that access per day "depends on several factors, for example, demand for use by others."

Lecturers' Students' Access to Computers and the Internet in the Faculty of Education and in the University

All the four lecturers said their students did not have access to computers in the faculty of education. Three of the four lecturers indicated that their students had access to Internet-connected computers in the students' central computer laboratory in the university and the forth said they did not. When asked how long per day students had access to the computers, two said, "when there are no lecturers in the computer lab" and "when doing their coursework in the computer lab." One lecturer summarized limited access to computers by saying, "It [access] depends on several factors, for example, demand for use of the lab by others."

Lecturers' Access to Computer Hardware and Software Support

All the four lecturers said they had access to a technician to assist them when they need help with a computer. All of them added that the access was minimal, little or not always there.

All the lecturers also indicated that they did have minimal access to a computer assistant in terms of computer operations and applications.

Lecturers' Opportunities for Staff/Professional Development

Two lecturers said the institution offered staff development in the form of short courses in the computer services department. Examples of staff development given by this department were training on using the Internet, MS word processing and PowerPoint

presentation. Two lecturers said the institution did not offer opportunities for staff development because there was not enough trained staff in that (ET) area and that the absence of money “inhibits professional development attempts.”

Two lecturers said they had participated in staff development activities and that the staff development had “to some extent” helped them in using technology for instruction. One lecturer specifically noted that the staff development helped him to use the computer (but not necessarily for instructional purposes) more effectively. The other two lecturers said they have not participated in staff development activities, with one adding, “Opportunity has not yet come my way so far.”

Additional Institutional Support

When asked what other support their faculty or institution provided to enable them to use technology in their day-to-day instruction, one lecturer said he did not know, two said, “none,” other than the provision of computers and basic computer training by the computer services department.

In terms of available institutional support, the forth lecturer said besides all of the lecturers being provided with computers in their offices, “the faculty sponsors lecturers interested in short computer courses in the university.” It was also noted by the same lecturer that, “The new library is equipped with a whole range of materials even accessible through one’s computer.”

Institutional Support to Lecturers' Integration of IT at Institution B

Availability of Technological Gadgets/Tools

When asked what technological gadgets/tools were available for their use in their instructing, eight of the ten lecturers mentioned the overhead projector (OHP). Seven lecturers stated the television (TV) and/or video cassette recorder (VCR) and six lecturers said computers. Three lecturers mentioned flip-charts and one lecturer (lecturer-in-charge of ET) said the LCD projector and slide projector. All the lecturers mentioned at least two of the above given gadgets /tools and six of them mentioned at least three of them.

Access of Technological Gadgets/Tools for Instructional Purposes

Seven lecturers felt the gadgets/tools were "fairly" or "quite" accessible. It was felt by some lecturers that in fact, the gadgets/tools were underutilized, as explained by one lecturer, "I have realized that quite a limited number of lecturers use them [gadgets/tools]. Very few lecturers can use PowerPoint."

The other three lecturers felt that the gadgets/tools were "not easily accessible," with one lecturer pointing out that the LCD projector "has problems to access," since there is only one in the university. Addressing the problem faced in accessing the projector, another lecturer observed, "I know of only one [LCD projector] in the university. It's kept by the information technology department – which is out of the education department, out of faculty [of education] – so I wouldn't bother myself."

Functional Condition of the Technological Gadgets/Tools

Six of the lecturers indicated that there were problems in the functional conditions of the technological gadgets/tools and four said they had not "noticed" or "experienced" any. The main problem cited was that of blown-up OHP bulbs, "breaking down of the

gadgets," "late or non-existent repairs," absence of spare parts," and the "lack of expertise in terms of people who can repair the gadgets." As one lecturer summarized these problems, "There are the usual problems of sourcing, maintaining and servicing of these gadgets."

Access to Computers in the Lecturers' Offices, Faculty of Education and in the University

Eight of the ten lecturers indicated that they had computers in their offices and that the computers were connected to the Internet. Two lecturers said they did not have computers in their offices.

Seven lecturers said they had access to a computer connected to the Internet, in the faculty (college) of education and three said they did not have that access. However, they all pointed out that the access was limited, as explained by one of the lecturers, "About six of us [lecturers] share this one computer and it becomes very difficult to work on the computer." Three lectures indicated that they did not have access to a computer in the faculty of education.

Eight of the ten lecturers said that they did have access to a computer in the university, specifically at the computer laboratory and in the library. The computers were connected to the Internet. Two lecturers indicated that they did not have access to computers in the university. In terms of how long per day the lecturers had access to the computers, six lecturers either indicated that they were not sure or were non-committal, with responses like, "can't say exactly," "not sure of that one," and "can't specify." One lecturer observed, "For everyone, the issue of ready access comes in," as another explained, "computers in the library are very few, some are broken down and it's very rare to see a computer not being used."

Lecturers' Students' Access to Computers and the Internet in the Faculty of Education

Five lecturers indicated that their students had access to Internet-connected computers in the faculty of education and the other five lecturers said their students did not have that access. Three lecturers were not sure of how long the students had access to computers whilst two lecturers said students had access to computers during IT lectures or when computers in the computer laboratory or library were not being used.

Lecturers' Students' Access to Computers and the Internet in the University

Nine lecturers indicated that the students they taught had access to Internet-connected computers in the university and one lecturer said he did not know. Three lecturers were not sure how long per day the students had that access to computers and five said access was "a problem," "poor," or "limited." Lecturer 1 summarized this problem by saying, "Access is a problem, the number of computers per given number of students is very low."

Lecturers' Access to Computer Hardware and Software Support

All the ten lecturers said they had access to a computer technician to assist them when they needed help with a computer. However, they indicated that the technician was not readily accessible. As pointed out by lecturer 1, "Yes, [I have access to a technician] but not at a time when I really need one." Lecturer 3 made the same observation, "Yes, [I have access to a technician] but it's one thing trying to bring him over here." It was explained that one had to fill in a form and then the form had to be processed before the technician could be accessed, resulting in, according to one lecturer, "very slow service and assistance."

Seven lecturers said they had access to computer assistance but the access was not readily defined, nor was it constant. As lecturer 1 put it, “They [assistants] are not defined for that purpose. You have to find one in the university; there are no assigned people in jobs for that.” This observation is supported by comments made by lecture 3, “We get assistance from assistants in the library,” and lecturer 5, “We rely on help from colleagues.” Lecturer 7 said since he had not worked with an assistant, he did not know if he had access to one. Two lecturers indicated that they did not have access to computer assistance.

Lecturers’ Opportunities for Staff/Professional Development

Six of the ten lecturers indicated that they were not aware of or sure of staff development opportunities offered by the institution through responses like, “It [staff development] is not clear. There is no policy for that,” “It [staff development] has not been specifically articulated like that, that is, relating to educational technology,” “I am not sure if they do have staff development” and “I want to think so [that there is staff development] … I don’t know what’s happening.” As can be seen, these responses also highlight lack of awareness by lecturers (of staff development opportunities in the university, if any) and the absence of a staff development policy at the institution.

Two lecturers said the institution offered “some,” or “minimal” staff development in the form of short computer courses in the information technology department. The inadequacy of these short computer courses and the need to specifically articulate staff development relating to IT integration was explained by lecturer 2, “I am aware the information technology department offers some courses but none as far as faculty of education integrating technology is concerned. With the move in educational technology

going to solely the use of computers, there is need for training in the use of computers. Our curriculum continues to keep educational technology [integration] in the periphery – so detached staff development will not make a difference."

Two lecturers said their institution did not offer staff development opportunities because of, as lecturer 3 summarized it, "lack of resources, manpower and expertise within the [education] department."

Additional Institutional Support

When asked what other support their faculty or institution provided to enable them to use technology in their day-to-day instruction, six lecturers, using expressions like, "I am not aware of any at the present moment," "Other than the sharing of computers, I can't think of any at the moment," and "…not that I am aware of," revealed the lack of awareness of additional support from the institution or the absence of additional institutional support.

In terms of available support, Lecturer 2 talked of the university's "vision to set up an educational technology center," but pointed out that the vision could not be realized, "because it's not on the university's budget." Lecturer 4 discussed the project in which the faculty (college) of education was involved in a project in which two professors came from California in the USA, "to help us upgrade knowledge on hand-held technology for teaching Math." He explained that they were arranging a workshop with the American professors for July 2005, to train student teachers and local teachers to us "Voyage 2000," the hand-held technology. Two lecturers suggested that there were funds set aside for lecturers to access and use for instructional purposes but follow-up questions revealed that these funds were no longer available.

Institutional Support to Lecturers' Integration of IT at Institution C

Availability of Technological Gadgets/Tools

When asked what technological gadgets/tools were available for their use in their instruction, six lecturers stated the overhead projector (OHP). All the seven lecturers mentioned the television (TV) and/or video cassette recorder (VCR). Six lecturers said the computer, with lecturer 1 and lecturer 4 adding the availability of the laptop and the Internet respectively. Two lecturers indicated that the electronic (LCD) projector was available.

Access of Technological Gadgets/Tools for Instructional Purposes

Five lecturers indicated that the gadgets were "quite easily'" available or accessible. It was pointed out that the gadgets belong to the department of educational technology and that one had to "request," "book," or "give notice," one day in advance, in order to secure the gadget for use.

Functional Condition of the Technological Gadgets/Tools

Four of the seven lecturers said there were problems in the functional condition of the instructional gadgets/tools and the other two indicated that they were not aware of such problems. Of these two lecturers, one said, "I have not used one, I am sure they must be functioning well."

The first problem given by the lecturers was the breaking down of the OHPs, and to a lesser extent, the electronic projector, and the lengthy periods these were down because of difficulties faced in having them repaired. What appears to be the main problem is explained by lecturer 4, "The major problem is that we do not have a room for the [ET] department and most of our lecture rooms are not compatible with the

technologies that we have. It's only the lecture theater that was meant for the use of projectors – complete with acoustic features and screens." This situation, according to lecturer 7, created a problem of continuously, "moving around some of the gadgets," which in turn led to their [gadgets/tools] breaking down.

Access to Computers in the Lecturers' Offices, in the Faculty of Education and in the University

Six of the seven lecturers indicated that they had computers in their offices and all the six were not connected to the Internet. One lecturer did not have a computer in his office.

All the seven lecturers indicated that they had access to one computer connected to the Internet, which was located in the faculty of education administration office. However, as lecturer 6 pointed out, "This [access] is in theory of course, since the computer is meant for use mainly by the faculty secretary and especially for word-processing and printing."

All the seven lecturers said they had limited access to Internet-connected computers either in the computer resource center or in the computer laboratory in the main library. As lecturer 4 explained, "With six computers connected to the Internet in the resource center, it's [resource center] overcrowded by too many people wanting to use the computers."

Lecturers' Students' Access to Computers and the Internet in the Faculty of Education

All the seven lecturers indicated that the students they taught did not have access to computers and to the Internet in the faculty of education.

Lecturers' Students' Access to Computers and the Internet in the University

All the seven lecturers said students they taught had access to computers connected to the Internet. Lecturer 3 and lecturer 4 pointed out that, "they [students] only have access when doing IT courses," and that, "they share computers 3 to 1 during lecture time." Access is also described by lecturer 6 as a problem, since the number of computers per given number of students is very low.

Lecturers' Access to Computer Hardware and Software Support

All the seven lecturers said they had access to a computer technician from the information technology department, to assist them when they needed help with the computer. It was pointed out by lecturer 6 that, "A certain protocol [to get assistance from the technician] has to be followed through the department [of applied education] chairman."

Asked if they had access to computer assistance, five of the seven lecturers said they had access to the same computer laboratory technicians in the computer science department. Lecturer 3 explained, "I think it's [assistants] the same people, but they are more of technicians." Two lecturers indicated that they did not have access to computer assistants.

Lecturers' Opportunities for Staff/Professional Development

All the seven lecturers indicated that they were not aware of or sure of staff development/professional development opportunities offered by the university through responses like "None [staff development] that I have heard of," "None [staff development] that I know of," and "I suppose so, I haven't found out [about staff development opportunities.]

Reasons advanced by the lecturers for the absence of staff development were, the absence of financial resources and lack of interest by decision makers. As Lecturer 1 put it, “Those right at the top may not really appreciate it [staff development.]” This point was supported by Lecturer 4 who added, “The administration may not even be aware of how many lecturers need professional development.”

Three of the seven lecturers said they had participated in staff development activities. Of these three, two had been involved in general teacher education workshops which did not necessarily focus on technology integration. Lecturer 4 indicated that he had been involved in a number of collaborative programs with the IERN, and that he had been helped “quite a lot” in terms of enhancing IT integration.

Four lecturers said they had not participated in staff development. Lecturer 3 explained that this was because, “Nothing had been offered specifically by the university. One mostly has to do that [staff development activities,] outside the university and out of their own initiative.” Two other lecturers in this group concurred respectively, “There have not been any [staff development], I think,” and “Nothing has been organized or offered so far.”

Additional Institutional Support

When asked what other support their faculty or institution provided to enable them to use technology in their day-to-day instruction, six of the seven lecturers mentioned the already discussed lecturers’ shared access to the faculty secretary’s computer, and the limited provision of funding for computers and related hardware and software. Two lecturers pointed out that there were loans which were given to academic staff to buy computers, but which seemed to have been discontinued. In the words of one

lecturer, “There was a scheme in which lecturers could borrow funds to purchase computers, but I haven’t heard of it of late.” The seventh lecturer, perhaps making a more informed interpretation of the question, said the faculty or university did not provide any other support to enable lecturers to use technology on a day to day basis.

