DSPACE

https://dspace.org/

Is ICT being integrated pedagogically into teaching and learning events at Kigali Institute of Education (KIE)?

Bahati, Bernard

2011-05-24
http://hdl.handle.net/10539/9919

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

IS ICT BEING INTEGRATED *PEDAGOGICALLY* INTO TEACHING AND LEARNING EVENTS AT KIGALI INSTITUTE OF EDUCATION (KIE)?

Bernard Bahati

A research report submitted to the Wits School of Education, Faculty of Humanities, University of the Witwatersrand in partial fulfillment of the requirements of the degree of Master of Education.

Johannesburg

2010

Declaration

I hereby declare that this research report is my own and unaided work. Wherever other resources have been used, they have been acknowledged. It is being submitted in partial fulfillment of the requirements for the degree of Master of Education in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.

Bernard BAHATI

December 7th, 2010

Abstract

This research was carried out in the context of the current efforts made in the line of integrating ICT-as a medium of teaching and learning - in Rwandan Higher Institutions of Learning and focused on the pedagogical integration of ICT in teaching and learning events at KIE. Both qualitative and quantitative research approaches were used and the data were collected using survey questionnaires, interviews, student discussions, and documentary analysis.

The findings show that while KIE has made the commitment to use ICT in supporting and facilitating the successful pursuit of its mission, there is no coherent and detailed strategy or framework to support the use of ICT pedagogical tools in the teaching and learning events. As far as equipment, connectivity and access of/to ICT facilities at KIE are concerned, this study show that although the current level of ICT equipment, accessibility, and connectivity of ICT-related facilities at KIE is not flawlessly conducive to the effective integration of ICT in teaching and learning activities, there is an ICT foundation (in terms of equipment, accessibility and connectivity) that would allow KIE academic members to integrate ICT in their activities to a certain extent. However, the lack of [or inadequate] teacher training and development coupled with other institution-level and human-level manipulative and non-manipulative barriers, is impeding the effective integration of ICT into teaching and learning events at KIE. As a result, KIE lecturers and students are using sporadically ICT as an add-on to their traditional "teaching and learning as usual" with no real impact in which lecturers would rethink new ways of re-engineering the teaching strategies leading to increased quality in teaching and learning.

Dedication

This work is dedicated to my wife and kids. I also would like to dedicate it to my late Father and Mother. May they rest in eternal peace.

Acknowledgements

First and foremost, I would like to thank the LORD Almighty for having given me the opportunity and strength to do my Masters.

There are also a number of people without whom this work might not have been done and to whom I am greatly indebted:

To my late parents for the myriad ways in which, throughout my life, you have actively supported me to become the best I could.

To my dear wife, Clémentine, who provided a cushion of encouragement, love and support to me and gave me encouragement when the road became rough. A very special 'thank you' for your practical and emotional support.

I would like to thank my supervisor, Professor Ian Charles Moll, for being there for me and guiding me through the academic corridors of the University of the Witwatersrand. Your advice and guidance helped me to sail through my Masters' program with success and courage. I was blessed to have advice and guidance of such high caliber Don and Researcher. I thank you for the time and efforts you deployed as I went through the different milestones in my Masters' program and for the deft ways in which you lovingly challenged and supported me throughout the whole of this work and knowing when to push and when to let up. My heartfelt thanks also go to Lynne Slonimsky - lecturer in the School of Education at the University of the Witwatersrand - whose steady insistence on "digging deep in my writings" helped me a lot. You were strong pillars for my academic progress.

Loving thanks to all my friends/learning partners and Rwandan Students at Wits School of Education, especially Gilbert Munyemana, who played such important roles along the journey, as we mutually engaged in making sense of the various challenges we faced and in providing encouragement to each other at those times when it seemed impossible to continue.

Lastly, I offer my regards and blessings to all of those who supported me in any respect during the completion of the project.

Table of contents

Declaration ----- ii
Abstract ----- iii
Dedication ----- iv
Acknowledgements ----- v
Table of contents ----- vi
List of Tables ----- viii
List of Figures ----- ix
Abbreviations ----- x

CHAPTER 1: INTRODUCTION ----- 1
1.1. Problem statement and Research Aim ----- 3
1.2. Research questions ----- 4
1.3. Rationale ----- 4
1.4. Organization of the Study ----- 5

CHAPTER 2: LITERATURE REVIEW ----- 6
2. 1. Defining ICT and ICT integration into teaching and learning ----- 6
2.1.1. Defining ICT ----- 6
2.1.2. Integration of ICT into teaching and learning ----- 7
2.2. Some Guiding Frameworks to pedagogical integration of ICT into teaching and learning ----- 9
2.2.1. Laurillard's (2002) conversational framework ----- 9
2.2.2. Pedagogical Approaches or Teaching Styles vis-à-vis the Use of Technology ---- 11
2.3. Why should ICTs be used in teaching and learning? ----- 14
2.3.1. The impact of ICT on what is learned ----- 15
2.3.2. The impact of ICT on *how* students learn ----- 16
2.3.3. Impact of ICT on Teaching and Pedagogy. ----- 16
2.4. Teachers/lecturers' and students' competencies vis-à-vis Pedagogical integration of ICT into teaching and learning ----- 17
2.5. Barriers to pedagogical integration of ICT in teaching and learning ----- 20
2.6. Conclusion of Literature Review ----- 22

CHAPTER 3: METHODOLOGY ----- 24
3.1. Research Participants ----- 24
3.2. Research Design ----- 25
3.3. Data collection tools ----- 25
3.3.1. Questionnaires ----- 25
3.3.1.1. Faculty Dean Questionnaire ----- 25
3.3.1.2. Lecturer Questionnaire ----- 26
3.3.2. Interviews ----- 26
3.3.3 Learner discussion focus groups ----- 27
3.3.4. Documentary Analysis ----- 28
3.4. Ethical considerations ----- 29
3.5. Data analysis ----- 30
3.6. The reliability and validity of the data of the study ----- 31
3.7. Limitations of the study ----- 32
Summary ----- 33

CHAPTER 4: PRESENTATION OF FINDINGS ---------- 34
4.1. Research site at a glance---------- 34
4.2. KIE ICT policy ---------- 34
4.3. Equipment, connectivity and access of/to ICT facilities at KIE---------- 37
4.3.1. ICT Equipment/facilities ---------- 37
Table 5. ICT facilities/tools available at KIE and meant to be used in teaching and learning ---------- 38
4.3.2. Connectivity ---------- 38
4.3.3 Access to ICT facilities ---------- 39
4.4. Pedagogical ICT use at KIE ---------- 40
4.4.1. Integration of ICT in teaching and learning at KIE---------- 40
4.4.1.1. Pedagogical use of ICT by KIE lecturers and Students---------- 46
4.4.2. Other findings: Ongoing Projects ---------- 51
4.4.2.1. Education for Community Cohesion ---------- 52
4.4.2.2. Pan African e-Network (Tele-Education) ---------- 52
Table 9. Teaching and learning events, pedagogical tactics, and associated ICT facilities and strategies at KIE ---------- 54
4.5. Teacher training and professional development---------- 55
4.6. Impact of ICT use on teaching and learning ---------- 58
4.6.1. Impact of ICT on lecturers and teaching ---------- 58
4.6.2. Impact of ICT on students and learning---------- 61
4.7. Barriers and challenges to pedagogical integration into teaching and learning events at KIE ---------- 64
4.7.1. Institution-level manipulative barriers ---------- 65
4.7.2. Lecturer-level non-manipulative barriers ---------- 68
4.7.3. Lecturer-level manipulative barriers---------- 70
4.7.4. Student-level non-manipulative and manipulative barriers---------- 70
Summary---------- 72

CHAPTER 5: DISCUSSION OF FINDINGS ---------- 73
5.1. KIE ICT Policy ---------- 74
5.2. Equipment, connectivity and access of/to ICT facilities at KIE---------- 75
5.3. Teacher training and professional Development ---------- 77
5.4. Pedagogical use of ICT ---------- 79
5.5. Impact of ICT Pedagogical use on KIE students and their learning, and on Lecturers and their teaching ---------- 83
5.5.1. Impact of ICT use on lecturers and teaching ---------- 83
5.5.2. Impact of ICT use on students and learning ---------- 84
5.6. Barriers and challenges to pedagogical integration of ICT in teaching and learning at KIE : ---------- 84
Summary---------- 86

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS ---------- 87
6.1. Conclusion ---------- 87
6.2. Recommendations---------- 88
6.3. Areas for Further Study ---------- 89