Summary of Institutional Support to Lecturers’ Integration of IT at the Three Institutions

Availability of Technological Gadgets/Tools

When asked what technological gadgets/tools were available for instructional purposes, 18 of the 21 lecturers indicated OHPs, VCRs and TV screens or monitors. This means that about 90% of the 21 lecturers felt OHPs and/or VCRs and TV screens were available for instructional purposes. Sixteen lecturers or 80% of the lecturers indicated computers and one lecturer said there was a laptop and the Internet. Three lecturers said there was the electronic (LCD) projector and four indicated charts and/or flip-charts.

Table 13.

Lecturers’ Perceptions of Availability of Technological Tools

Technological Tool(s)	No. of Lecturer(s) Indicating Availability
OHP, VCR, TV and Screens/Monitors	18
Computers (PC)	16
Laptop and Internet	2
Electronic (LCD) Projector, Slide Projector	3
Charts and/or Flip-charts	4

Note. OHP = Overhead Projector; VCR = Video Cassette Recorder; TV = Television; P C = Personal Computer; LCD = Light Crystal Display

Access of Technological Gadgets/Tools for Instructional Purposes

Thirteen lecturers or 65% of the 21 lecturers felt that technological tools were "quite easily" or "fairly well" accessible; with 3 lecturers pointing out that the gadgets were in fact underutilized. The reasons given for underutilization were that, for example, few lecturers could use PowerPoint. At two institutions it was also pointed out that the gadgets/tools belonged to the departments of information technology or educational technology and that one had to request, "book" or give notice in advance, in order to secure the tools.

Eight lecturers or 35% of the lecturers felt that the gadgets were "not easy" or "very difficult" to access. The main reason advanced for this poor access is the small numbers of gadgets/tools available compared to the large numbers of lecturers or potential users. For example, as indicated by the lecturers' responses, each institution had only one electronic (LCD) projector – which was kept by the information technology department and had to be accessed by special arrangement.

Functional Condition of the Technological Gadgets/Tools

Fifteen lecturers or 75% of the lecturers indicated that there were problems in the functional condition of these instructional gadgets/tools and the other 7 lecturers said that they had not noticed, were not aware or had not experienced problems. The main problem cited was the breaking down of the gadgets/tools, and especially the issue of blown-up OHP bulbs. This was then said to be compounded by the late or non-existent repairs, which were largely due to the absence of or failure to secure spare parts and/or the lack of expertise to repair and maintain the gadgets.

A lecturer at institution B effectively summarized the issue of the functional condition of the gadgets when he pointed out that, “There are the usual problems of sourcing, maintaining and servicing of the gadgets.” The absence of appropriate and adequate teaching and learning facilities, for example, lecture rooms and theatres, was also said to lead to the continuous movement of the gadgets across the university campuses, leading to their breaking down.

Access to Computers and the Internet in the Lecturers’ Offices, in the Faculty of Education (FOE) and in the University

Seventeen lecturers or 85% percent of the lecturers indicated that they had computers in their offices. Eleven of these computers were connected to the Internet and 6 were not connected. This means that 11 out of the 21 lecturers or 52% of the lecturers had access to the Internet in their offices. Four of the 21 lecturers said they did not have computers in their offices.

Table 14.

Lecturers’ Access to Internet-Connected Computers in their Offices

Institution	No. of lecturers with access to Internet-connected computers in their offices	No. of lecturers without access to Internet-connected computers in their offices	Total No. of lecturers
A	3	1	4
B	8	2	10
C	0	7	7
Total	11	10	21
%*	52	48	100

* Rounded off

Eighteen lecturers or 86% of the lecturers said they had access to an Internet-connected computer in the FOE. However, that access was said to be "in theory" and "limited" as, for example in one institution, up to ten lecturers share the one computer with the faculty secretary. In another institution, access to the FOE Internet-connected computer was said to depend on how busy it (computer) was and what the lecturers needed to do. Only three lecturers at Institution B indicated that they did not have access to a computer in the FOE.

Table 15.

Lecturers' Access to Internet-Connected Computers in the Faculty of Education (FOE)

Institution	No. of lecturers with access to Internet-connected computers in the FOE	No. of lecturers without access to Internet-connected computers in the FOE	Total No. of lecturers
A	4	0	4
B	7	3	10
C	7	0	7
Total	18	3	21
%*	86	14	100

* Rounded off

In terms of access to Internet-connected computers in the university, eighteen lecturers or 86% of the lecturers indicated that they had such access. In all cases, the computers were said to be located either in the computer laboratories or resource centers or in the university libraries. Ready access was said to be a problem because the computers were few, some were broken down and the resource centers were said to be

crowded by people wanting to have their turn at using the computers. Three lecturers said they did not have access to computers at their universities.

Table 16.

Lecturers' Access to Internet-Connected Computers in the University

Institution	No. of lecturers with access to Internet-connected computers in the University	No. of lecturers without access to Internet-connected computers in the University	Total No. of lecturers
A	3	1	4
B	8	2	10
C	7	0	7
Total	18	3	21
%*	86	14	100

* Rounded off

Lecturers' Students' Access to Computers and the Internet in the Faculties of Education

Sixteen lecturers or 80% of the lecturers indicated that the students they taught did not have access to computers (and the Internet) in their faculties of education. Five lecturers at institution B said their students had access to Internet-connected computers. Of these five, three were not sure of how long students had access to computers whilst two lecturers said students had access to computers during information technology lectures in the computer laboratories or library or when the computers in these facilities were not being used.

Lecturers' Students' Access to Computers and the Internet in the Universities

Nineteen lecturers or 90% of the lecturers indicated that the students they taught did have access to Internet-connected computers in the university. When asked how long

per day students had access to computers in the university, sixteen lecturers or 80% of the lecturers said access was a problem, poor or limited, two lecturers said they were not sure and one lecturer said the students did not have the access. At institution C, for example, it was explained that the number of computers per given number of students was very low and that they share computers 3 to 1 during information technology lecture times. At institution A, students were said to have access to computers in the university when there were no lectures in the computer laboratory or when they were doing their coursework in the computer laboratory.

Lecturers' Access to Computer Hardware and Software Support

All the 21 lecturers at the three institutions said they had access to a technician to assist them when they needed help with computer hardware. However, this access was said not to be readily available, minimal, little, not always there and not clearly defined or constant. At institution B and Institution C, it was pointed out that a certain protocol had to be followed – through the department chair – in order to get assistance from a computer technician, and this was said to result in slow service and assistance.

Sixteen lecturers or 80% of the lecturers indicated that they had minimal access to computer assistance in terms of operations and software. However, this limited assistance was said to be not defined, since there were no people assigned for that purpose. At institution B, lecturers relied on assistance from library technicians and from two fellow lecturers. Four lecturers said they did not have access to a computer assistant and one said since he had not worked with an assistant, he did not know if he had access to one.

Lecturers' Opportunities for Staff/Professional Development

Thirteen lecturers or 65% of the lecturers indicated that they were either not aware or were not sure of staff /professional development opportunities offered by their institutions. Four lecturers from institutions A and B said their institutions offered some staff development in the form of short computer courses in the IT departments. However, the inadequacy of these short computer courses, and the need to articulate staff development specifically relating to instructional technology integration in day to day teaching and learning was pointed out.

Another four lecturers said their institutions did not offer staff development opportunities. The reasons given for the absence of staff development at these universities were the lack of financial and material resources and the shortage of skilled manpower and expertise within the departments. The keeping of educational technology "in the periphery" of these universities' curricula, which was perceived by the lecturers as part of the administrators lack of awareness and/or interest in technology integration, was also pointed out as a reason for the absence of appropriate staff development.

Ten lecturers or 49% of the lecturers indicated that they had participated in staff development activities. The activities tended to be general in nature and not specific to the use of technology in day to day instruction. The lecturers said the staff development activities had helped them to a limited extent in using technology for instructional for instruction.

Eleven lecturers or 51 % of the lecturers said they had not or not yet participated in staff development activities. The absence of clear policies on staff development in the universities, the shortage of funding and resources and the demands of other teaching

responsibilities were said to be the main challenges to participating in staff development activities. Six of the latter lecturers said the reason they had not participated in staff development activities was that the opportunities had “not come their way” or that they had not been “offered” or “given” the opportunities.

Additional Institutional Support

Ten lecturers or 49% of the lecturers indicated that there was no additional support or that they either did not know or were not aware of any other support their faculty (college) or institution provided to enable them to use technology in their day to day instruction. However, the findings show that in some case, there was some additional institutional support. For example, a lecturer at institution A said the new library at their institution was equipped with a whole range of materials even accessible through one’s computer and that their faculty sponsored lecturers to take short computer courses in the university.

Eleven lecturers or 51 % of the lecturers gave additional institutional support as consisting of the occasional access to short computer courses, shared and limited access to the Internet (using the faculty secretaries’ computers) and the limited provision of computers and related hardware and software. One lecturer from institution B and another one from institution C revealed that there were once schemes at their institutions, were lecturers could borrow funds to buy computers. When this issue was probed further, it emerged that these schemes had been discontinued or were no longer in existence.

Constraints Faced by Lecturers in Integrating IT

Constraints to Instructional Technology Integration at Institution A

The constraints to integrating technology for instructional purposes given by the 4 lecturers are divided into five categories, with some categories having sub-categories. The first category to emerge from the responses given by the lecturers is that of *budgetary constraints*, which was said to lead to poor or inconsistent availability of technological hardware and software. One lecturer explained, “There are budgetary constraints in terms of software and hardware acquisition. For example, my computer needs speakers for audio, but I do not have them because there is no money to purchase some.” Lecturer 4 commented that printing facilities were not adequate, adding, “I have never been allocated a printer in my office. We do not have a reprographics section with heavy-duty printers, photocopiers, etc.”

The second broad category of constraints identified from the responses is that of *poor Internet access and connectivity*. In this category are problems of *narrow bandwidth, slow internet connection* and the *Internet simply being down*. Lecturer 3 summarizes the key points when he says, “We have very narrow bandwidth here. Computers on campus are very slow. One of the slowest you can think of. We need to boost the capacity of the computers.” The same observations were made by lecturer 1, who said that there were problems in accessing the Internet - as, “at times it’s down.” He explained, “Even when it’s not down, one may fail to access any websites due to very slow connection times.”

The third category of constraints identified is that of *absence of relevant and appropriate technological knowledge, skills and attitudes*. One lecture (lecturer 2) said

there was need for relevant computer skills and to that effect, he pointed out, “We need computer and instructional technology experts to deliver specifically designed courses or training for lecturers in specific subject areas.” Lecturer 3 described his problem, thus, “My lack of knowledge on certain operations that a computer can do is frustrating and one can say this is a result of inadequate training in that [instructional technology] area.”

The need to inculcate appropriate attitudes and awareness in the use of technology can be seen in lecturer 3’s observations, “Use of computers in our set-up is not yet universal, and not everyone has access to a computer and therefore basing instruction on computers for now is not correct.” He went on to say that, “The few who are computer literate are running too fast for the majority who are computer illiterate.” Lecturer 1 summarizes this point by pointing out that, “The bottom line is collaboration – but people don’t work together. We need a culture of collaboration between departments.”

The fourth category of constraints to emerge is that of *absence of appropriate staff development.* The main point to come out was that workshop or training participants complained about the quality of training given. It was also hinted that there was little or no collaboration between departments in this regard.

Lastly, the problem of *electricity blackouts* was narrated, with lecturer 4 saying that, “Electricity blackouts are not uncommon due to power shortages affecting the whole country.”

Constraints to Instructional Technology Integration at Institution B

The constraints to using technology for instructional purposes given by the 10 lecturers are divided into five categories, along the lines of those that emerged from the

responses by lecturers at institution A, with some categories having sub-categories. The terms used to describe the constraints differed for each category.

The first category to emerge from the responses given by the lecturers is that of *lack of funding,* which lecturer 10 described as "crippling," and the resulting, "absence of resources." The absence of resources was characterized as including failure to pay for the cost of technology and related expenses. For example, lecturer 10 mentioned the failure of the institution to, "replace the old computers and get the modern ones which have better functions and are more efficient."

The second category of constraints identified from the lecturers' responses was that of, in lecturer 3's words, "very *limited access to the Internet,*" which was compounded by *slow dial-up connections* and quite *frequent power outages*." Lecturer 7 pointed out that the Internet was sometimes down, adding, "Internet web pages are very slow to open and generally, using the Internet is better before 8:00 am or during weekends, otherwise you end up taking up to an hour or more just to open a single webpage." Lecturer 5 summarized the frustrations faced by the lecturers in using the Internet when he explained, "Generally, the need to make use of the Internet is there but in my view, the frustrations of accessing what you want in our set-up, far outstrip the perceived benefits of the Internet."

The third category of constraints to emerge from the data was that of, as lecturers 3 and 5 put it, *"limited" or "lack of" know-how, skills and/or knowledge* in using some of these gadgets. Lecturer 6 highlighted this point when she explained, "We do not know the basics. Most of us are just working on computers from nowhere. You find someone

playing games and doesn't know, "kuti ndodii" (what should I do). Lecturer 5 added, "For example, I wanted to use PowerPoint but was not sure of how to do it."

The issue of big numbers of students enrolled by the university, resulting in *large class sizes and/or groups*, and in the context of the constraints being discussed, emerged as the forth category of constraints. Lecturer 5's explanation gave a good illustration of this problem, "Our students come in large numbers, resulting in them using equipment in large groups, so a large majority of them will never have a first-hand experience with some of the materials and equipment. The large groups also impinge on the type and quality of activities that we do with them." Lecturer 4 agreed, "In most cases it's the teacher with the technology, not the students. This limits the students' exploration of the technology." Lecturer 5 noted how limiting to technology integration, the student-to-gadgets ratio was, pointing out, "Accessing the Internet for an assignment will be very difficult, for example, when 60 students are competing to use 3 or 4 free computer terminals in the library."

The fifth category is that of *relevance or appropriateness of the technology* to the local context. Lecturer 2 pointed out that he saw this issue as having two faces, "Firstly," he explained, "most computer software needs to be adapted to the Zimbabwean curriculum since most of the materials there are American and they use American examples. The other face of relevance is that our students [student teachers] will be found teaching in Zimbabwean schools, and most of these schools do not have these gadgets."

Lastly, the *absence of a national information and communication technology (ICT) policy*, which is supposed to be the basis for the framework for technology integration in the education system in Zimbabwe, was cited as a major constraint.

Lecturer 2 highlighted this problem when he said, “I also suspect that the government has no policy on the use of ICT in Zimbabwe, the main reason being that it [government] has no money.”

Constraints to Instructional Technology Integration at Institution C

The constraints to using technology for instructional purposes given by the 7 lecturers are divided into five categories, along the lines of those that emerged from the responses by lecturers at institution A and institution B, with some categories having sub-categories. The terms used to describe the constraints differed for each category.

Lack of “funding” or “financing,” as noted by some of the lecturers, and the resultant *“absence” or “unavailability” of resources*, emerged the main broad category of constraints from the data. This broad category also has a bearing on all the other constraints given. Five of the seven lecturers mentioned the *absence of physical structures or infrastructure* like faculty of education buildings, with specifically designed and designated lecture rooms, computer laboratories and educational technology facilities. *Failure to replace outdated technology and to acquire the required software* was also cited. Lecturer 1 explained, “The computers, especially the hardware part, for example, sticking keys on keyboards, have somehow worn out or become outdated.” Lecturer 2 concurred, “Some computers are very old, for example mine, one has to call the technician many times just to help with the old hardware itself.”

The issue of *poor connectivity and the slow speed of accessing the Internet* was the second category of constraints to be identified. All the seven lecturers expressed concern at the lack of enough computers connected to the Internet and at the “very slow” Internet. Lecturer 3 asked, “In terms of connectivity, imagine teaching about the Internet

in a lab with computers that are not hooked to the Internet? It's difficult or maybe not even possible to demonstrate on the Internet when the computers are not networked."

The third broad category to emerge from the responses is that of *lack of knowledge on technology integration*. Under this broad category also emerged the *absence of staff development* at the institution and the *absence of higher education institutions offering degree-level training* in educational technology in the country. Lecturer 6 and lecturer 4 highlighted these points, respectively; "Perhaps I haven't had enough training in educational technology myself. I can use this computer for routine stuff, but I need much more than that "and " The idea of staff development is a critical one, especially when taking into consideration the fact that there is no institution offering a degree in educational technology in Zimbabwe. There is need for the university to put staff development programs in place." Lecturer 3 added, "Even with the little knowledge I have [being one of the two holders of the post-graduate Dip Ed Tech in the university], there is no platform for sharing with other staff members."

The issue of large classes and/or group sizes is the fourth constraint identified. Lecturer 1 summarized the problem arising from that, "Because of overuse, which is too much use by too many people, the computers become faulty and, in the absence of an efficient [computer] support system."

Lecturer 5 highlighted the *issue of relevance* when he explained the absence of appropriate software to use in their own context, "Currently available application programs have got Western perspectives and I feel there is a need to make their content more relevant to our own life and cultural experiences."

The *absence of an ICT policy and framework for technology integration* also emerged, and in the words of lecturer 4, "there seems to be no deliberate policy to teach teachers how to integrate technology." The lack of appreciation of the importance of educational technology and the opportunities that it could offer to the university was evident in what lecturer 3 said, "Somehow at the top [on being probed, respondent is referring to policy makers], this [IT integration] is not being appreciated, more so for our lecturers and in particular, for students. So until such a time that that 'top' begins to appreciate, we might remain where we are for years."

Summary of Constraints to IT Integration by Lecturers at the Three Institutions

The constraints to using technology for instructional purposes given by the 21 lecturers at the three universities were divided into eight main categories and summarized in Table 17.

Table 17.

Constraints Faced by Lecturers in Using Technology for Instructional Purposes

Category of Constraints	Constraints Given by the Lecturers		
	Institution A	Institution B	Institution C
1. Lack of funding/ Budgetary constraints	1. Poor/inconsistent availability of hardware & software	1. Absence of resources 2. Failure to pay for technology & related expenses 3. Failure to replace old computers with efficient ones.	1. Absence of resources 2. Absence of physical structures/ infrastructure 3. Failure to replace outdated technology 4. Failure to acquire required software
2. Poor Internet Access & Connectivity	1. Narrow bandwidth 2. Slow connection 3. Internet down	1. Limited access 2. Slow dial-up 3. Internet down sometimes	1. Poor connectivity 2. Very slow Internet speed 3. Not enough computers connected to Internet
3. Lack of Relevant/Appropriate	1. Lack of technological	1. Limited/Lack of know-how, skills &	1. Lack of knowledge on technology

Expertise	knowledge 2. Lack of technology integration skills 3. Lack of appropriate technology use attitudes & awareness	knowledge in technology integration.	integration
4. Absence of Appropriate Staff Development	1. Absence of appropriate staff development 2. Poor quality of the limited training	1. We do not know the basics [of technology integration] 2. Need for training on use of PowerPoint & upcoming programs	1. Absence of higher education institution offering degree-level training in ET 2. Absence of platform for sharing ideas
5. Unreliable Electricity Supply	1. Electricity blackouts 2. Electricity load shading	1. Frequent power outages.	
6.Large Class and/or Group Sizes		1. Large numbers of students, limited supplies of technology 2. Up to 60 students competing to use 3 or 4 computers	
7. Cultural and Contextual Relevance		1. Software needs to be adapted to suit local curriculum 2. Majority of local schools do not have technological gadgets	1. Absence of technological content relevant to own life and cultural experiences 2. Available software has got Western biases
8. Absence of ICT Policy & Technology Integration Framework		1. Absence of ICT policy & technology integration framework	1. Absence of policy on technology integration for student teachers

Lack of Funding and Budgetary Constraints

The first and main category to emerge, and a category that transcends all the other categories, was that of budgetary constraints, or simply put, *general lack of funding*. This constraint was said to lead to the absence of resources, and most critically, the absence of physical structures or infrastructure for the faculties of education. The absence of resources given included poor funding leading to poor and inconsistent acquisition of the required hardware and software, and failure to pay for technology related expenses, for example, the replacement of old computers with new and/or efficient ones.

Poor Internet Access and Connectivity

The second category of constrains to emerge was that of poor Internet access and connectivity. Explanations given for this category centered on the very limited access to the Internet, which was compounded by narrow bandwidth, slow dial-up connections, not enough computers connected to the Internet and the Internet reportedly simply being down.

Lack of Relevant and Appropriate Expertise

The lack of relevant and appropriate expertise emerged as the third category of constraints. Lecturers at the three institutions explained that the limited or lack of know-how, skills, attitudes and knowledge in technology integration was a major constraint.

Absence of Appropriate Staff Development

In terms of the absence of appropriate staff development, it was explained that this included poor quality of limited training, at times in the form of short computer courses, and the need for training in the basics of technology integration in specific subject content areas. The non-existence of a platform for sharing ideas and the absence of higher education institutions offering degree-level training in educational technology in Zimbabwe, were also cited as critical barriers to technology integration.

Unreliable Electricity Supply

The fifth category of constraints to emerge is that of unreliable electricity supply. Explanations of these constraints included the frequent electricity blackouts or outages and electricity load-shading, in the context of limited power generation and distribution at the national level.

Large classes and/or group sizes

In the face of limited supplies of technology and the absence of related support services, with as many as 60 students competing to use 3 or 4 computers, large classes and/or group sizes emerged as the sixth constraint to using technology for instructional purposes.

Cultural and Contextual Relevance

The issue of cultural and contextual relevance emerged as a critical constraint to using technology for instructional purposes. The main point advanced in this category was the need for technological content relevant to lecturers' and their students' life and cultural experiences and the need to adapt or design software to suit local curricula, since the available software largely have Western biases. It was also pointed out that the majority of schools in Zimbabwe do not have computers and the related information and communication technologies.

Absence of ICT Policies and an Instructional Technology Integration Framework

The absence of ICT policies and an IT integration framework emerged as one of the major underlying constraints to the use of technology for instructional purposes in Zimbabwe. In the eyes of some of the lecturers, this was because of the lack of appreciation of the importance of educational technology and the opportunities that it could offer to the universities and to the education system as a whole.

Conclusion

This chapter presented findings on instructional technology integration by university lecturers in pre-service secondary school teacher education programs in

Zimbabwe. Findings relating to the context, and to each of the four research questions, were first presented for each institution, followed by a summary of findings from the three institutions. In order to establish the context in which integration of IT was taking place, lecturer interviews and the universities' catalogues and institutional strategic development plans were analyzed to reveal the institutions' own analyses of their internal and external operating environments. Lecturers' interviews provided data on the lecturers' teacher education experience, their qualifications as well as their prior use of or experience with computers.

The conceptualization of IT was presented in terms of the lecturers' definitions of ET, their views on IT and ET, as well as on their understanding of the term IT integration. Results on how the lecturers integrate IT in their instruction were presented from three data sources. Lecturer interviews provided data on the lecturers' day-to-day integration of IT, and this was complimented by findings from the analysis of lecturers' course outlines. Lecturers' computer technology proficiencies and competencies were presented based on data collected from lecturer questionnaires. Lastly, findings on the support that lecturers get from their institutions, as well as on the constraints that they face in the integration of IT were presented from data collected from lecturer interviews.

Findings show that the conceptualization of IT and its integration by the majority of the lecturers was largely as hardware in nature, with focus put on viewing technological tools as audiovisual aids. Lecturers with qualifications in educational technology (ET) viewed IT and its integration from what Schiffman (1995) calls a narrow systems view. Most of the lecturers used technological tools for illustrating key points in their lecture delivery and lecturers who used computers used these for lecture

preparation. Lecturers' computer proficiency and competencies were at the basic level in Internet usage, with little confidence shown in basic productivity software skills and in IT integration tasks and processes. The lecturers' integration of IT was at the Entry and Adoption stages (Dwyer, Ringstaff and Sandholtz, 1991). Institutional support was characterized by poor availability and access to appropriate technological tools by both lecturers and students, and in the context of a hyper-inflationary operating environment, constraints ranged from lack of institutional funding, to the absence of an IT integration policy framework, and lack of appropriate initial and continuous staff development.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

Introduction

This chapter presents a discussion of the findings from the data analysis and is divided into two main parts. The first part is a discussion of the context of IT integration by lecturers at pre-service secondary school teacher education programs in Zimbabwe. Besides examining the universities' internal and external operating environments, this part also discusses the lecturer's background in terms of their teaching and teacher education experience, qualifications and prior use of or experience with computers.

The second and greater part of this chapter discusses findings relating to the lecturers' perspectives and experiences on technology integration in their day-to-day instructional activities, in their local contexts. This discussion addresses the following guiding questions of the study:

1. How is IT conceptualized by lecturers in pre-service secondary teacher education programs at universities in Zimbabwe?
2. How do the lecturers integrate IT in their instruction?
3. What support do the lecturers get from their institutions in integrating IT?
4. What are the constraints faced by the lecturers in integrating IT?

The chapter concludes by offering some recommendations arising from the research findings and discussions. Lastly, suggestions for future research are made.

The Context of IT Integration by University Lecturers at Pre-Service Secondary School Teacher Education Programs in Zimbabwe

The essence of the interpretative approach to this research is that instead of a search for generalizations, the emphasis is on understanding that the realities of technology integration at pre-service teacher education programs in Zimbabwe are not fixed in such a way that once discovered, they are true forever. As Willis et al. (1999) put it, in the interpretive approach, realities are local, transitory or short-lived, contextually based and constructed by humans in groups. This can be interpreted to mean that all truth is local and what is real for one group is not necessarily real for another.

It is this approach to what constitutes meaning and reality that influences this researcher, through detailed presentation of findings and thick description, to put emphasis on understanding the context (of IT integration by university lecturers at pre-service secondary school teacher education programs in Zimbabwe,) since much of the meaning of the study is in the context.

Background to the Three Universities

An analysis of the universities' catalogues and their own analyses of their contexts, which were based on the business model of exploring Strengths, Weaknesses, Opportunities and Threats (SWOT analysis) in their internal and external environments, provided credible data for understanding the context of IT integration at these institutions. This analysis found that lecturers' integration of IT in pre-service secondary school teacher education programs in Zimbabwe is taking place largely in the context of internal operating environments of new universities established in the last ten to fifteen years (1992, 1996, and 1999) and that two of the three universities are still operating

from temporary sites. As a result, there is lack of requisite physical infrastructure, which includes lecture rooms and laboratories.

Inadequate funding and/or financing, characterized by static and inadequate income, as well as limited income generating capacity transcend all the other aspects of this context. Consequently, there is a lack of adequate teaching and learning equipment and facilities, which is compounded by inadequate telecommunication facilities, inefficient ICT networking and poor access to personal computers by both staff and students. The universities have problems in recruiting and retaining lecturers and staff with the necessary qualifications and experience due to poor compensation and the prevailing economic climate. The lack of financial resources makes it a challenge for the universities to develop their own staff and faculty.