REFERENCES ---------- 90
APPENDICES ---------- 96

List of Tables

Table 1. Teaching and learning events and associated media forms ---------- 9
Table 2. Implications of different pedagogical approaches for different technologies. -- 11
Table 3. Potential and Actual research participants ---------- 24
Table 4. Research questions (and themes) and data collection tools that were used------ 29
Table 5. ICT facilities/tools available at KIE and meant to be used in teaching and learning ---------- 38
Table 6. Results of lecturers' self-evaluation in regard to the Basic Teacher Computer Use ---------- 41
Table 7. KIE Student-teachers' competencies in using ICT for learning activities ------- 45
Table 8. Computer programs and websites used by KIE lecturers in their teaching specialties ---------- 47
Table 9. Teaching and learning events, pedagogical tactics, and associated ICT facilities and strategies at KIE ---------- 54
Table 10. Summary of ICT-related skills mastered by some KIE lecturers following different training programmes ---------- 57
Table 11. Summary of barriers faced by KIE Lecturers and Students in Using ICT for academic purposes ---------- 64

List of Figures

Figure 1. A Unified Model of integrating ICT into teaching and learning processes----- 13
Figure 2. Results of lecturers' self-evaluation in regard to the Basic Teacher Computer Use ---------- 43
Figure 3. Categories of ICT uses in KIE student's assignments production ---------- 50

Abbreviations

AAU:	Association of African Universities
AEU:	Association for European Universities
B.Ed:	Bachelor of Education
CAD:	Computer-Aided Design
CAL:	Computer-Assisted Learning
CBT:	Computer-Based Training
CD:	Compact Disc
CD-ROM:	Compact Disc Read-Only Memory
CMC:	Computer Mediated Communications
DFID:	Department for International Development (UK)
DVD:	Digital Versatile Disc or Digital Video Disc
HEI:	Higher Education Institution
ICT(s):	Information and Communication Technology (ies)
IGNOU:	Indira Gandhi National Open University
IP:	Internet Protocol
ISDN:	Integrated Services Digital Network
KIE:	Kigali Institute of Education
LAN:	Local Area Network
LCD:	Liquid Crystal Display
MBA:	Master of Business Administration
MS:	Microsoft
NICI:	National Information and Communications Infrastructure (Rwanda)
PC:	Personal Computer
PhD (DPhil):	Doctor of Philosophy
PHP:	Hypertext Preprocessor
PISA:	Programme for International Student Assessment
PPT:	PowerPoint
SA:	South Africa
SPSS:	Statistical Package for the Social Sciences
TV:	Television
TWIK:	Teaching with ICT Kits
UNESCO:	United Nations Educational, Scientific and Cultural Organization
USAID:	United States Agency for International Development
VSAT:	Very Small Aperture Terminal
WAN:	Wide Area Network
WWW:	World Wide Web

CHAPTER 1: INTRODUCTION

Society is undergoing drastic changes at a rapid pace. One of the traditional and fundamental functions of education has been and will continue to be about helping people to find their way in the society by equipping them with enabling and necessary skills, knowledge, and competencies. Many scholars agree that at the dawn of the 21st century education delivery should not continue to be as 'business as usual'. The traditional three Rs-literacy (**R**eading, w**R**iting, and a**R**ithmetic) is challenged by an unprecedented rapid creation and dissemination of knowledge and information hence the move from an Industrial Society to a Knowledge Society. As Kwadwo (2007) puts it, the Knowledge Society is the society that knows how to use information. For the effective use of information, one needs more than traditional reading, writing, and arithmetic skills.

The dynamism of the drastic socio-economic change leads some educational analysts to question the way education is currently being delivered. This is reflected in Christie's (2008) ideas, when she says that "given that knowledge and information have become sources of value in the global economy, the 'term knowledge economy' has some appeal. Questions then arise about an appropriate education for the knowledge economy"(p.55).

In answering the question 'What should school teach?', Christie reviewed theorists who advocate the teaching of *multiliteracies* that signifies the expanded literacies of the knowledge society, and for her, "this raises the issue of *technologies* that link the global world in networks of information, images and ideas". For people to effectively participate in the global networked economy, they must have the power to access networks, and switch between multiple networks (citing Castells, 2001:17).

Can ICTs help meet the educational requirements of the digital era?

The answer to this question is not straightforward as it may seem. First of all ICTs are not a certain 'magic wand' that educationists can shake to fix all the educational challenges faced in the current knowledge society.

> "The demands and concerns facing the education enterprise were not created by ICTs and will not be resolved by ICTs either. It is going to be very difficult—if not impossible—for countries to meet the objective of *effective learning, for all, anywhere, anytime*" (Wadi & Draxler (2002: 8)

Notwithstanding the fact that ICTs are not considered to be a panacea to solve current educational requirements, these authors' contention is that some countries and institutions have turned to information and communication technologies (ICTs) and are exploring ways by which ICTs may help them in pursuing their educational goals (p.29).

However, ICTs can help meet the educational requirements of the digital era, only if all attempts to use ICT in education are underpinned by sound pedagogical principles aiming at improving the quality of teaching and learning. In this context, the introduction of ICT to educational process alone is not enough. The ICT-pedagogy integration is essential since technology, by itself, will not bring about the desired changes in students' learning and participation in the global networked economy.

It is this claim that forms the basis of the present study which focuses on pedagogical integration of ICTs into teaching and learning events in one of the Rwandan Higher Institutions of Learning (KIE), the sole institution in Rwanda whose prime mission is the training of secondary teachers. The researcher strongly supports Carlson and Gadio's (2002) views about professional teacher-training in the field of ICT:

> "Educational technology is not, and never will be, transformative on its own—it requires teachers who can integrate technology into the curriculum and use it to improve student learning."

This raises the questions of: Has Rwanda embarked on the process of becoming a knowledge-empowered society? How well does the Rwandan prospective secondary teachers' training process integrate the use of ICTs? Is KIE embracing the global move or lagging behind?

Therefore, the central research question of this study is: **Is ICT being integrated *pedagogically* into teaching and learning events at Kigali Institute of Education (KIE)?**

1.1. Problem statement and Research Aim

Information and Communication Technologies (ICT) is becoming a ubiquitous feature in education. Many educational institutions are striving to integrate different aspects of ICT in their teaching and learning processes. The advent of the Internet led some analysts to predict a certain kind of educational revolution that would profoundly alter the way teaching and learning events occur. Even though the rapid development of emerging technologies attracts the attention of teachers, there are challenges to the effective pedagogical integration and use of these new technologies.

So far, at KIE[1], efforts have been made in terms of access to ICT-related facilities. However, access does not imply usage and (any) usage does not imply effective usage is happening.

Any attempt to integrate ICT into teaching and learning events in an educational institution like KIE needs to be underpinned by sound pedagogical principles aimed at improving the quality of teaching and learning. In this context, mere introduction of technology to the educational process is not enough. The way in which teachers integrate ICT in their teaching will determine whether or not there is an added value to the learners. This will be attained if "the knowledge about technology is not seen as a separate and unrelated body of knowledge divorced from the context of teaching" (Khirwadkar, 2007). In describing 'techno-pedagogy as a skill', Khirwadkar refers to three areas of knowledge: *Content* (the subject matter that is to be taught), *Technology* (modern technology such as computers, Internet, digital video, overhead projectors, CDs, etc), and *Pedagogy* (the collected practices, strategies, procedures and methods of teaching and learning). In this study, technology integration means the understanding and negotiation of relationship of these three elements. Therefore, the present study aims to analyse and understand the pedagogical integration of ICT at Kigali Institute of Education (KIE).

Trainers (lecturers), in teacher training institutions like KIE, need to serve as good role models both in terms of effective teaching and adopting innovations such as the use of

[1] Kigali Institute of Education

ICTs in their teaching practices to raise the quality of learning experience of trainee-teachers. In addition, if student-teachers are to become confident and competent users of different technologies in their own classes, then they need to see their lecturers also using various technologies in their instruction. It is often easier for some teachers to preach "by theories" instead of "preaching by examples" thus encouraging their students to use ICTs yet they (lecturers) do not use ICTs themselves to show the learners the "how to…".

1.2. Research questions

The focus of this study is on the pedagogical integration of ICTs in teaching and learning activities at KIE and thus an attempt is made to find answers to the following question:

- Is ICT being pedagogically integrated into Teaching and Learning at KIE? For practical reasons, this question was broken down into sub-questions as follows:

    - Are KIE lecturers using available ICT facilities and resources to help them to pedagogically improve their teaching practices?