The external operating environment, which is described as being influenced by political instability and the deteriorating relationship between Zimbabwe and key donors, is said to have compromised potential for both local and foreign investment in the universities. The socio-economic situation is described as having resulted in a hyper-inflationary operating environment which is said to make it difficult for the institutions, in the context of the global economy, to run their programs effectively.

Background of Lecturers at the Three Institutions

With 18 male and 3 female lecturers constituting the total number of lecturers who participated in this study, it is quite apparent that there is a gender imbalance in staff recruitment at these institutions. However, solutions to this scenario are in the long term, as this (gender imbalance) is tied to years of differentiation in the enrollment and

retention patterns and trends going back to primary and secondary schooling in the country.

The fact that 15 lecturers were over 40 years old and the other 6 were less than 35, and that all the lecturers had between 5 and 20 years high school and teacher education experience, in the context of 65% of the lecturers surveyed having been teaching at their current institution for about a year or less, serves to show the high lecturer turnover at these emerging universities. This has implications on the lecturers' integration of IT and is corroborated by findings from lecturers' interviews, where it was clear some lecturers were "new" and not fully aware of what was happening, or not happening in terms of IT integration at their institutions.

All the lecturers had bachelors' degrees, 16 (80%) of the lecturers held masters' degrees and two held doctorates in education. This means that three lecturers held bachelors degrees only. All the lecturers had done some AVA courses; however, only three of the 21 lecturers had special training or qualifications in the form of the post-graduate diploma in educational technology from the University of Zimbabwe. These three lecturers were also in charge of the teaching of ET or IT at the three institutions. It should be noted that findings from lecturers' interviews and documents analyzed showed that the lecturers with the special qualifications in ET conceptualized IT integration at an advanced and more analytical level than their colleagues without this special training or qualification.

For example, these lecturers were able to mention, allude to or discuss some elements or aspects of the systematic design of instruction as a critical part of instructional technology integration. As indicated by data from questionnaires, these

lecturers also tended to be more competent and/or proficient in computer technology tasks and process, as they relate to technology integration.

In terms of lecturers' prior experience with computers, about half (51%) of the lecturers had not used computers during their own teacher training or education simply because there were no computers at their teachers' colleges then. The other half (49%) of the lecturers had used computers for basic tasks like typing assignments, and in some cases and to a lesser extent, accessing and searching for information on the Internet and doing some data analysis using SPSS. These findings have implications for IT integration, especially in the context, as discussed in the literature review, of research suggesting that teachers tend to teach the way they were taught (Ball, 1990; Lortie, 1975). With most of the lecturers having been taught without computers and some having been minimally exposed to computers in their teacher training or education, and in the absence of initial and/or continuous staff development in ET, it is quite clear how IT integration, especially given the pace of continuous innovations in technology, may be a challenge for the lecturers.

How is IT Conceptualized by Lecturers in Pre-Service Secondary Teacher Education Programs at Universities in Zimbabwe?

Lecturers' Definitions of ET

Analyses of the definition of ET given by the lecturers at the three pre-service secondary school teacher education programs in Zimbabwe reveal that the definitions cover four main aspects. The research findings show that all the lecturers presented what this study is referring to as the spectrum of ET. Gentry (1995), refers to this aspect as the

boundaries of the ET field and all that constitutes the field. At this stage it is essential to point out that this discussion's reference to 1990s literature is probably a reflection of a ten-year lag in the conceptualization of ET and instructional design (ID) in Zimbabwe, as much as it is a confirmation of the state of the art (ET/IT and ID) in the country.

The spectrum presented is quite wide, ranging from viewing ET as something very broad, seeing ET as the use of technology in delivering instructional materials or as methods of teaching, to seeing it as something more specific, like tools and gadgets, modern technology or something to do with computers. These perspectives are quite consistent with the observation by Muffoletto (1994) that technology is commonly thought of in terms of gadgets, instruments, machines and computers, especially when considering the fact that these tools have had an effect on the naming and defining of the field. Gentry's (1995) proverbial saying that the meaning of ET "depends considerably on what part of the elephant is being touched and by whom!" (p. 4) is also supported by these findings.

In terms of what ET involves or encompasses, only the lecturers holding the post-graduate diploma in ET indicated that ET involves the design, development, implementation and evaluation of teaching and learning materials or aids. The stages given in this definition are consistent with those of the systems-based analysis, design, develop, implement and evaluate (ADDIE) model of instructional design, as well as Getnry's (1995) observation that ET is also defined as a process. However, in this case, the lecturers' definitions are limited to hardware in approach, as they mention the instructional design stages as they specifically relate to the *production* of teaching and learning materials, without including or addressing the totality of the instructional design

set-up, which goes beyond the design, development, implementation and evaluation of teaching and learning materials. It should be noted that, glaringly absent in these stages of ID presented by the lecturers is the prerequisite and all important needs analysis stage.

Although probably not realizing the limitations of the instructional design stages they presented – the lecturers with the special qualifications in ET specifically said ET is systematic or based on the systems approach. However, and according to Schiffman (1995), this is a *narrow systems view*, which looks more like a real systems approach, but with needs assessment and formative evaluation noticeably absent. In terms of Schiffman's (1995) five perspectives on instructional systems design, these lecturers at pre-service teacher education programs in Zimbabwe are primarily concerned with the use of hardware and production of materials, as evidenced by the inclusion of only design, develop, implement and evaluate (DDIE) teaching and learning materials and no (A) for analyze (as in the ADDIE model of instructional design) in their definitions. Schiffman (1995) argues that this focus can be traced back to the media or hardware view of instructional design. Using Schiffman's (1995) views of ISD, it could be concluded that these lecturers' conceptualization of ET is largely at the *media or hardware view*, with the lecturers with special qualifications in ET projecting what he calls a *narrow systems view*.

The challenge, according to Schiffman (1995), would be for the lecturers to develop their conceptualization of ET and ID to the *standard systems view* and then elevate it to the *instructional systems design view*. The standard systems view is said to reflect a fair representation of the instructional systems design, with needs assessment first (which the lecturers excluded in their definitions) and formative evaluation (which

the lecturers did not specifically mention in their definitions). The elevation of the lecturers' conceptualization of ET and ID to the instructional systems design view, according to Schiffman (1995), should lead the lecturers to "a synthesis of theory and research" (p. 136) related to teaching and learning theories, information literacy and communication, systems theory and approach as well as to the managerial ability to pull all these aspects into a coherent whole. In the case of lecturers in this study, attaining proficiencies to synthesize theory and research in the respective content areas, and molding these into a coherent ET whole, would demand extensive initial and on-going professional development efforts in ET as well as an enabling and supportive teaching and learning environment.

The other aspects to emerge from the lecturers' definitions are descriptions or examples, as well as purposes of ET. The main description given is that ET is about teaching and learning aids and the popular examples given - overhead projectors, computers, charts and flip-charts, reflect what Engler (1972), calls the tools and media of communication. This hardware meaning is reinforced by the lecturers' assertion that ET tools enhance, further or facilitate the teaching and learning process.

The lecturers' used the term "aids" throughout their responses. Perhaps this was a reflection of the influence of the audiovisual aids (AVA) courses, which focused on the preparation and use of teaching aids, which all the lecturers indicated they had taken at some time in their initial teacher education or training. It could also be said that the focus on and description of ET as "aids" originated from or has been influenced by the audiovisual movement in the past, and which today continues to emphasize ET as media (Roblyer and Edwards, 2003).

Lecturers' View on IT and ET

With 60% of the lecturers saying there is a difference between ET and IT, 30% saying there is no difference and the remaining 10% indicating that they are either not sure if there is a difference or that there is an overlap between ET and IT, it could be said that there is general "confusion" and lack of agreement in the use and application of these terms at universities with teacher education programs in Zimbabwe. This finding is supported by the literature in the field, which points out the struggle for an identity and conventional and universally acceptable name in the field of ET. According to Roblyer and Edwards (2003), no other topics are the focus of so much new development in so many content areas, yet no single acceptable definition for these two terms dominates the field.

Secondly, the findings in this area show that there is a general belief that ET is broad and refers to technology in education in general. On the other hand, IT is viewed as more of a component of ET and limited to the teacher using technology to enhance teaching and learning in the classroom.

Lecturers' Understanding of the Term IT Integration

Although indicating that they are not familiar with the term IT integration in day-to-day teaching and learning terminology, fifteen lecturers were able to make some quite informed inferences as to the meaning of the term. Twelve lecturers gave a "hardware approach" definition to IT integration by focusing on; the introduction of modern technology, use of modern gadgetry, the process of applying IT and how IT and related technologies are used.

Three lecturers were less focused on the processes of *how*, *applying* and *using* IT. They saw IT integration as a *mixture* or *combination* of different instructional techniques, which could be used at the same time. They also perceived IT integration in terms of how various forms of communication capability may be combined or in terms of *putting together* all the IT that is available, in order to enhance teaching and learning.

This latter understanding of IT integration goes beyond the simpler hardware approach to IT integration to include putting together all of the available IT, including mixing and combining the various forms of communication capacity at their disposal, to effect teaching and learning. The process of *putting together* all of the instructional technologies to effect teaching and learning, is a process that should include the initial and parallel processes of *determining* what works for who, where, why, when and how. That process is found in the systematic design of instruction, which will be discussed later in this chapter. This understanding is quite consistent with Robyler & Edwards (2003) definition of IT integration as, "the process of determining which *electronic tools* and which methods for implementing them are appropriate for given classroom situations and problems (p. 8)."

Some of the lecturers (three of them holders of the post-graduate Dip Ed Tech) indicated that they were familiar with the term IT integration. One said technology was part and parcel of any program in ET with another one agreeing that IT integration should be part of instruction. Whilst the two lecturers included or justified technology integration as part and parcel of instruction, they did not, in their understanding, address or explain the *process* of integrating technology. The other four lecturers saw IT integration as a process of applying technology in the teaching and learning process,

using technology in order to assist or enhance learning in an instructional set-up, as well as the use of modern gadgetry to enhance the process of instruction.

The understanding of the term IT integration by the lecturers who said they were familiar with the term falls into three views. The first perspective was viewing it as "technology as a component of all instruction." The second perspective was viewing IT integration from a "hardware approach" or "technological deterministic" point of view. This point of view emphasizes the technology itself, its uses and how it assists or enhances instruction. The third perspective was viewing IT integration as a process of *applying* technology in the teaching and learning process. This definition limits IT integration to applying, without taking into account or addressing the processes of planning and designing that should to take place before the process of applying.

These three attempts at explaining IT integration are largely consistent with the view of IT as hardware, and the notion that technology is used or applied in order to assist or enhance the teaching and learning process in a classroom situation. It should be noted that the explanations do not address IT integration as including the process of determining who is to be involved and where, why, when and how this may best be done, which is a function of instructional design. All these findings bring to the forefront, the issue of instructional design in pre-service teacher education programs in Zimbabwe. The critical conclusion from these findings and discussions on the conceptualization of ET is that nearly all the lecturers, especially those with the more specific views, define ET as hardware or have a hardware approach to their definition of ET, their view on IT and ET as well as on their understanding of the term IT integration.

It could be concluded that this media or hardware approach to the conceptualization of ET has been influenced by the lecturers' training in AVA courses in their initial teacher training or education. This deduction tends to be supported by Schiffman's (1995) assertion that, "The media view is particularly prevalent in higher education because ISD evolved from audiovisual education in many colleges and universities" (p.132). As noted in the discussion of the lecturers' qualifications, as well as from findings from other data sources, the absence of special training in ET, which is compounded by the absence of degree level ET programs in the country, and that of current and ongoing staff development in that area, perpetuate the media or hardware conceptualization of ET by the lecturers. While technological innovations in ICT continue, teacher education in Zimbabwe, especially as it relates to IT integration, has lagged behind as evidenced by conceptualization of ET by most of the lecturers. Although the three lecturers with the special training in ET hold what Schiffman (1995) referred to as a narrow systems view (with needs assessment noticeably absent), their conceptualization of ET from a systems approach is probably testimony of the critical role of education and training in the form of initial (pre-service) and continuous (in-service) professional development in the integration of IT.

How do the Lecturers Integrate IT in Their Instruction?

Lecturers' Hardware Approach to IT Integration

Other than the AVA courses taken in their initial teacher training or education, the lecturers in this study lacked training in ET or IT. As might be expected, this influenced their approach to IT integration.

With the majority of lecturers indicating that they largely use the OHP and transparencies, chalkboards, charts and flip-charts and a few saying they use TV screens, VCRs, film and projectors, and the electronic/LCD projector as teaching and learning aids, the media view or hardware approach to their IT integration is strengthened. Further evidence to this media or hardware approach to the lecturers' integration of IT is in the finding that 90% of the lecturers indicated that they use these technological tools, which do not include computers, for illustrating, highlighting or showing concepts or key points in their lecture delivery.

Lecturers who use computers use these for preparing teaching and learning materials such as handouts, OHP transparencies and worksheets, and this is further evidence of the lecturers' media or hardware approach to their integration of IT. This finding leads to the follow-up question of whether the lecturers are currently using the computers for instructional purposes, and more than half (65%) of the lecturers were currently *not* using computers for instructional purposes. Given the innovations in ICT and the multi-media capability of the computer in education today, this finding reflects the lecturers' limitations in terms of integrating IT in their instruction.