    - Are KIE student-teachers using available ICT facilities and resources for academic purposes (in their various academic activities)?

    - What is the impact, if any, (as perceived by both lecturers and student-teachers), attributable to ICT pedagogical integration on teaching and learning on (a) student and their learning (b) lecturers and their teaching at KIE?

    - What are the major barriers (as perceived by both student-teachers and lecturers) hindering ICT integration in teaching and learning events at KIE?

1.3. Rationale

Information and Communication Technologies (ICTs) have been the great enabler over the past couple of years and humanity has increasingly relied on them. Castells observed: "Information technology, and the ability to use it and adapt it, is the critical factor in generating and accessing wealth, power, and knowledge in our time"(1998: 92). However, it is well known that there is a major gap between industrialized and developing countries (including Rwanda) in terms of their access to and use of information and communications technology (ICT). This phenomenon is known as the

digital divide. It is, therefore, necessary and imperative to find different ways of bridging this divide otherwise developing countries such as Rwanda will be left behind in the current digital era. The pervasiveness of Information and Communication Technology extends into all aspects of life, including education. The Rwandan education system is affected by this global trend and efforts have been made to position information and communication technology (ICT) in different sectors of life including Higher Education. The prospective teachers at KIE are expected to play an important role in the sustained implementation of ICT in schools and also make sure that the learners are exposed to the effective use of ICT in their training. This research was conducted in the context of the current efforts made in the line of integrating ICTs as a medium of teaching and Learning in Rwandan Higher Education. The findings provide an overall picture of the integration of ICTs in teaching and learning events at KIE and thus serve as the basis for improving further practices in this educational domain.

1.4. Organization of the Study

The study is organized into six chapters. Chapter 1 presents an introduction to this study and the context in which it was carried out, the statement of the problem, purpose of the study, and the research questions. The review of literature on topics regarding the integration of ICT in teaching and learning is contained in Chapter 2. In Chapter 3 the methodology of the study is described. Presentation of the study findings forms the basis of Chapter 4. Chapter 5 deals with discussion of findings. In Chapter 6, the conclusions and recommendations are presented and suggestions are made for what can be done in future research.

CHAPTER 2: LITERATURE REVIEW

The literature related to this study sheds light on a number of essential features including:

- Definition of ICT and integration of ICT into teaching and learning
- Frameworks of pedagogy-ICT integration
- Impact of ICT use on teaching and learning
- Teachers/lecturers' and students' competencies vis-à-vis the pedagogical integration of ICT into teaching and learning and
- Barriers to pedagogical integration of ICT in teaching and learning**.**

2. 1. Defining ICT and ICT integration into teaching and learning

2.1.1. Defining ICT

There is a general common understanding emerging from (AAU[2] (2002:7; Wadi & Draxler, op.cit. p.68; UNESCO, 2003:13; Toomey in Lloyd, 2005) who define Information and Communication Technology (ICT) as "those technologies that are used for accessing, gathering, manipulating and presenting or communicating information".

When it comes to providing details about the different features of ICT, AAU, Wadi and Draxler seem to focus on " the new digital technologies" items (seen as PCs; notebooks; laptops; televisions; digital cameras that are both video and single-image; local area networks; Intranet, the Internet; World Wide Web; CD-ROMs and DVDs) as well as their applications [software] (including word processing; spreadsheets; tutorials; simulations; electronic mail; digital libraries; computer-aided designs; computer-mediated conferencing and videoconferences, and virtual reality). In contrast, the UNESCO's (2003) definition of ICT – as applied primarily to education, traces back to previous terms like *information technology (IT)* and *the new technologies* and the addition of *communication* to previous terms such as *information technology (IT)*- emphasizes the growing importance attributed to the communication aspects of *new technologies* (citing

[2] Association of African Universities

Anderson and Baskin (2002). Here the technologies could include hardware (e.g. computers and other devices); software applications; and connectivity (e.g. access to the Internet, local networking infrastructure, and videoconferencing) [p.13]

Moursund (cited in UNESCO, 2003) accepts this definition of ICT but details a more comprehensive range of technologies embraced by ICT. ICT includes the full range of computer hardware, computer software, and telecommunications facilities. Thus, it includes:

- computing devices ranging from handheld calculators to multimillion-dollar super computers
- the full range of display and projection devices used to view computer output
- the local area networks and wide area networks that allow computer systems and people to communicate with each other
- digital cameras, computer games, CDs, DVDs, cell telephones, telecommunication satellites, and fiber optics
- computerized machinery, and computerized robots. (P.13).

To these technologies, Achacoso (2003: 8) also adds sound systems and tape recordings, TVs and radios.

For the purpose of this study, the term ICT is used as it is conceived in both Moursund's and Achacoso's works. The reason behind this choice is based on the detailed, clear, and comprehensive way these authors define the term ICT in its varying aspects.

2.1.2. Integration of ICT into teaching and learning

Integrating ICT into teaching and learning is not a new concept. For Wang and Woo (2007), it may be as old as other technologies such as radios or televisions. Citing Earle (2002)**,** Wang and Woo describe integration as having a sense of completeness or wholeness by which all essential elements of a system are seamlessly combined together to make a whole. For these authors, in a properly crafted integrated ICT lesson, the ICT and other crucial educational components such as content and pedagogy are molded into one entity rather than simply handing out to students a collection of websites or CD-ROM programs. Putting these two words together, they define ICT integration as:

> "A process of using any ICT tool to enhance student learning. It is more of a process rather than a product. A simple placement of hardware and/or software will not make integration naturally follow" (citing Earle, 2002)

Insisting on the central position that ICT should take in relation to the learner, the content and the teacher, Lloyd sees it as the context for learning rather than the content for learning. In this context, he gives an argument for the substitution of "integrated" with the term "embedded" and offers three important concepts towards the definition of ICT integration:

> "The first is that integration is distinct from an operational use of hardware and software. The second is that it is not defined or explicated but presumed to be part of a teacher's tacit knowledge or general understandings. The third is that it is conditional knowledge (after Anderson, 1997) in that it relates to the 'how' and 'when' ICT is used in the classroom, 'exploited' in the learning context" (Lloyd, op.cit.p.6).

Whilst acknowledging that defining both terms (technology and integration), may drive the problem, Earle (2002) supports the position by Wang and Woo and Lloyd when he argues that integration does not only mean the placement of hardware in classrooms. He further contends that technologies must be pedagogically sound and go beyond information retrieval to problem solving. This allows new instructional and learning experiences that are not possible without them.

From this review, it can be seen that the process of integrating ICT in teaching and learning has to be done at both pedagogical and technological levels with much emphasis put on pedagogy: ICT integration into teaching and learning has to be underpinned by sound pedagogical principles. In fact, pedagogy tends to be placed over technology and this aligns with UNESCO's (2005) postulation about ICT-pedagogy integration:

> "Mere mastering the hardware and software skills is not enough. Teachers need to realize how to organize the classroom to structure the learning tasks so that ICT resources become automatic and natural response to the requirements for learning environments in the same way as teachers use markers and whiteboards in the classroom" (p.17)

2.2. Some Guiding Frameworks to pedagogical integration of ICT into teaching and learning

2.2.1. Laurillard's (2002) conversational framework

Laurillard argues that academic learning requires a variety of learning activities to develop understanding of knowledge and mastery of the skills in a subject. She explains how different activities are optimally supported by different learning media forms (Laurillard, 2000). The conversational framework provides a way of describing teaching and learning in terms of five key events: acquisition; discovery; dialogue; practice and creation. These events involve specific teaching strategies, roles or actions which interact with specific learning strategies, roles, actions and experiences (Czerniewicz & Brown, 2005: 4). The framework links five media forms with the key teaching and learning events as it shown in Table 1 below:

Table 1. Teaching and learning events and associated media forms

Teaching & Learning Event	Teaching action or strategy	Learning action or experience	Related media form	Examples of non-computer based activity	Example of computer based activity
Acquisition	Show, demonstrate, describe, explain	Attending, apprehending, listening	**Narrative:** Linear presentational. Usually same 'text' acquired simultaneously by many people	TV, video, film, lectures, books, other print publications	Lecture notes online, streaming videos of lectures, DVD, Multimedia including digital video, audio clips and animations
Discovery	Create or set up or find or guide through discovery spaces and resources	Investigating, exploring, browsing, searching	**Interactive:** Non-linear presentational. Searchable, filterable etc., but no feedback	Libraries, galleries, museums	CD based, DVD, or Web resources including hypertext, enhanced hypermedia, multimedia resources. Also information gateways.