About a third of the lecturers indicated that they use computers for purposes of preparing lectures through their research, word processing, computing marks and grades and looking up information on the Internet. Another one third of the lecturers said they use computers for instructional purposes in the form of typing exercises and examinations, research and downloading materials on the Internet. It can be seen that all these are lecture preparation activities largely involving the production or preparation of teaching and learning materials or aids. As can be seen from these findings, these

lecturers seem not to regard lecture preparation as part of the instructional process. Their interpretation of using computers for instructional purposes is that of using computers for purposes of presentation and/or delivery of lectures, not for preparation. This interpretation is quite consistent with the hardware approach to the conceptualization and integration of IT, with its little or no emphasis on needs and learner analysis, which are prerequisites for effective instructional design.

Consistent with the findings of this study's analyses of the institutions' internal and external operating environments, and not surprisingly, the main reason given by the lecturers for not currently using computers for instructional purposes is the lack of resources – both hardware and software. This lack of resources leads to poor or limited access to offices and computer laboratories and available laboratories may not have adequate numbers of computers, appropriate application software or Internet connection. Where computers are available, slow Internet speed is also cited as a limitation to using the available tools for instructional purposes.

The significance of the fact that only one lecturer indicated that he uses the computer for demonstrating his instruction on the screen, through his Web publication on the IERN website, and in the context of a collaborative learning project, is that the lecturer holds the post-graduate diploma in ET and is in charge of the teaching of ET at his institution. This represents a situation where the lecturer uses the computer (and Internet) during the course of the presentation or delivery of the lecture to demonstrate what he wants the students to learn. This finding is further proof of the importance of staff development for lecturers, as evidenced by this lecturer's relative progress in the integration of IT.

Probably the most critical and revealing finding, and a finding in which the institutions can do a lot more in solving, even given their limited capacities, is that lecturers are not using computers for instructional purposes because they are *not capable* of using computer for that purpose. The problem is strongly linked to the absence of relevant skills and knowledge, resulting from lack of training. This is an important finding which tends to point to the absence of a properly coordinated policy and structure to support initial (pre-service) teacher education and continuous (in-service) staff development in IT integration. It should, however, be noted that the lack of resources at these institutions, and the finding that lecturers said they were not capable of using computers for IT integration, becomes a cycle in which the absence of resources makes it difficult and at times impossible for the institutions to put in place the appropriate staff development activities or programs.

Lecturers' Computer Technology Proficiencies and Competencies

The finding that all the lecturers feel confident that they can do the basic and common email and Internet tasks like sending e-mails with attachments and using search engines to look for information on the Internet shows that the lecturers can, to some extent and given the relevant training, use the computers and the Internet as communication tools. However, the finding that more than half the lecturers were not confident that they could execute slightly higher-order skills such as subscribing to a discussion list or keeping track of websites visited, tend to limit their ability to effectively use the computer and Internet as communication tools.

As can be seen, these are not necessarily new tasks; they are an application of the basic e-mail skills (sending and receiving messages), that the lecturers are already

confident in. This could mean that the lecturers seem to lack the awareness or the knowledge to apply their skills to slightly higher-order tasks. The lecturers' possible membership and participation, which is free of charge, to a discussion list like the dynamic and fast growing Southern African Network for Educational Technology and eLearning (SANTEC) listserv, would expose the lecturers to invaluable knowledge, skills, discussions and best practices in IT integration in the Southern African region and context. Free membership to Western-based discussion lists like the Instructional Technology Forum (ITFORUM), would afford the lecturers access to knowledge, publications and discussions relating to the state-of-the-art (IT integration) and help their insights into the field, as well as how they may enhance their own IT integration.

This is a problem that a simple and basic training intervention, for example a two-hour workshop on identifying, joining and actively participating on a discussion list, would quite easily solve, resulting in invaluable benefits to lecturers in their IT integration.

The lecturers' little or no confidence in the use and application of basic productivity software to do simple spreadsheet, database, desktop publishing and presentation tasks is an indicator of the extent of the lecturers' readiness to integrate IT along those lines.

This lack of readiness is further confirmed by the lecturers' lack of confidence and their uncertainty in their ability to do critical IT integration tasks like describing how they would use IT in their classrooms, creating a lecture or teaching unit that incorporates subject matter software or writing an IT integration plan with a budget to buy technology for their classrooms. In addition, the fact that all of the 21 lecturers were not confident

that they could create their own Web home pages, or describe five software programs they could use in their instruction, reveals the lecturers' limitations in terms of effectively using the World Wide Web (WWW) for instructional purposes.

Whilst some of the lecturers felt competent doing some basic IT integration processes like using e-mail to communicate with colleagues and using the WWW to find educational resources, most of them did not feel confident in executing IT integration processes like planning and implementing projects in which students use a range of ICT tools, helping students learn to solve problems, accomplish complex tasks and use higher-order thinking skills in an ICT environment, as well as working with students in various ICT environments. These findings and conclusion add to the picture of indicators to the lecturers' lack of readiness to integrate IT in their instruction.

Implications on Lecturers' Instructional Design

The dearth of competencies on the basic IT integration processes, particularly in the process of planning and implementing problem-solving based projects for students in various ICT environments, confirms two key points discussed in these findings. First, it confirms the finding that the lecturers' conceptualization of IT and its integration, as well as their use of IT, are hardware-based and put focus on use of technology for lecture preparation or for illustrating main points in their lecture delivery. Second, it confirms the absence of a systematic approach to systems based instructional design, especially given the fact that all the lecturers (except the 3 holders of the post graduate diploma in ET) had not shown evidence of being aware of, or of using what Schiffman (1995) calls the standard systems view of instructional design.

This conclusion is further supported by findings from analysis of documents, which showed that most (90%) of the lecturers did not specifically plan for IT integration and this was reflected in the instructional strategies and assessment approaches planned for. Course outlines used by the three lecturers (with post-graduate diplomas in ET) who are in charge of the teaching of ET or IT at the three institutions, suggest that they are influenced by the AVA and/or media movement or view, as evidenced by the naming of one of the courses as Educational Media and Technology.

Evidently from a hardware perspective, two of the course outlines emphasize the application of media and technology as tools and resources used to facilitate teaching and learning, without including prerequisite theoretical background content relating to, for example, teaching and learning theories and the systematic approach to instructional design. Although two of the course outlines include introductions to systems-based instructional design by mentioning the ASSURE model and focusing on designing, developing and implementing, it is quite clear that this is a narrow approach to ID, which is based on what Schiffman (1995) refers to as a narrow systems view.

In concluding this discussion on the findings' implications on the lecturers' instructional design, it could be said that even taking into consideration the limited resources at the universities, given an IT integration policy framework and appropriate motivation at the institutions, initial (pre-service) and continuous (in-service) training (staff development) intervention measures can elevate lecturers conceptualization of IT and its integration. These would also improve the lecturers' understanding of the systems approach to instruction design, all of which would enhance their readiness to integrate technology in their instruction.

Given the critical nature of human resources, the continuous innovations in technology and the need for expertise in IT integration, the establishment of bachelor degree level and graduate degree programs at local universities would be strategic. Such programs would not only produce educators who can be at the forefront of IT integration in the local context, but would create the momentum and base for scholarly research in ICT integration in education in Zimbabwe in general, and in higher education in particular.

Lecturers' Stages of Technology Integration

Based on the research findings, as well as on the stages of technology development (Entry, Adoption, Adaptation, Appropriation and Invention) by Dwyer, Ringstaff and Sandholtz (1999) and in line with the proposal by the AAA (2000) for determining an institution's ICT maturity, it is this study's conclusion that the lecturers in this study were at the Entry and Adoption stages. It is also important to note at this stage that these stages of technology development focus on integration of computers and related technologies.

Although all the lecturers used different technological tools like OHPs, TVs, VCRs, films and projectors, only a few of them used computers to illustrate or highlight key points in their lectures, even though most of them had some (though limited) access to computers and the Internet. These are the typical indicators of the Entry stage, with computers and related technologies installed and lecturers unsure of the technology, they used the technology and as they gained confidence, they mainly used the technology for text-based work.

Of the few lecturers who used computers for instructional purposes, only three (holders of the Dip Ed Tech) could be said to have been at the second stage - Adoption. These lecturers, as shown by the findings, used computers to support text-based instruction using, for example, word-processing applications. Another indicator was that although there was moderate access to computers, the lecturers largely used whole group instruction through lectures and individual work.

As can be seen, the third stage – Adaptation – had not yet been achieved because technology had not yet been fully integrated into teaching and learning since computer access and exposure to different application software was limited and the available computers were not being used to support instruction. Since the Appropriation stage is characterized by changes hinged to the lecturers' mastery of technological skills and experiences in facilitating creative activities in, for example, collaborative and interdisciplinary work, it is this researcher's view that there will be need for systematic and consistent staff development interventions in order to achieve this stage.

The final stage – Invention – at which technology is fully integrated, needs intensive access to computers and related technologies and both lecturers and students would need to interact and collaborate in solving problems and constructing knowledge. The stage is far from being achieved by the lecturers. This ultimate stage of technology integration, as this study will argue, may be achieved only when institutional support - from lecturers' access to technological tools and technical support, to consistent staff development – have been systematically addressed.

What Support do the Lecturers get from their Institutions in Integrating IT?

Lecturers' Access to Technological Tools for Instructional Purposes

The findings show that the majority of lecturers have access to OHPs, VCRs and TV screens or monitors for instructional purposes and most of them have some access to computers and the Internet. Whilst 65% of the lecturers felt that the tools are quite easily accessible and to some extent underutilized, the other 35% said the tools are difficult to access. The limited numbers of certain types of tools, for example, the availability of only one LCD projector in each institution, and the protocol to be followed by the lecturers in accessing the tools, created problems in terms of ready access. The underutilization of some available tools, as suggested by some of the lecturers, represents some missed opportunities and could be linked to some of the lecturers' inability or lack of readiness to use the tools, due to their lack of the appropriate technological skills and knowledge.

Functional Condition of Technological Tools

Most of the lecturers experience problems in the functional condition of these technological tools, mostly due to break-downs in the context of the absence of spare parts and lack of expertise to repair and maintain the technology. These problems are compounded by the unavailability of appropriate and adequate teaching and learning facilities in the faculties of education and in particular, the absence of educational technology facilities. This scenario presents a situation where scarce tools like LCD projectors are continuously moved around for use at different locations in the universities. This set-up is also likely to result in the tools being over utilized to the point of overstretching their capacity, and therefore causing them to break down. Given the

context of failure to source spare parts, maintain and/or service the tools, the functional condition of the tools becomes an issue that affects the lecturers' integration of IT.

Lecturers Access to Computers and the Internet

The finding that more than half of the lecturers had access (with its attendant problems) to computers and the Internet in their offices, and that at least 90% had limited access to the Internet in the faculties (colleges) of education and in the university computer laboratories, university libraries or computer resource centers, is an important indicator to existing opportunities for putting in place interventions that will enhance the lecturers' access to technological tools. On the other hand, a comparison of the technological tools used by the lecturers in their day-to-day instruction (see Table 11), purposes for which the tools are used (see table 12) and the lecturers' perception of the availability of technological tools in their universities (see Table 13), reveals some elements of underutilization of the tools. For example, while most of the lecturers indicated that computers were available for instructional purposes, and that the tools were generally quite easily accessible, only a small number said they actually used computers for instructional purposes. Also, despite the perceived availability of a laptop connected to the Internet, no lecturer indicated that he/she used this technological tool for instructional purposes.

Even given that the Internet may not be readily accessible due to the small numbers of available computers and overcrowding by potential users, it is this researcher's view that a properly coordinated strategy, driven by an institution drawn ICT integration policy, would capitalize on the existing and at times missed opportunities and enhance lecturers' readiness to integrate IT.

Lecturers' Students' Access to Computers and the Internet

One of the main factors that may work against the lecturers' attempt to integrate IT is the students' poor access to computers and the Internet in the faculties of education. The majority of lecturers also indicated that their students do not have access to computers and the Internet in the universities and the few who were said to have that access, had access during information technology lectures in the computer laboratories, libraries or when the facilities were not being used.

These findings, supported by findings from data collected from university documents, may indicate that students' access to computers at these universities is restricted to computer laboratory time and when the students are either taking formal computer laboratory classes or during their spare time, which also depends on whether the computer laboratories are not being used for other activities. It should be noted that lecturers who indicated that their students do not have access to computers in the universities may themselves simply not be aware of that access, and therefore missing the opportunity of having their students explore or use computers and the Internet. It is this researcher's view that a properly instituted strategy, based on systems based needs analysis, and guided by an ICT integration framework, would identify these missed opportunities and influence intervention measures that would enhance the lecturers' integration of IT.

Lecturers' Access to Computer Hardware and Software Assistance

While the lecturers have some limited access to technicians when they need help with computer hardware, most of them have minimal access to assistance in terms of using computers. According to interview findings, there are no computer technicians or

assistants for the ET related departments. This situation is also related to the absence of permanent infrastructure, including ET facilities, at these institutions.

Two key observations emerge from these findings. First, there is limited access to computer technicians in the faculties (colleges) of education. Second, available assistance is often based on help from technicians in the university libraries or computer laboratories, or from a few willing and capable fellow lecturers.

It could therefore be concluded that computer assistance at these institutions is not readily defined, is not constant and is not of a uniform or standard nature. Since the basic personnel are available to enable better access to computer assistance to lecturers at these institutions, it is this researcher's view that well coordinated strategies within clear policy frameworks would help in defining and streamlining such assistance.

Lecturers' Opportunities for In-Service Staff Development

Although most of the lecturers indicated that they were either not aware of, or were not sure of staff development opportunities offered by their institutions, with a smaller number saying the institutions did not offer such opportunities, the findings from university documents and lecturer interviews indicate that some opportunities (usually in the form of short computer literacy workshops) are offered by the universities' computer services departments. However, most of the lecturers have not taken up these opportunities and many seem not to be aware of or not to have interest in the limited opportunities. These scenarios represent missed opportunities.

These findings also point to problems arising from the perceived subordinate or peripheral role given to ET and the absence of IT integration policies, which would motivate IT integration in these universities. The lecturers' lack of interest in some short

computer courses, which some view as “detached” staff development, also point to the need for appropriate staff development, specifically designed for technology integration in specific subject content areas.

The lecturers who had participated in staff development activities feel these had helped them to a limited extent, since the activities were general in nature and not specific to the use of technology for instructional purposes. The remaining half of the lecturers had not or not yet participated in staff development activities due to a range of reasons ranging from the absence of clear policies on staff development at the universities and the shortage of funding and resources, to the lack of time and motivation due to the demands of daily teaching responsibilities.

The important point coming from these findings is that staff development activities done at these institutions tend to be scarce and general in nature, without specifically addressing issues relating to IT and its integration into the curriculum. The finding of the lecturers’ attitude of “waiting for opportunities to come our way” or to be “offered” or “given” staff development opportunities is important from a motivation point of view. Given the continuous innovations in ICT and its impact on IT and teaching and learning practices, it is this researcher’s view that opportunities do not always have to go the lecturers’ way. In order to be better able to integrate IT, besides institutional efforts, lecturers may need to look for and/or create staff development opportunities for themselves. The lecturers know their circumstances better, as well as the knowledge and skills they need in order to be more effective in their use of technology in their day to day instruction.

The overarching problem is the absence of policy and frameworks for not only implementing, but also motivating staff development in these institutions. This situation, by default, leaves the responsibility of staff development to the individual lecturers' own initiatives whilst the lecturers wait "for opportunities to come their way," resulting in little meaningful staff development taking place.

What are the Constraints Faced by the Lecturers in Integrating IT?

The constraints to integrating technology for instructional purposes given by the 21 lecturers (see Table 21) need to be looked at in the context of the backgrounds of the three institutions. A review of the institutions' analyses of their own internal and external operating environments and the lecturers' responses to the issues of constraints reveals a general agreement (between the universities as institutions and lecturers as practitioners in those institutions) on the main constraints to IT integration. This agreement is further strengthened by the reviewed literature on the context and state of ICTs in Zimbabwe and in sub-Sahara Africa.

Table 18.

Summary of Constraints Faced by Lecturers in Using Technology for Instructional Purposes

Constraint	Explanations given by the Lecturers
1. Lack of funding/ Budgetary constraints	1. Absence of: • physical infrastructure • resources 2. Poor/inconsistent availability of hardware & software 3. Failure to: • pay for technology & related expenses • replace outdated technology • acquire required software

2. Poor Internet Access & Connectivity	1. Narrow bandwidth 2. Poor connectivity 3. Slow Internet speed 4. Slow dial-up 5. Limited access 6. Not enough computers connected to Internet 7. Internet down sometimes
3. Lack of Relevant/Appropriate Expertise	1. Lack of technological knowledge, technology integration skills and appropriate technology awareness. 2. Limited know-how, skills & knowledge in technology integration.
4. Absence of Appropriate Staff Development	1. Absence of appropriate staff development. 2. Limited and poor quality training 3. Absence of platform for sharing ideas 4. Absence of higher education institution offering degree-level training in ET.
5. Unreliable Electricity Supply	1. Frequent electricity blackouts 2. Electricity load shading
6.Large Class and/or Group Sizes	1. Large class sizes, limited supplies of technology 2. Up to 60 students competing to use 3 or 4 computers.
7. Cultural and Contextual Relevance	1. Absence of technological content relevant to own life and cultural experiences. 2. Available software has got Western biases. 3. Software needs to be adapted to suit local curriculum. 4. Majority of local schools do not have technological tools.
8. Absence of ICT Policy & Technology Integration Framework	1. Absence of ICT policy & technology integration framework 2. Absence of policy on technology integration for student teachers

Lack of Funding and Budgetary Constraints

Budgetary constraints, largely arising from a general lack of funding and characterized by the absence of physical infrastructure and resources and failure to

consistently pay for new technology and related expenses, easily emerge as the main constraint to IT integration by the lecturers. This constraint, which transcends all the other constraints, is confirmed by the institutions' analyses of their own operating environments in which they single out inadequate funding as their main constraint. The lack of funding is said to be a result of static and limited income generating capacity resulting from the institutions' high dependency on external funding and limited state funding.

The emergence of several universities offering pre-service secondary school teacher education programs in Zimbabwe in last 15 years and the fact that some of these institutions have not been able to put up physical structures specifically for the faculties (colleges) of education, is compounded by these budgetary constraints and lack of funding. This, as the findings show, has resulted in the lack of adequate teaching and learning facilities and equipment such as classrooms, computer laboratories and computers.

The findings are also supported by the reviewed literature on the cost and financing of ICT at universities in Zimbabwe and in Africa. Machacha (2004) points out the inadequate and irregular funding of ICT initiatives and prohibitive importation costs of ICT equipment, compounded by high national import tariff levels in Zimbabwe. Supporting this point, Zinyeka (2005) says cost is the main constraint which has resulted in lack of resources and undesirable institutional operating environments. Looking into the future, Nwuku (2003) observes that while donors are playing an active role in enabling access to IT in most institutions of higher education in Africa, at some time, these institutions must assume funding and maintenance of their initiatives.

Poor Internet Access and Connectivity

Internet access and connectivity, which is characterized by limited access to as well as narrow bandwidth, largely accessed through dial-up connections, leads to slow Internet speed at these institutions. This slowness is compounded when viewed in the context of few available computers connected to the Internet and frequent Internet connection breakdowns. The institutional analyses of operating environments indicated the inadequacy of telecommunication facilities, the ineffectiveness of information technology networking and the poor access to computers as constraining Internet access.

This point is highlighted by the Africa Tertiary Institutions Connectivity Survey (Steiner, et al. 2005) which concludes that the state of Internet connectivity in tertiary institutions in Africa can be summarized as too little, too expensive and poorly managed. Machacha (2004) confirms that there is Internet traffic congestion in Zimbabwe due to limited bandwidth, which he says is expensive and inadequate to organizational needs.

Machacha (2004) makes some suggestions that this study will consider in its recommendations. He suggests that more affordable access to bandwidth could be achieved by controlling costs through the state opening up the telecommunications market, networking with other countries to negotiate and develop better connectivity as well as encouraging local Internet Service Providers (ISP) to set up county or regional Internet exchange points that would route traffic within the country or region instead of through Europe or North America. This strategy is supported by Nwuke (2003) who points out the need to improve network connectivity and interoperability, not only within individual countries, but also across countries in the sub-Sahara region.

Lack of Relevant and Appropriate Expertise

Lecturers' lack of technological knowledge, IT integration skills and appropriate technology awareness presents major constraints. Unfortunately, the institutions are not in any better positions to handle these than the two preceding constraints. This finding supports the finding by Zinyeka (2005) who found that there was a lack of experts in ICT for teaching and learning in most universities in Zimbabwe.

According to the universities' institutional analyses, due to poor working conditions and the prevailing economic climate in the country, the universities have difficulties in recruiting and retaining suitably qualified lecturers and staff. In cases where well qualified lecturers were recruited, these were largely inexperienced in both teaching and research. The interconnectedness of these constraints is shown by the fact that efforts to develop the lecturers and staff members are hampered by the lack of both financial and human resources.

Absence of Appropriate Staff Development

The absence of appropriate staff development is closely related to the preceding constraint of lack of relevant or appropriate expertise. The findings show that the lecturers felt they could not execute some basic IT integration tasks and processes because they did not have the appropriate skills, which was partly a result of inadequate initial teacher education or training. This was compounded by the fact there were no higher education institutions offering degree-level education or training in ET in Zimbabwe.

As pointed out by the lecturers, the absence of a platform for sharing ideas in IT integration, as well as the poor quality of the limited staff development/training impede

staff development. The situation is not made any easier when one factors in the perennial lack of funding and the resultant budgetary constraints.

Addressing the issue of capacity building in IT integration in Africa, Nwuku (2003) argues that without training, the implementation of new technologies could result in reduction in efficiency, especially when considering that resources that would have been used to buy much-needed new books for universities would have been spent on information technology. Specifically referring to Zimbabwe, Machacha (2004) explains that ICT is a continuously changing field which needs continuous training, which is expensive. However, he points out, organizations in Zimbabwe including universities, have not adequately invested in this constant retraining and upgrading of ICT professionals.

Unreliable Electricity Supply

Unreliable electricity supply, which was described in terms of electricity blackouts, frequent power outages and nationwide electricity load-shading, is a constraint closely linked to ICT infrastructure. This finding also supports Machacha's (2004) observation that while Zimbabwe has grown steadily to embrace ICT, it has yet to put in place the basic infrastructure needed to take advantage of the information age. Acknowledging the critical role of infrastructure in ICT integration, Nwuku (2003) points out that the main challenge for Africa in this area (infrastructure) is to set up a system that is both reliable and efficient.

Large Class and/or Group Sizes

A constraint which is largely a direct result of inadequate physical infrastructure at the institutions (two of which are still operating from temporary sites), and which itself

(inadequate infrastructure) is a result of lack of funding and budgetary constraints, is the resulting large class and/or group sizes. At one institution for example, up to 60 students were said to be competing to use 3 to 4 computers. It is important to note that lecturers would be required to teach these large class sizes in the context of limited access to ICT, poor Internet access and connectivity, lack of relevant expertise and absence of appropriate staff development.

Cultural and Contextual Relevance

If one is to follow the argument that language is critical to culture because it is the medium through which culture is experienced, perceived and transmitted, then as Nwuku (2003) writes, it is quite clear that university content in Africa and specifically in Zimbabwe, needs to be attended. The finding that lecturers felt there was a need for content and technology relevant to the lecturers' and their students' life and cultural experiences underscores the important role of language, not only as the subject content language, but also as the medium of instruction.

Nwuku (2003) argues that the predominance of English and other inherited languages such as French and Portuguese as means of conveying scientific (and technological) knowledge has been a barrier to access to education and that this barrier is likely to be reinforced by information technology if early interventions, for example, developing content in indigenous African languages, are not put in place. A classical example is that of Africa University – a pan-African institution enrolling students from across the sub-continent – which teaches English, French and Portuguese in its general education program. Swahili, the Bantu-based language most widely spoken (over 200 million speakers) across countries in East and Central Africa, (and soon to become the

African Union's official language) and currently taught at some universities in Western countries like the US and UK, is not taught at Africa University. Not only do Africa University and other universities on the continent need to teach Swahili, as Nwuku (2003) asserts, there is also need to develop content in indigenous African languages like Swahili. The need to adapt or design content and software to suit local curricula was also expressed by Zinyeka (2005) who says that heavy dependence on external content brings in the problem of suitability and relevance to the problems at home.

Absence of ICT Policies and IT Integration Framework

A close look at the constraints discussed above will show that the absence of ICT policies and an IT integration framework in Zimbabwe, completes the picture of the interconnectedness of the constraints. The lecturers felt this absence of ICT policies and an IT integration framework was a result of the lack of appreciation of the importance of ET and the opportunities that IT could offer to universities and the education system as a whole.

This finding supports Nwuku's (2003) assertion that in many African countries, there is a lack of leadership and senior management support for information technology initiatives. Specifically referring to Zimbabwe, Machacha (2004) says that the low-level priority accorded by institutional leadership to ICT development and application is shown by unrealistic ICT budgets, compounded by the lack of funds allocated to ICT in the national budget. As can be seen, the problem of leadership is closely linked to the absence of a national ICT policy, as well as that of an IT integration framework in education in general and in higher education in particular.