Dialogue	Set up, frame, moderate, lead, facilitate discussions	Discussing, collaborating, reflecting, arguing, analysing, sharing	**Communicative:** Conversation with other students, lecturer or self	Seminar, tutorials, conferences	Email, discussion forums, blogs
Practice	Model	Experimenting, practising, repeating, feedback	**Adaptive:** Feedback, learner control	Laboratory, field trip, simulation, role play	Drill and practice, tutorial programmes, simulations, virtual environments
Creation	**Facilitating**	Articulating, experimenting, making, synthesizing	**Productive** Learner control	Essay, object, animation, model	Simple existing tools, as well as especially created programmable e software

Czerniewicz & Brown (2005) adapted from Laurillard (2002)

The usefulness of Laurillard's framework is related to the way teaching events are thoroughly related to their corresponding learning events, the associated media forms with their corresponding computer and non-computer based activities. In a nutshell, this framework systematically integrates ICT and pedagogy in certain more comprehensive and meaningful way.

In the same perspective, and in a more detailed manner, the Association of European Universities (2002), based on an extensive survey of European universities, developed a set of guidelines for using ICTs (see Appendix 9) for Universities to use these new technologies in their teaching delivery. This guidance emerged as a practical and detailed answer to the question raised by Gajarag (2002) who asked: "How will they [ICTs] be used?" Broadly speaking, this author contends that ICTs can be used for either one of two purposes, or, in some cases, for both purposes simultaneously. The first purpose is to enhance the richness and quality of education on-campus and in the classroom. The second purpose is to distribute campus-developed knowledge products off-campus through distributed learning, distance education, and open flexible learning. This guidance links technology strategy to support pedagogical approaches, the pedagogical practices and examples, and the corresponding technology requirements.

Like the Laurillard's (2007) conversational framework, this guidance is of great worth since it intimately links technology and pedagogy together. However, it is worth pointing out that this guidance provides more detailed information on technological, pedagogical strategies and tactics than the Laurillard's conversational framework provides.

As far as this study is concerned, these two frameworks were not considered to be mutually exclusive each other, but rather operate as complementary frameworks.

2.2.2. Pedagogical Approaches or Teaching Styles vis-à-vis the Use of Technology

These approaches were proposed by UNESCO's (2005) researchers who acknowledged that: "the integration of ICT with teaching and learning is first and foremost about pedagogy, about creating an environment for students' activities that lead to meaningful and sustainable learning experiences" (p.11). According to them, in a conventional education system, technology may be used to support either teacher-centred or learner-centred pedagogical approaches or to use a combination of the two approaches as it shown in Table 2.

Table 2. Implications of different pedagogical approaches for different technologies.

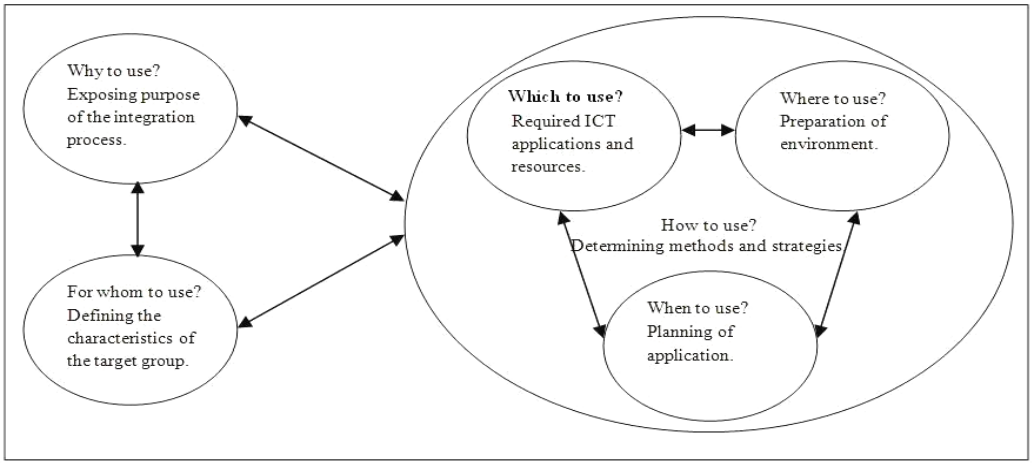
Teaching style	Main pedagogical characteristics and implications for the use of technology
Teacher-centred approach	The focus is on the teacher as the source of knowledge. The teacher tends to be active while the learner is expected to receive the knowledge being dispensed rather passively. The teacher talks, the learner listens. The teacher acts, the learner watches. This is convenient for large class sizes. *A wide range of technologies can be used to aid the teacher's presentation and performance. Handouts, overhead projector (OHP) slides, models, etc., can all be used to capture and retain the learner's attention.*
Learner-centred approach	The emphasis is on the learner as knowledge-seeker, with the teacher as facilitator and guide. The learner tends to be active, talking and doing things in the process of learning. The teacher designs and manages the setting as well as the process for learning. This is difficult with large class sizes.

	Technology can be used extensively to help the learner make sense of the tasks assigned and learn what is required. However, there is usually a need for multiple units of the technology which all the learners need to use at their own pace. Work sheets, models, interactive technology etc., all need to be available to learners on an individual basis or in small groups.
Combination of the two approaches	This method attempts to strike a balance between the teacher as the main source of knowledge, on the one hand, and the learner as an active seeker of knowledge, on the other. In some cases, the teacher dispenses knowledge and the learner has to take things on trust. At other times, the teacher simply creates the conditions for the learner to explore and discover knowledge. At its best, it is highly interactive, with the focus shifting alternately between teacher and learner at different points in a lesson. *Technology can be used to aid the teacher's presentation as well as to assist learners in their exploration.*

Source: Wright, Issues in Education & Technology, Commonwealth Secretariat in UNESCO (2005)

The three frameworks analysed above (the Laurillard's conversational framework, Association for Europe Universities'guidelines and the proposed UNESCO's Pedagogical Approaches or Teaching Styles vis-à-vis the Use of Technology) are echoed in another model of integrating ICT into teaching and learning processes as proposed by Haşlaman et al. (2008). As these authors explain, for an effective integration of ICT in teaching and learning, six questions, put in what they call '5W1H framework' (see Figure 1), have to be answered. These questions are: Why should ICT resources and applications be used? For whom are ICT resources and applications used? How are ICT resources and applications used with appropriate teaching methods and learning strategies? Which ICT resources and applications should be used? Where are ICT resources and application supplied from and where shall they be used? And when should ICT resources and applications be used?

Figure 1. A Unified Model of integrating ICT into teaching and learning processes



Haşlaman et. al. (2008)

This Unified Model clarifies and completes the three other frameworks described earlier. Moreover, the close analysis of these frameworks leads the researcher to conclude that issues raised in the first three out of six questions of the Unified model are implicitly reflected in both the Laurillard's conversational framework, the UNESCO's pedagogical approaches and in some ways in AEU's guide. The remaining (3) questions are fully answered in the AEU's guide.

These critical questions, detailed in the Unified Model described above, have much to do with what UNESCO (2002) calls the "strategy questions" in relation to ICTs for education. Those questions are: *Which technologies? How will they be used? Will contentware be created or acquired?* (p.67). The answers to these questions can be found nowhere else apart from meticulously developed ICT policies on both national and institutional levels. Specifically, in Higher Education Institutions (HEIs), the importance of generating such polices is emphasized in UNESCO's Background paper from the Commonwealth *of* Learning during a UNESCO (2009) World Conference on Higher Education in Paris:

> "National ICT policies should articulate a vision and a strategic framework for harnessing the potential of ICTs to address a country's development challenges. For the education sector it should provide a sense of focus and direction and spell out clearly how improving the ICT capacity of the education sector can help to address issues of access, equity and quality at all levels. Such a national policy

should provide a framework that can be a basis for developing ICT policies by HEIs"(p.8).

Throughout this review of the ICT-pedagogy integration frameworks, important features have been described for each framework. Then, it is worthwhile to highlight different ways by which these frameworks were integrated in this study. The study focused on the analysis of pedagogical integration of ICT in teaching and learning at KIE and both pedagogical and technological aspects of this integration were analysed. The Laurillard's conversational framework, the AEU's guidelines on ICT Applications to support education, and the UNESCO's pedagogical approaches or teaching styles vis-à-vis the use of technology helped in analysing and describing the ICT-pedagogy integration at KIE, whereas the questions raised in the Unified Model of integrating ICT into teaching and learning processes guided the researcher in analysing the context (ICT policy, ICT environment, ICT equipment) in which ICT is being used at KIE.

2.3. Why should ICTs be used in teaching and learning?

In answering the question: '*Is Technological Infusion Necessary in Higher Education?*' Miller et al. (2000), recognize that technology-based teaching may not be essential in all classes, but generally it is most facilitative as a result of providing relevant examples and demonstrations; changing the orientation of the classroom; preparing students for employment; increasing flexibility of delivery; increasing access, and satisfying public demands for efficiency. "The whole purpose of using technology in teaching is to give better value to students" (Daniel, in Miller et al., 2000). This better value should also impact the learners/students performance.

However, as Adel and Mounir (2008) put it, the relationship between the use of ICT and student performance in Higher Education is not clear, and there are contradictory results in the literature. On the one hand, some researchers demonstrate that there is no evidence of ICT playing a key role in higher education. These authors give an example of studies by Coates et al. (2004), and Anstine and Skidmore (2005) which showed that there is no evidence for a positive relationship between increased educational use of ICT and students' performance. On the other hand, some studies show a positive correlation of impact of ICT on student achievement. When Adel and Mounir reviewed Kulik's (1994)

meta-analysis study and the Fuchs et al. (2004) study, the conclusion was reached that students who used ICT-based instruction scored higher than students without computers and a strong positive correlation between the availability of ICT and students' performance was observed.

From the analysis of these research studies presented above, it can be seen that there is still debate among researchers with regard to the impact of ICT on student performance. For the purpose of this study, the researcher seeks to understand how the views of these clusters of researchers apply to KIE case.

In this study, the impact of ICT on teaching and learning (if any) is analysed by taking into account various dimensions such as: what and how students learn, the learning environment, and the teaching and pedagogy.

2.3.1. The impact of ICT on what is learned

Oliver (2002) acknowledges that the delivery strategies which characterized teaching and learning for many years (course written around textbooks, teaching through lectures and presentations interspersed with tutorials and learning activities designed to consolidate and rehearse the content) are being replaced by contemporary strategies that favour curricula that promote competency and performance and which are concerned more with how the information will be used than with what information is. According to Oliver (2002), ICT exerts its impact on what is learned in two ways: the moves to *competency and performance-based curricula* and *information literacy*. Contemporary ICTs are able to provide strong support for the requirements of the performance-based curricula and therefore for many years, argues Oliver, teachers wishing to adopt such curricula have been limited by their resources and tools but with the proliferation and widespread availability of contemporary ICTs, many of the restrictions and impediments of the past have been removed.

Another way in which emerging ICTs are impacting the content of education curricula, is for Oliver, related to the trend that there is a need for educational institutions to ensure

that graduates are able to display appropriate levels of information literacy[3]. Institutions need to ensure that their graduates demonstrate not only skills and knowledge in their subject domains but also general attributes and generic skills involving such capabilities as an ability to reason formally; to solve problems; to communicate effectively; to be able to negotiate outcomes; to manage time; project management; and collaboration and teamwork skills.

2.3.2. The impact of ICT on *how* students learn

Oliver (2002) makes a specific link between the impact of ICT on what and how students learn by arguing that the shift from content-centered curricula to competency-based curricula is associated with moving away from teacher-centered forms of delivery to student-centered forms of teaching and learning. There are two particular forms of learning, related to the growing use of ICT, that are gaining prominence in universities and schools worldwide. The first form of learning is the 'student-centered learning'. Technology has the capacity to promote and encourage the transformation of education from a very teacher directed enterprise to one which supports more student-centered models. The second learning form described by Oliver (2002) and which is related to the growing use of ICT is the "task-based learning".

2.3.3. Impact of ICT on Teaching and Pedagogy.

Teachers are a key component in the learning environment and therefore the impact of ICT on teachers and the strategies they employ to facilitate the environment are critical (Jagdish 2006:11). Although Jagdish acknowledges that the impact of ICT on teachers is varied and idiosyncratic (peculiar to the individual), he summarizes this impact as being strategies that are:

[3] the capacity to identify and issue and then to identify, locate and evaluate relevant information in order to engage with it or to solve a problem arising from it" (McCausland et al. in Oliver, 2002).

- More learner-centered
- More cooperative and collaborative
- More active learning
- Based on greater access to information and sources of information.

2.4. Teachers/lecturers' and students' competencies vis-à-vis pedagogical integration of ICT into teaching and learning

For effective integration of ICT in teaching and learning, both teachers and students need to demonstrate a set of competencies related to IT-skills and pedagogical knowledge (for teachers). Teachers/lecturers have to be ready to make use of the possibilities that ICT offers (García & Tejedor, 2006). These researchers conducted a study on Teaching Competencies related to the use of ICT at the University of Salamanca in Spain. From the lecturers' opinions, the 12 most important competencies that they should acquire and make use of regarding ICT were identified as follows:

1. To know how to use the Internet to look for information and resources in the preparation of classes;
2. To know websites (portals, web pages, electronic magazines, dictionaries, search engines…) related to their specialty;
3. To elaborate and to use presentations (Power Point, etc.) to explain topics in class;
4. To know how to use specific computer programs in their professional field;
5. To design a personal website to support their face to face classes;
6. To know how to use the main tools of the Internet to communicate (e-mail, routing slips, forums…);
7. To guide the students in the use of ICT;
8. To know collaborative working strategies mediated by ICT;
9. To design online tutorships to follow students' learning;
10. To know how to use a virtual platform to design activities which are complementary to the face-to-face activities;
11. To design multimedia resources (integrating text, image, audio…) for their didactic use;

12. To collaborate with other teachers in their specialty through ICT with educational purposes;

These competencies were sorted into the order of significance with the most important competency at the top of this list.

In addition, the work of lecturers, no matter how competent they are, will not be effectively facilitated if the student's side in terms of IT-skills is ignored. Karsenti (2009:89) summarizes the required students' competencies in order to effectively be involved in the process of pedagogical ICT integration and groups these competencies into 3 categories as follows:

A) General Competencies:

- Knowledge of different parts of the computer;
- Familiarization with basic software (word processing, spreadsheet, presentation software, browsers)
- Use of interactive software to create and save text, tables, annotations, objects, copy and paste images
- E-mail communication with teachers and other students

B) Capacity to use ICT for academic activities:

- Knowledge and use of search engines: Google, Altavista, etc..
- Use of ICTs for research
- Navigation on the Web sites containing educational resources
- Download document (text and images).
- Use of CD-ROM and creation of resource materials

C) Capacity to use ICT for other learning purposes

- Use of other ICT resources (digital camera, and slides overhead projector to teach the whole class
- Use of Office software (Word, Excel, PowerPoint) for professional purposes to create and adapt educational resources, writing reports, planning working time, data recording and Miscellaneous notes, etc..
- Using generic software to create resources for self-learning
- Software for creating Web pages (Dreamweaver), drawing, etc.
- Use of other ICT resources (e.g. digitizer or scanner, the digital camera

Before concluding this section about teachers/lecturers' and students' competencies vis-à-vis the pedagogical integration of ICT into teaching and learning, it is important to point

out that the quality of teachers' competencies to use ICT pedagogically depends on the level and quality of teacher/lecturer professional development (or in-service training).

> "Teacher professional development is absolutely essential if technology provided to schools is to be used effectively. Simply put, spending scarce resources on informational technology hardware and software without financing teacher professional development as well is wasteful" (Carlson & Gadio in UNESCO, 2002: 119).

And the decision makers involved in the process of integrating of ICTs in teaching and learning should take into account that:

> "Educational technology is not, and never will be, transformative on its own. It requires teachers who can integrate technology into the curriculum and use it to improve student learning" (Kumar et al., 2008).

Drawing on these two quotations above, it is clear that teachers are the key to whether technology is used appropriately and effectively. In this context, professional development is necessary and will refer to "a variety of activities, both formal and informal, designed for the personal and professional growth of teachers with respect to pedagogy-technology integration" (UNESCO 2005).

In this perspective, the "*Guidelines for Teacher Training and Professional Development in ICT*", developed by the South African Department of Education (2007), provides clear direction in addressing the ICT-Pedagogy training process of teachers for the appropriate use of ICT in teaching and learning. These guidelines are rooted in the holistic approach to teacher development with the following three dimensions (adapted from the European Union's T3 Core Curriculum for Telematics in Teacher Training):

- A pedagogical dimension, which implies an understanding and application of the opportunities of the use of ICT for teaching and learning in a local curriculum context.