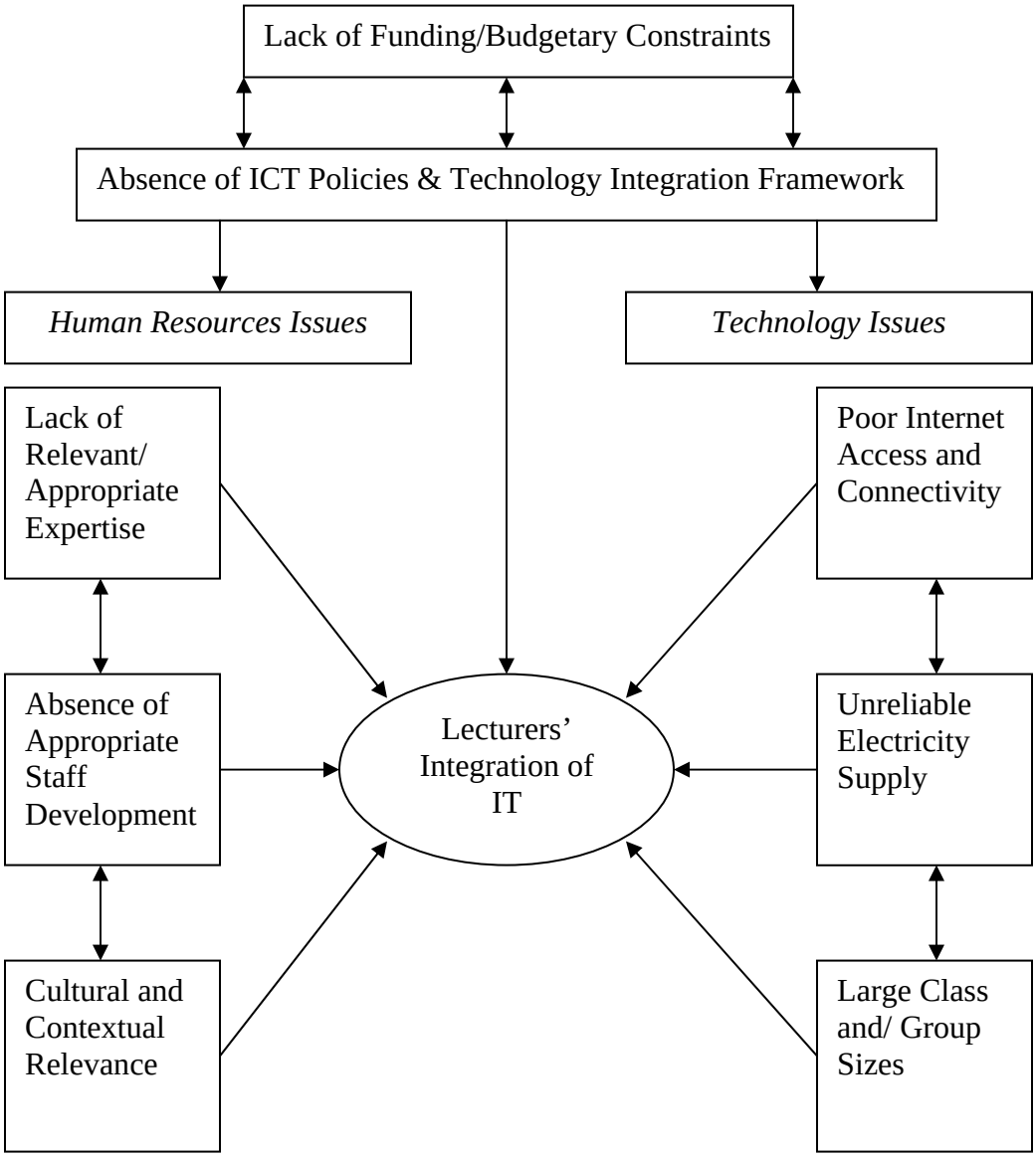
Interconnectedness of Constraints to Integration of IT by Lecturers

This discussion presents a web of constraints to the integration of IT by lecturers (see Figure 1), which consists of what this researcher identifies as the two main constraints (lack of funding/budgetary constraints and absence of ICT policies and a technology integration framework), both of which are the cause of, or have an overriding effect on all the other constraints. The next three constraints relate to human resources issues and the last three are technology related and each of these six latter constraints is either related to, is a result of, or is the cause of the next/other constraint.

Lack of funding and budgetary constraints (characterized by absence of physical infrastructure, technological tools related resources) and the absence of ICT policies and a technology integration framework result in the other six constraints identified in this study. For example, the absence of physical infrastructure because of lack of funding leads to poor electricity supply, which affects connectivity and Internet access and results in large classes or group sizes having to share few Internet-connected computers.

On the other hand, the absence of ICT policies and an integration framework play a part in budgetary constraints and the absence of appropriate staff development, which can be linked to the dearth in relevant and appropriate expertise, as well as to the issues concerning the cultural and contextual relevance of the integration of the technology. On the model in Figure 1, the double arrows between constraints show the interconnectedness of the constraints across the board.

Figure 1. Model of Constraints to IT Integration by the Lecturers



Impact of the External Operating Environment

The constraints to IT integration at universities in Zimbabwe, as well as their interconnectedness, need to be understood in the context of the institutions' external operating environment. In other words, what is it that constitutes that environment in

which the universities find themselves operating in, but over which they may have little or no control?

It should be noted that the political instability in Zimbabwe, and the deteriorating relationship between Zimbabwe and key donors was noted as having affected potential investment and funding in the universities, thereby worsening the lack of funding, which is the main constraint and which itself results in, causes or affects all the other constraints discussed in this study. As pointed out in the analysis of the institutions' analyses of their external operating environments, the hyper-inflationary environment resulting from the political instability makes it difficult for the universities to tackle these constraints.

Transformative Integration of IT

As can be seen in the above discussion of the eight constraints to IT integration by the lecturers, there is a perverse interconnectedness of these constraints across the board. It could be said that one or two constraints are likely to be the result of or have a negative or undesirable effect or impact on the other constraint(s). It is this researcher's view that given this pattern, (interconnectedness of constraints) there is need for a holistic and systematic approach to tackling the constraints in a transformative manner. Although White (1999) suggests that the transformative approach to technology integration begins in teacher education, it is this researcher's position that transformation in Zimbabwe has to start at some level of national leadership, in order to have the desired transformative effect on teacher education in universities as well as throughout the education system.

Based on the transformative approach to IT integration, lecturers' conceptualization of ET, their integration of IT as well as the interconnectedness of

institutional support and constraints to IT integration, it is this researcher's belief that the main solution lies in putting in place a national leadership, possibly at ministerial level, that would formulate national ICT policies and a technology integration framework. The main task of such a leadership would be to work with and establish partnerships between all stake holders (such as the state, public sector and civil service, private or business sector, civic organizations and both local and international investors and donors), with a view to raising funds for infrastructure development, IT integration and project implementation in line with the sourced funding and resources. With such a leadership, ICT policies and an IT integration framework in place, all the other constraints with their origins in lack of funding would then be tackled by designated committees and institutions within the established framework.

The availability of adequate funding would reduce budgetary constraints and provide resources to build and improve infrastructure, pay for ICT and improve Internet access and connectivity. Funding would, for example, on the basis of recommendations by a particular committee, enable institutions to strategically introduce degree programs in ET for both pre- and in-service teacher educators and to put in place constant institutional and national staff development programs.

These interventions would not only help in the development of lecturers' conceptualization and understanding of ET or IT, but would also assist in improving the infrastructure and resources and enable the lecturers to acquire the relevant IT integration knowledge, skills and attitudes. Degree level education in ET would help in producing scholars who should be in the forefront of integrating IT, as well as researching the

cultural and contextual relevance and application of subject content, indigenous languages and ET in Zimbabwe.

Summary

This study sought to find out the state of IT integration by university lecturers in pre-service secondary school teacher education programs in Zimbabwe. The study explored the lecturers' conceptualization of ET as well as perspectives and experiences on their integration of technology in instruction. The lecturers' conceptualization and integration of IT need to be viewed in the context of the emergent nature of these universities, (established in the last ten to fifteen years, and with two of them still operating from temporary sites) which is characterized by the absence of adequate and appropriate infrastructure. Added to this context, most of the lecturers had taught at their current institution for a year or less and few of them had any special training in ET nor did they have much prior experience with computers.

The lecturers' conceptualization of ET was quite varied but largely at the *media* or *hardware view*, with the lecturers with training in ET projecting a *narrow systems view* (Schiffman, 1995). Although most of the lecturers were not familiar with the term IT integration in their day-to-day terminology, they gave a media or hardware approach to its definition, focusing more on the introduction and use of modern technology and less on the process of putting together all the IT that is available in order to enhance teaching and learning. Those familiar with the term IT integration, saw it (IT integration) as "technology as a component of all instruction," viewed it from a "hardware approach" or "technological deterministic" point of view or perceived it as a process of applying

technology in the teaching and learning process. These three attempts at explaining IT integration are consistent with the view of IT as media or hardware, and the notion that media or technology is used or applied in order to assist or enhance the teaching and learning process in a classroom situation.

The finding that most of the lecturers used technological tools like OHPs, TVs, and VCRs for illustrating, highlighting or showing concepts in their lecture delivery, strengthens the lecturers' media or hardware view and approach to IT integration. This is complimented by the finding that the few lecturers who used computers, used these just for preparing teaching and learning materials like handouts and OHP transparencies.

The absence of resources – both hardware and software – and the lecturers' own lack of preparedness to integrate technology, were given as the main reasons the lecturers were not using computers for instructional purposes. The lack of readiness was further confirmed by the lecturers' lack of confidence and their uncertainty in their ability to do some critical IT integration tasks. Examples of such tasks are describing how they would use IT in their classroom, creating a teaching unit that incorporates subject matter software, planning and implementing projects in which students use a range of ICT tools and helping students accomplish complex tasks in an ICT environment.

This set-up, supported by the findings on the instructional goals and strategies in the lecturers' course outlines, also confirmed the absence of a systematic approach to what Schiffman (1995) refers to as the standard systems view or approach to instructional design by the majority of the lecturers. On the other hand, the positive impact of training in ET was shown by the shift from the media or hardware approach to the narrow systems

view or approach to instructional design by the few lecturers with the post-graduate diploma in educational technology.

This study also looked at the support that the lecturers get from their institutions and the constraints they face in their integration of technology in instruction. Establishing the external and internal environments in which the universities operate, as well as the universities' and lecturers' backgrounds created the context in which the findings of the research findings should be understood, since much of the meaning is in that context.

The unstable political and socio-economic situation in Zimbabwe today, (which is hyper-inflationary) and the deteriorating relationship between the state and both local and international investors and donors, has created a difficult situation in which the universities increasingly find themselves short of funding. With little or no funding, institutional support to IT integration in terms of access to computers, the Internet, related technological tools, staff development opportunities and other relevant support is limited. This lack of funding, resulting in budgetary constraints, emerged as the single biggest constraint to IT integration in this study, and it transcends all of the other constraints.

The absence of ICT policies and an IT integration framework, which are partly due to the lack of funding, are also related to the issue of the cultural and contextual relevance of some aspects (like language and subject content) of IT integration in Zimbabwe. The other constraints, ranging from poor Internet access and connectivity, lack of relevant or appropriate expertise, absence of appropriate staff development to unreliable electricity supply and large class and/or group sizes, have their origins in or something to do with inadequate or lack of funding.

Putting together all the findings reported in this study, and based on the stages of technology development (Entry, Adoption, Adaptation, Appropriation and Invention) by Dwyer, Ringstaff and Sandholtz (1991), this study suggests that lecturers in the study were at the Entry and Adoption stages of IT integration. The subsequent stages of IT integration (Adaptation, Appropriation and Invention), as the study argued, may be achieved only when conceptualization and day-to-day integration of IT, institutional support (from lecturers' access to technological tools and technical support to consistent initial and continuous staff development), and constraints to IT integration have been holistically and systematically addressed.

Recommendations of the Study

In line with the transformative approach to IT integration and based on and complimenting the emerging national ICT policy framework, this study recommends the following:

a) The creation of a National ICT Council, which should be tasked with the formulation and implementation of ICT policies, with particular emphasis on ICT integration in the national curricula. The council should be made up of representatives of key stake holders in ICT integration. Such members should represent the president's office, the reserve bank, ministry of finance, all ministries with ICT responsibilities, the business sector and local and foreign investors and donors.

b) The formulation of steering committees at institutional level (under the direction of the national council) to implement the technology integration policies at local level. This initial framework would need to address the following issues:

- fund raising
- improvement of access to technological tools and the Internet
- initial (pre-service) teacher education and continuous (in-service) staff development
- cultural and contextual relevance of subject content and ET
- evaluation of ICT projects and programs

Fund Raising

This could be done by establishing partnerships with stakeholders (such as the state, business sector, civic organizations and both local and international investors and donors), at national and institutional level, aimed at enhancing local and foreign investments in universities and raising funds for improving and maintaining national and institutional infrastructure. The funds generated would, through the established framework, be used in tackling and addressing the constraints to IT integration discussed in this study.

Improvement of Access to Technological Tools and the Internet

This would include exploring and recommending ways of ensuring reliable electricity supply, and ensuring adequate bandwidth for Internet requirements by controlling costs through opening up the telecommunications market, and ensuring that Internet Service Providers (ISPs) set up Internet exchange points that would route traffic within Zimbabwe or the sub-region, instead of through Europe and North America.

Initial (Pre-Service) Teacher Education and Continuous (In-Service) Staff Development

The dearth in knowledge, skills and appropriate attitudes in IT integration will need to be tackled through systematic staff development programs and initiatives at national and at institutional levels. The following initiatives are recommended:

a. Strategic establishment (through recommendations of the various committees within the established national and institutional framework) of degree-level and graduate programs in ET and related areas at selected local universities.
b. Establishment of continuous (in-service) staff development programs and opportunities for lecturers at the respective institutions. Programs may include faculty exchange programs, in-house training of technologists and technicians and joint workshops for faculty and staff.
c. Creation of partnerships, joint ventures and collaboration with regional and international institutions seen as leaders in best practices in ICT integration.
d. Establishment of a platform for teacher educators to share their knowledge, skills and experiences. This could be done through:

- facilitating the formulation of a professional organization for teacher educators with special interest in IT integration.
- encouraging and facilitating teacher educators to join regional IT integration discussion lists and mailing lists, such as the SANTEC listserv.
- establishing a local discussion list and mailing list(s) for professionals interested in IT integration in Zimbabwe.

- encouraging teacher educators to subscribe to international discussion lists like ITFORUM, for them to benefit from discussions and experiences of fellow professionals at the international level.

Cultural and Contextual Relevance of Subject Content and ET

The adaptation and implementation of the preceding recommendations should create the ideal conditions for exploring the application of content for different subjects and ET in the Zimbabwean curriculum, with a view to improving their cultural and contextual relevance.