- A technical dimension, which implies an ability to select, use and support a range of ICT resources as appropriate to enhance personal and professional effectiveness; and the willingness to update skills and knowledge in the light of new developments.

- A collaboration and networking dimension, which includes a critical understanding of the added value of learning networks and collaboration within and between partners; and the ability to create and participate in communities of practice (p.2).

Therefore, the question of how teachers/lecturers and learners/students use the competencies described above in ICT-mediated teaching/learning learning processes is raised. To answer the question, it is worth looking critically at the AAU's (2002) Guidelines for Institutional self-assessment of ICT maturity in African Universities. This guideline provides a matrix (see Appendix 10) where technology access and usage patterns of both academic staff and students are taken into account through five stages of institutional technological development:

1. **Entry stage**: institutions create awareness and teach staff and students to use the technology.
2. **Adoption stage**: institutions use technology to support traditional instruction.
3. **Adaptation stage**: institutions use technology to enrich curriculum.
4. **Appropriation stage**: institutions integrate technology and use it for its unique capabilities.
5. **Invention stage**: institutions develop entirely new learning environments that use technology as a flexible tool; learning becomes collaborative, interactive, and customized (p.30)

2.5. Barriers to pedagogical integration of ICT in teaching and learning

A number of authors have tried to understand why academics do not appear to be integrating new technologies into their teaching events. Miller et al. (2000), divide the barriers to introduction of ICT in teaching and learning into two broad categories: organizational barriers (such as lack of leadership and an intractable institutional culture) and individual resistance (which arises from such sources as Faculty fear of change and inertia). However, according to Donna (2000), this lack of technology use in the curriculum could very well lie with the institution. For Donna (2000), the resistance to change consists of three ingredients for Faculty behavior modification and these are: (a) access to resources which promote the desired behavior (i.e., computer on their desk, training when and where they need it, consultants, mentoring, release time), (b) convenience in adapting the desired behavior (i.e., standardizing presentation technology across campus, providing

onsite technicians, technical support), and (c) reward and recognition for following the desired behavior (i.e., monetary compensation, credit toward promotion and tenure) [Rao & Rao, in Donna, 2000].

Other researchers have approached these barriers without placing emphasis on who or upon what these impeding factors (to ICT infusion into teaching and learning) could be attributed. These include Darrell (2002) who found that these barriers have to do with human factors; technological factors; as well as institutional factors. Rogers' (2000) research aimed to identify barriers to Technology Adoption at the Post-Secondary Level and limited these barriers to four: lack of technical support for staff; lack of time; funds not specified for technology-related needs and lack of sharing best practices across system. Keengwe et al. (2008) categorize these barriers into external (first-order) or internal (second-order) barriers. First-order barriers include lack of equipment; unreliability of equipment; lack of technical support and other resource-related issues and second-order barriers including both school level factors, such as organizational culture and teacher level factors, such as beliefs about teaching and technology and openness to change. There are many other authors who talked about the barriers to ICT-pedagogy integration in teaching and learning but, notwithstanding the above mentioned findings, the categorization of these barriers by Anja et al. (2006:54) seems to be most enlightening. Their study summarized the main factors that prevent teachers from making full use of ICT by grouping them into three broad categories as follows:

- *Teacher-level factors:* lack of teacher ICT skills, lack of teacher confidence, lack of pedagogical teacher training, lack of follow-up of new ICT skills, lack of differentiated training programs;
- *School-level factors:* absence of ICT infrastructure, old or poorly maintained hardware, lack of suitable educational software, limited access to ICT, limited project-related experience, lack of ICT mainstreaming into school's strategy; and
- *System-level factors:* rigid structure of traditional education systems, traditional assessment, restrictive curricula, and restricted organisational structure.

2.6. Conclusion of Literature Review

After this review of the literature relevant to this study, it is time to determine the direction and focus of my research and find answers to some critical questions like: is there a theory or set of generalisations to which my research problem has reference? Are there some theories or paradigms that are useful for my purposes? Do some analysed approaches make the more sense in these circumstances?

Before finding answers to these questions, it is worthwhile returning to the purpose of this study and its research questions. This research was intended to analyse and understand the pedagogical integration of ICT at Kigali Institute of Education (KIE) and thus to seek answers to the following research questions:

- Are KIE lecturers using available ICT facilities and resources to help them to pedagogically improve their teaching practices?
- Are KIE student-teachers using available ICT facilities and resources for academic purposes (in their various academic activities)?
- What is the impact, if any, (as perceived by both lecturers and student-teachers), attributable to ICT Pedagogical integration on teaching and learning - on (a) student and their learning (b) lecturers and their teaching – at KIE?
- What are the major barriers (as they are perceived by both student-teachers and lecturers) hindering ICT integration in teaching and learning events at KIE?

The study was approached through a number of themes (and sub-themes)[see Appendix 11] that guided and drove this research. The themes were derived from the literature reviewed above and reference was made to the "Methodology Guide" of the Panafrican Research Agenda on the Pedagogical integration of ICT. These themes are:

Theme I: KIE ICT policy
Theme II: Equipment, connectivity and access of/to ICT facilities at KIE
Theme III: Teacher training and professional development
Them IV: Pedagogical use of ICT

Theme V: Impact of ICT use on educators and teaching (as it is stated by lecturers)

Theme VI: Impact of ICT use on learners and learning (as it is stated by lectures and students)

Theme VII: Barriers and challenges to ICT integration in teaching and learning at KIE (as they are perceived by all the participants in this research)

Information about the first three themes was mostly found in different KIE administrative documents. The last four themes, however, were approached by confronting the findings against the existing literature and approaches. Are there some theories, set of generalisations, or approaches that were useful for my purposes? The information contained in Appendix 11 shows the themes developed in this research, their corresponding criteria/indicators which were looked at, and the existing and analysed literature they are derived from.

CHAPTER 3: METHODOLOGY

This chapter describes the research design that was used for this study, the research participants, research instruments that were used to address the research questions, and data analysis procedures that were applied.

3.1. Research Participants

This research was carried out at Kigali Institute of Education. Participants in this research were all the Deans of Faculties, full-time students and lecturers. All Faculty Deans and lecturers were eligible to participate in the study and student-teachers were expected to participate in this research by discussing, in small groups[4], the different aspects of the study.

The initial estimate of potential research participants in this study consisted of one hundred and ninety six (165 lecturers [including Faculty Deans], and 31 students). In reality 122 (98 lecturers [including Faculty Deans] and 24 student-teachers) actually participated (see Table 3).

Table 3. Potential and Actual research participants

Designation	Potential participants	Actual participants	Percentage
Faculty Deans	4	4	100%
Lecturers	161	94	58.3%
Student-teachers	31 distributed in 4 discussion groups (8, 8, 7, 8)	24 distributed in 3 discussion groups (8, 8, 8)	77.4%
Total	**196**	**122**	**62.2%**

As shown in the Table 3 above, a good number (41.7%) of lecturers did not participate due to three main reasons: some were doing further studies in other countries; others hadn't showed up yet at the time of data collection which was done at the beginning of the academic year 2010, and some lecturers the researcher could not reach. Likewise, only three student-teachers discussion groups (B.Ed students, students from the Faculty of Science, and those from the Faculty of Arts and Languages) were used in this study. It

[4] Each group was composed of the Heads of academic combinations of each Faculty

was not possible to work with the student-teachers from the Faculty of Social Sciences and Business Studies due to conflicting schedules.

3.2. Research Design

This study utilized a multi-methods approach or mixed methodologies in which qualitative and quantitative approaches were used in data collection and analysis. The reason behind the adoption of this research approach was based on the fact that answers to research questions guiding this study required different data collection strategies which fall under quantitative and qualitative methodologies. Methodological and technical levels were both concerned in combining these approaches and the purposes were (a) to expand the scope of a study (at the method level); (b) triangulation: to achieve or ensure corroboration of data, or convergent validation and (c) complementarity, to clarify, explain, or otherwise more fully elaborate the results of analyses (Greene et al. cited in Sandelowski, 2000: 2 and 3).

3.3. Data collection tools

3.3.1. Questionnaires

One of the tools that were used to collect data in this study is the questionnaire. One of the obvious advantages of questionnaires is that they provide data amenable to quantification, either through the simple counting of boxes or through the content analysis of written responses (Hannan, 2007). The questionnaires used in this study were adapted from (a) Panafrican Research Agenda on the Pedagogical integration of ICT (2008), and (b) U.S. Department of Education, Office of Educational Research and Improvement (1998).