Evaluation of ICT Projects and Programs

Formative and summative evaluation of programs and projects should be carried out at all levels of implementation. This will enable the planners to determine the worth of these IT integration initiatives as well as how best they may be executed.

Limitations of the Findings

The findings of this study, which reflect the integration of IT by university lecturers at pre-service secondary school teacher education programs in Zimbabwe, need to be understood in the context of the following limitations:

1. The late start to the academic year at the two state universities, which was caused by the scheduling of general parliamentary elections in March, meant that there were no students on campus (at these two institutions) until the end of March 2005. As a result, lecture observations could not be done and most of the data collected through interviews was based on self-reports of the participants'

perspectives and experiences. Lecture observations would have provided data to support and triangulate data from interviews, questionnaires and analysis of documents.

2. Collection of data relating to university administrators' perspectives and experiences on lecturers' integration of IT was not done. Data from the administrators would have given a more detailed picture of the lecturers' integration of IT at these universities.
3. Data on students' use of technology in their day-to-day learning activities could have supported and complimented data collected from the other sources.

Suggestions for Future Research

This exploratory study provides a basis on which further research needs to be done in IT integration by lecturers in pre-service secondary school teacher education programs in Zimbabwe. First, there is need to carry out a similar study to establish the perspectives and experiences of the universities' leadership. Deans of faculties (colleges) of education, heads-of-departments in these faculties (colleges) and heads of information technology or computer services departments would yield data essential to establish the administrators' conceptualization of IT, their support for IT as well as their views on the constraints to IT integration. This in turn would help in arriving at a better understanding of IT integration issues and inform more comprehensive approaches to technology integration at these universities.

The broad and contentious issues of the cultural and contextual relevance of subject content and ET in teacher education in Zimbabwe needs to be researched, with a

particular focus on the role of indigenous languages in instruction, and the application of content and educational technology solutions to the Zimbabwean curriculum.

Conclusion

If African tertiary institutions "need to run very fast to avoid falling very far behind" in terms of ICT integration (Africa University Strategic Development Plan 2001-2008, 2002 p. 4), then these institutions need to stand up first, before they can walk, let alone run. To engage in the ICT race, (which seems to have become a marathon) African tertiary institutions will need to ensure adequate funding and institutional support to IT integration. They will need to formulate policies and implementation frameworks that seriously address the conceptualization of IT and its integration, as well as address issues relating to institutional support and constraints to IT integration identified in this study. Only then will the institutions be able to steadily walk, on their way to seriously engaging in the ICT marathon.

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APPENDIXES

APPENDIX A

Letter of Introduction from Research Director

Department of Middle/Secondary Education
and Instructional Technology

University Plaza
Atlanta, GA 30303
Phone: 404/651-2510
Fax: 404/651 2546

December 6, 2004

To Whom It May Concern:

This is to certify that Rodwell Chitiyo is a PhD (Instructional Technology) student in the College of Education at Georgia State University and is traveling to Zimbabwe to collect research data for his dissertation.

If you have any questions, feel free to contact me.

Academic Advisor: Dr. Steve Harmon

Signature:

Dr. Stephen W. Harmon
Associate Professor
Director of Educational Technology

Georgia State University
College of Education/Instructional Technology Center
Box 3976
Atlanta, GA 30302-3976

404-651 2349 (voice)
404-651 2546 (fax)
E-mail: swharmon@gsu.edu

APPENDIX B

Request for Permission to Collect Data

Africa University
P. O. Box 1320
Mutare

The Registrar
…….. University
Zimbabwe

Dear Sir/Madam,

RE: **Request for Permission to Collect Data for My PhD (Instructional Technology) Dissertation**

I am requesting for permission to collect research data at …….University. The proposed title of my dissertation is, "Integration of Instructional Technology by University Lecturers in Pre-Service Secondary School Teacher Education Programs in Zimbabwe: An Exploratory Study".

I am an Instructional Technology lecturer in the Faculty of Education at Africa University. Currently I am on study leave and studying for a PhD in Instructional Technology at Georgia State University in Atlanta, Georgia, USA. Please see attached copy of a letter of introduction from my research director.

If granted permission, this research will look at IT integration by lecturers at the university. Specifically, the study will attempt to answer the following questions:

- How is instructional technology (IT) conceptualized by the lecturers?
- How do the lecturers integrate IT into their instruction?
- What support do the lecturers get from their institutions?
- What constraints are faced by lecturers in integrating IT?

It is hoped that this exploratory study will not only be a harbinger in empirical research in IT integration in Zimbabwe, but that it will be part of the nucleus of IT literature in the Zimbabwean context. It is also hoped that insights gleaned may influence policy, practice and future research in teacher education in general and in IT integration in particular.

Yours Faithfully,

Rodwell Chitiyo.

APPENDIX C

Letter of Self Introduction to Lecturers

Georgia State University
College of Education
Box 3976
Atlanta, GA 30302

Faculty of Education

Dear Colleague,

Re: Research Data Collection

I am a doctoral student in Instructional Technology at the above-mentioned institution and I am carrying out a study on the integration of instructional technology by university lecturers in pre-service secondary school teacher education programs in Zimbabwe.

The research study has been approved by the respective university authorities.

Part of the study involves obtaining information from your department. I therefore request your kind assistance by allowing me to interview you. I also hope to collect some related documents.

No name of participants shall appear in the study and the results obtained will be used for academic purposes only.

Thank you for your kind assistance.

Yours sincerely,

Rodwell Chitiyo.

APPENDIX D

Georgia State University

Middle-Secondary and Instructional Technology Department

Informed Consent Form for Lecturer

Title: Integration of Instructional Technology by University Lecturers in Pre-Service Secondary School Teacher Education Programs in Zimbabwe: An Exploratory Study

Please read this consent agreement carefully before you decide to participate in the study

Purpose of the study: The purpose of this research study is to explore and gain a better understanding of the integration of instructional technology by university lecturers in pre-service secondary teacher education programs in Zimbabwe.

What you will do in the study: You will be interviewed once, at a quiet location of your choice. You will also be observed teaching a class by the principal investigator, Rodwell Chitiyo. There will be minimal, if any, distraction to the lesson and the observer will not interact with students. I will not be evaluating your ability to teach and the information collected will not be used in any performance evaluation. No one in your institution will have access to the information I collect during the observation. A two-page questionnaire will be administered.

Time required: The interview is expected to last between 60 minutes and 90 minutes. Lesson observation is expected to be within the 2 hour duration of the lesson. The questionnaire should take 10 to 15 minute to complete.

Risks: There are no risks or discomfort associated with this study.

Benefits: The study will not benefit you directly, but may lead to a better understanding of instructional technology integration in pre-service teacher education in Zimbabwe.

Confidentiality: The information that you give will be handled confidentially. Interviews will be tape-recorded, with your permission for later transcription. All the audio-tapes will be securely stored and destroyed at the conclusion of the study. Your name and that of your institution will not appear in the dissertation or any presentations that may result from this study.

Voluntary participation: Your participation in this study is voluntary. Your refusal to participate in the study will not result in sanctions against you and your job will not be jeopardized if you decline the invitation to participate.

Right to withdraw from the study: You have the right to withdraw from this study.

How to withdraw from the study: If you want to withdraw from the study, please inform the investigator, Rodwell Chitiyo, by e-mail rodchitiyo@hotmail.com or by phone: 091-344-450 (Zimbabwe number) or 1-678-795-3397 (USA number).

Who to contact about this study or your rights in the study: You may present questions about this project to Rodwell Chitiyo, at the above contact details. You may also contact his advisor, Dr. Steve Harmon, Department of Middle Secondary and Instructional Technology, at Georgia State University by telephone: 1-404-651-2349 or by e-mail: swharmon@gsu.edu . Susan Vogtner may also be contacted by telephone at 1-404-463-0674 or by e-mail: svogtner1@gsu.edu The Georgia State University Research Office can provide you with general information about the rights of human subjects in research.

Agreement: I agree to participate in this study. A copy of this form will be made available for me to keep.

_____ I grant permission to be audio-taped.
_____ I do not grant permission to be audio-taped.

_____	_____	_____
Participant's Name	Signature	Date

_____	_____	_____
Principal Investigator's Name	Signature	Date

APPENDIX E

Interview Guide for Lecturers

Background Information:

Gender: _____ Location _____

1. How many years have you been preparing pre-service teachers?

   Did you teach elsewhere before becoming a teacher educator?

   If so, for how many years did you teach elsewhere?

   How many years have you been teaching at your current institution?

2. What is the highest degree earned?

   In what discipline was the degree earned?

   Did you take educational technology (ET) courses(s) in your teacher/lecturer preparation?

   If so, what was the title of the ET course(s) you took?

   Do you have any special training or qualifications in educational technology?

3. Did you use computers during your own teacher education years?

   If so, what did you use the computers for?

   If not, why did you not use computers?

Research Question 1: How is IT conceptualized by lecturers in pre-service secondary school teacher education programs at universities in Zimbabwe?

4. How would you define the term educational technology?

5. In your own view, is there a difference between ET and instructional technology (IT)?

If so, what is/are the differences?

6. What do you understand by the term IT integration?

Research Question 2: How do the lecturers integrate IT in their day-to-day instruction?

7. Which course(s) do you teach?

8. Which technological gadgets/tools do you use in your day-to-day instruction?

9. For what purpose do you use each of these gadgets/tools?

10. Do you currently use computers for instructional purposes?

If so, for what and how do you use the computers?

If not, what is/are your reason(s) for not using computers?

Research Question 3: What support do the lecturers get from their institutions in integrating IT?

Research Question 4: What are the constraints faced by the lecturers in integrating IT?

11. What technological gadgets /tools are available for you to use in your instruction?

12. How accessible are the gadgets/tools for instructional purposes?

13. Are there any problems in the functional condition of these instructional gadgets/tools?

If so, what is/are the problem(s)?

14. Do you have a computer in your office?

If so, is the computer connected to the Internet?

15. Do you have access to a computer in the Faculty of Education (FOE)?

If so, is the computer connected to the Internet?

For how long per day do you have access to that computer?

16. Do you have access to a computer in the university?

If so, is the computer connected to the Internet?

For how long per day do you have access to that computer?

17. Do the students you teach have access to computers in the FOE?

    If so, are the computers connected to the Internet?

    For how long per day do the students have access to computers?

18. Do the students you teach have access to computers in the university?

    If so, are the computers connected to the Internet?

    For how long per day do the students have access to computers?

19. Do you have access to computer technicians to assist you when you need help with a computer?

20. Do you have access to a computer instructor/assistant to assist you when you need help with computer operation and applications?

21. Does your institution offer opportunities for staff/professional development in ET?

    If so, what are the opportunities offered?

    If not, why are opportunities not offered?

22. Have you participated in staff/professional development activities?

    If so, did the staff/professional development help you in using technology in your instruction?

    If not, why did you not participate?

23. What other support does your faculty/institution provide to enable you to use technology in your day-to-day instruction?

24. Is there any addition or comment you would like to make in terms of IT integration at your institution?

25. What other constraints do you face in using technology for instructional purposes?

APPENDIX F

Computer Technology Proficiency and Competence (CTPC) Questionnaire for Lecturers

All information will be treated in strict confidence. Please write your answers in the spaces provided or put an X in the appropriate box.

Part A:
Instructions: Select one level of agreement to each item and place an X in the corresponding box.

SD = Strongly Disagree D = Disagree U = Undecided A = Agree
SA = Strongly Agree

I feel confident that I could …

	SD	D	U	A	SA
1. send e-mail to a friend					
2. subscribe to a discussion list					
3. create a “nickname” or an “alias” to send e-mail to several people at once.					
4. send a document as an attachment to an e-mail message					
5. keep copies of outgoing messages that I send to others					
6. use an Internet search engine (e.g. Goggle or Alta Vista) to find Web pages related to my specific subject area.					
7. search for and find the Smithsonian Institute Web site					
8. create own World Wide Web home page					
9. keep track of web sites I have visited so that I can return to them later (e.g. using bookmarks)					
10. find primary sources of information on the Internet that I can use in my teaching					
11. use a spread sheet to create a pie chart of the proportions of students’ scores (in ranges), on a revision test.					
12. create a news letter with graphics and text in 3 columns					
13. save documents in formats so that others can read them if they have different word processing programs (e.g. saving as Word)					
14. use the computer to use a slideshow presentation					
15. create a database of information about important authors in a specific subject area					
16. write a paper describing how I would use instructional technology in my classroom					

17. create a lecture or teaching unit that incorporates subject matter software as an integral part					
18. use technology to collaborate with fellow lecturers or student teachers who are distant from my lecture room					
19. describe 5 software programs that I would use in my teaching					
20. write a plan with a budget to buy technology for my lecture room					

Part B:
Instruction: Select one level of agreement to each item and place an X in the corresponding box.

SD = Strongly Disagree D = Disagree U = Undecided A = Agree
SA = Strongly Agree

	SD	D	U	A	SA
21. I feel competent using a word processor and graphics to develop teaching materials					
22. I feel competent using e-mail to communicate with colleagues					
23. I feel competent using the World Wide Web to find educational resources					
24. I feel competent using an electronic grade book					
25. I feel competent planning and implementing projects in which students teachers use a range of information technologies					
26. I feel competent to help students learn to solve problems, accomplish complex tasks, and use higher-order thinking skills in an information technology environment					
27. I feel competent about teaching student teachers appropriate information technology skills and knowledge.					
28. I feel competent working with students in various IT environments (e.g. standalone and networked computers, one-computer classrooms, labs, etc)					

Thank you for your time.