3.3.1.1. Faculty Dean Questionnaire

The questionnaire for Deans was initially composed of 27 items scattered across four sections. The first section was about demographic information about the number of lecturers and students in the Faculty and their various characteristics, the number of courses taught in the Faculty (see Appendix 1**).** The second section dealt with training and professional development of academic staff in Pedagogical use of ICT. The third section was about the use of ICT in teaching and learning and the fourth section was

about the impact of ICT on teaching and learning and Professional Development. In this study, questionnaires were hand-delivered to all four KIE Faculty Deans and 3 Questionnaires were returned representing 75% of the total Dean questionnaires that had been sent out.

3.3.1.2. Lecturer Questionnaire

The Lecturer Questionnaire used in this study, was composed of two parts. The first had 21 Items covering the integration of ICT in teaching and learning in general. These items covered five sections. The first four sections are the same as those described in the Dean Questionnaire above. The sole difference is found in the first section where the aspects of demographic information asked in the Dean Questionnaire differ from those (aspects) asked in the lecturer questionnaire. The fifth section in the Lecturer Questionnaire covered issues related to barriers to ICT integration in teaching and learning at KIE. The second part of the Lecturer Questionnaire had nine closed-ended items dealing with Self-Evaluation Rubrics for Basic Teacher Computer Use by lecturers. This self-evaluation covered a number of computer based skills in various domains including: Basic computer operation, File management, Word processing, Spreadsheet use, Database use, Graphics use, Hypermedia use, Network use, and Student Assessment (see Appendix 2 and 3). In this study, 94 lecturer questionnaires were sent out. Of these, 61 questionnaires were returned representing 64.8% of the total number of the lecture questionnaires that had been sent out.

3.3.2. Interviews

The interview is one of the most widely used data collection tools in qualitative research. According to Woods (2006), "a great deal of qualitative material comes from talking with people whether it is through formal interviews or casual conversations." There are three types of interviews and Hannan (2007) describes them as follows:

> "The structured interview in which the participant is asked the pre-prepared set of questions and there is little room for adaption. At the opposite extreme in interview design is completely unstructured conversation between researcher and respondent, where the latter has as much influence over the course of the interview as the former. There is, however, a half-way house, where the researcher designs a set of key questions to be raised before the interview takes place, but builds in considerable flexibility about how and when these issues are

> raised and allows for a considerable amount of additional topics to be built in response to the dynamics of conversational exchange. This is known as semi-structured interview and is the form most often used in education research."

In this study, semi-structured interviews were used. The researcher designed a set of key questions to guide the conversation and used an interview protocol. Interviews were conducted with 8 selected lecturers (2 from each faculty) whose responses to the Lecturer Questionnaire provided evidence that they (interviewed lecturers) were striving to integrate ICT in their teaching activities. The interview protocol for Lecturers had a total of 10 questions and comprised 4 sections. The First section covered the use of ICT in teaching and learning; the second section was about issues related to the required teacher competencies for using effectively ICT in teaching; the third section looked at the impact of ICT on teaching and learning; and the fourth section the barriers to ICT integration in teaching and learning (see Appendix 4)

3.3.3 Learner discussion focus groups

Group discussion, says Kitzinger (1995), "is particularly appropriate when the interviewer has a series of open-ended questions and wishes to encourage research participants to explore the issues of importance to them, in their own vocabulary, generating their own questions and pursuing their own priorities." Group discussion was utilized in this study as a "carefully planned discussion designed to obtain perceptions in a defined area of interest in a permissive, non-threatening environment" (Kreuger in Lewis, 2000).

According to Wolff et al. (1993), focus group can be used to complement sample surveys in several ways, depending on the sequential order with which the research components are combined. Conducted before the survey, the focus group can be used to facilitate questionnaire design and to anticipate on survey non-response or refusal problems. It can also be conducted shortly after the survey has taken place to evaluate the survey process. By conducting it after the survey results have already been analysed, it aims at corroborating findings or exploring in greater depth the relationships suggested by the quantitative analysis. Or, according to these authors, the fourth approach is to conduct focus groups more or less concurrently with surveys as complementary components of a unified research design (p.120).

The form of the focus group used in this research has to do with this last approach where a focus group is conducted concurrently with surveys. Survey questionnaires and focus discussion group protocols or guidelines were designed in advance and both were used as complementary data collection tools.

Like other data collection tools described earlier, the student-teacher discussion protocol was made of a set of questions covering various issues of the subject under investigation. The discussion protocol comprised 9 questions distributed in five sections: the use of ICT in learning activities and communication; required student competencies for using effectively ICT in learning; impact of ICT on learning process; and the barriers to ICT integration in teaching and learning (see Appendix 5).

3.3.4. Documentary Analysis

The fourth data collection tool used in this study was documentary analysis. As Voce (2005) pointed out:

> "Records, documents, artefacts and archives constitute a particularly rich source of information about many organisations and programs. In contemporary society, all kinds of entities have a trail of paper, a kind of spoor that can be mined as part of fieldwork."

The documents that were collected and analyzed in this study included: KIE policy and strategic planning documents; some course work and assignments produced by student-teachers using different ICT tools; some learning modules and learning materials produced by lecturers using ICT; a professional development module about E-learning, Resources Development and Student Support; and documents about electronic resources at KIE disposal; Téle-education and Delph projects at KIE. The data collected from documents was used as complementary to the data collected from interviews and questionnaires. Table 4 shows the data collection instruments for each of the main themes addressed in this study.

Table 4. Research questions (and themes) and data collection tools that were used

Research questions and/or themes addressed	Data collection tools	Items/questions number
KIE ICT policy	Documentary analysis	-
	Dean Questionnaire	18, 19
Equipment, connectivity and access of/to ICT facilities at KIE	Documentary analysis	
	Lecturer Questionnaire	1, 2
Pedagogical ICT use	Documentary analysis (courses and students works and learning modules)	-
	Dean Questionnaire	8, 13, 14, 15, 22, 23
	Lecturer Questionnaire	7, 8, 15, 16, 17, 18, 20, 21
	Lecturer interview	1, 2
	Students' discussion groups	1, 2, 3, 5
Teacher training and professional Development	Documentary analysis	-
	Dean Questionnaire	6, 7, 9, 10, 11, 16, 24, 25
	Lecturer Questionnaire	4, 5, 6
Impact of ICT use on educators and teaching	Dean Questionnaire	17
	Lecturer Questionnaire	9, 10, 11, 12, 13, 14
	Lecturer interview	8
Impact of ICT use on students and learning	Lecturer interview	5, 6, 7
	Students' discussion groups	6, 7, 8
Barriers to ICT integration in teaching and learning	Lecturer questionnaire	19
	Lecturer interview	3, 9
	Students' discussion groups	4

As shown in this table, items number 1 through 5 in the Dean questionnaire do not appear anywhere. This was because these items were covering demographic information that the researcher realized was not necessary to mention in the table. Furthermore, items number 12, 20, 21, and 26 were removed from the Dean Questionnaire after realizing that information they were covering could not be obtained at the Faculty level. The researcher was redirected to search for this information by approaching the Head of KIE ICT Directorate.

3.4. Ethical considerations

Before this study started, the researcher applied for Ethics Clearance. The research proposal, together with all required documents explaining the nature of the research project: Questionnaires; interview protocols; and student-teachers discussion protocols; consent forms in regard to participation in an interview and audio-taping, filling the questionnaire, and participating in group discussion; were prepared and sent to the

Faculty of Humanities Ethics Committee for approval. This study was carried out after permission was obtained from the University of the Witwatersrand ethics committee (see the letter in Appendix 6).

The research process followed ethical procedures. Informed consent was sought from the research participants. Participants were informed that their participation was voluntary and that they could, at any time, decide to discontinue their participation, or decline to answer any question or stop the participation for any reason without penalty. In addition, they were assured that confidentiality and anonymity were to be maintained. No names or personal information were to be divulged and that the data were to be kept confidential and used for research purposes only. After transcribing interviews, the tapes were kept in a safe place. After the study has been completed and a final report written and accepted, the tapes will be destroyed.

3.5. Data analysis

In this study, data analysis was conceived as occurring as an explicit step in conceptually interpreting the data set as a whole, using specific analytic strategies to transform the raw data into a new and coherent depiction of the thing being studied (Sally, 2000:1)

The main part of this study was a form of qualitative research that aims at understanding the situation of ICT-pedagogy integration at KIE from the participant's views and not from the researcher's perspective.

As Sally (2000) pointed out, "qualitative data are not the exclusive domain of qualitative research. Rather, the term can refer to anything that is not quantitative, or rendered into numerical form. Many quantitative studies include open-ended survey questions, semi-structured interviews, or other forms of qualitative data"(p.2).

Two strategies of categorizing the data were used. The first strategy was coding. This strategy was used for "fracturing" the data and "rearranging" them into categories that facilitate comparison between things in the same category (Maxwell, 1996: 96). The second strategy was about organizing the data into broader themes and issues based on "organizational", "substantive" and "theoretical" categories (Maxwell, op.cit, p.97).

Organizational categories are broad areas or issues established prior to data collection (see the research themes above). Substantive categories are primarily descriptive in a broad sense that includes description of participants' concepts and beliefs. These stay close to the data categorized, and do not inherently imply a more abstract theory. Theoretical categories, in contrast, will place the coded data into a more general or abstract framework. These categories may be derived either from prior theory or from inductively developed theory. More precisely, data analysis in this study involved taking one piece of data (one interview, one statement, one theme) and comparing it with all others that may be similar or different in order to develop conceptualizations of the possible relations between various pieces of data (see Sally, 2000:3). In analyzing the data collected (through interviews, open-ended survey questions, and group discussions), the researcher started by looking at responses to a particular question across all the respondents at a time. The concentration on each question helped identify points of convergence and divergence on similar issues.

In analyzing some quantitative data collected through closed survey questions, quantitative data were collated onto a MS Excel spreadsheet, and analyzed using basic descriptive statistical tools for mean, frequencies and percentages. In addition, some summary data from this study were presented in the form of a figure (histograms and charts), so that it was easy to observe and make inferences about possible general trends.

3.6. The reliability and validity of the data of the study

The issue of reliability and validity raises the question "how can an enquirer persuade his or her audience that the research findings of an enquiry are worth paying attention?" (Lincoln & Guba in Golafshani, 2003). For these authors, triangulation is typically a strategy for improving the validity and reliability of research or evaluation of findings. This involves the use of multiple methods of data collection in order to cross-check and to support methods which do not provide adequate data (Yin in Khairul, 2008).

In this study, the researcher deliberately made use of multiple sources of data which cross-checked discrepancies within the data and added more credibility to it. The multiple sources of data that were used are surveys, interviews, student discussions and

documentary analysis. The answers to the research questions that guided this study required several different data collection strategies, the methodological triangulation Risjord et al. (2002). The qualitative data from the interviews and focus group-discussions helped the researcher to further develop findings derived from quantitative (some items of survey questionnaires) and vice-versa. Since the study themes were reflected in both qualitative and quantitative data collection tools, the researcher compared and confronted the data on either side in order to clarify some inconsistent or doubtful findings. This was done by taking one piece of data (from interview, survey, and discussions) and comparing it with all others that may be similar or different in order to develop conceptualisations of the possible relations between various pieces of data (see Sally 2003).

3.7 Limitations of the study

The present study has certain limitations that need to be taken into account when considering the study findings and conclusions.

The first limitation is related to the research instruments used in this study, mainly interview and student discussions. In each of the research instruments, there is the potential impact of bias from the researcher that may contaminate the data in some way which should not be ignored.

Also, it is difficult to make generalizations from the findings of the group discussions on account that only 24 of 5801 students at KIE participated in discussions. So, the size of the sample is too small to warrant generalization and this study's findings on the student's side should be considered as indicative rather than conclusive.

Another limitation is related to the list of items in both the Dean and Lecturer questionnaires which was reported by these participants as too long and this may have contributed to the poor return rate or quality of responses. The latter limitation is related to the fact that this study has focused on a phenomenon that is too broad for this study to contain within the time frame and other resources available.

Summary

This chapter described the methodology for studying the pedagogical integration of ICT in teaching and learning events at KIE. The description covered a number of issues including the description of research design, research participants and the format of research instruments that are survey questionnaires, interview, student-discussions, and documentary analysis. The process of data collection and data analysis has also been described and issues relating to ethical considerations were explained as well. Finally, issues relating to the validity and reliability, and limitations of the study were discussed.

CHAPTER 4: PRESENTATION OF FINDINGS

The purpose of this study was to analyse and understand the pedagogical use of ICT in teaching and learning activities at KIE. The study covered seven broad themes *inter alia*: the KIE ICT policy; Equipment, connectivity and access of/to ICT facilities at KIE; Pedagogical ICT use; Teacher training and professional development; Impact of ICT use on educators and teaching; Impact of ICT use on learners and learning; and the barriers and challenges to ICT integration in teaching and learning at KIE. This chapter focuses on the analysis of the data collected from survey questionnaires, interviews, student-discussions, as well as documentary analysis.

4.1. Research site at a glance[5]

Kigali Institute of Education (KIE) is a young public institution of higher learning in Rwanda, which was founded in 1999 and legally established under KIE Statute Law No. 49/2001 of 27/12/2001. The establishment and operation of KIE was made possible by combined efforts of the Rwandan government as major stakeholder, and various donors including the World Bank; African Development Bank; Swiss Co-operation; Belgian Co-operation; DFID; USAID; German Cooperation; the French Co-operation and the Netherlands. In 2009, KIE had 5801(part-time and full-time) student-teachers and 165 lecturers distributed across four Faculties: the Faculty of Education, the Faculty of Science, the Faculty of Arts and Languages, and the Faculty of Social Sciences and Business Studies.

Being the sole Public Higher Learning Institution where prospective secondary teachers are trained, its main mission is to train school teachers and teacher-educators to meet local educational needs.

4.2. KIE ICT policy

As mentioned earlier, any institutional ICT policy should reflect the vision stated in ICT policy developed at national level. Such a national policy provides a framework that can be a basis for developing ICT policies by HEIs (see UNESCO, 2009). Therefore, before

[5] Retrieved from www.kie.ac.rw, on March 21, 2010.

analysing the KIE ICT policy, the researcher explored whether ICT-related issues are addressed at national level. In fact, Rwanda's Vision on the Role of ICT, can be summed up in two main pillars:

- To transform the current Agriculture-based Economy into a Knowledge-based Economy by year 2020
- To use science, technology and ICT as a key enablers of this transformation (Murenzi[6], 2008).

ICT is central to Rwanda's Vision for 2020, and ICT in education is one of the core pillars of the country's National Information and Communications Infrastructure Policy and Plan (NICI) that was adopted in 2000 when Rwanda promulgated its national ICT policy. In the education sector, the sub-plan for education in NICI-2010 sets out a number of policy action items. Among the latter, those that fall within the scope of this study are:

- Develop programmes to promote the acquisition of computer equipment by educational institutions
- Train a critical mass of computer literate teachers
- Develop a national programme to speed up the deployment and use of ICTs in higher learning institutions (A specific component is the establishment of a Rwandan Academic Research Network that links all institutions and provides a gateway to the Internet.) (Government of Rwanda, 2006).

The question this raises is: does KIE have an ICT policy reflecting policy action items highlighted above? The sole document available to help in answering this question is the "*KIE ICT policy statement*" dating back to March, 2006. In this document, it is acknowledged that the KIE policy statement "is consistent with the government's ICT policy that will support the realisation of the knowledge economy goal." In fact, KIE ICT initiatives are informed by the stress put on the importance of ICT in Rwanda's vision 2020 where the aim is to transform the education system using ICT to improve accessibility, quality and relevance to the development needs of the country.

[6] The then Minister in the Office of the President in Charge of Science and Technology

More specifically, the policy acknowledges the fact that information technology (a) will support and facilitate the successful pursuit of KIE's mission by its staff and students; (b) will ensure the free flow of data and knowledge that powers quality education and research; (c) is important in teaching, research and administration; (d) will help to further enrich the environment for student learning by making maximum use of the opportunities created by these technologies and bring more services to staff and students. In order to translate these ideal commitments into actions, seven implementation strategies are identified in the policy statement and those are stipulated as follows:

- Ensure staff and students have access to ICT core services and outside their localities
- Enhance skills of staff and students through continuous opportunities for training in the application and use of ICT in teaching and learning
- Provide assistance and support to staff and students in their use of ICT
- Evaluate and plan for new development and systems within time frames, which optimise the use and availability of ICT to staff and student
- Ensure information is accessible within appropriate security framework, with emphasis on information integrity and availability
- Coordinate ICT development across the institute to ensure effective and efficient use of technology and services and seek to achieve at least 20% benchmark against the higher education sector for provision and quality of ICT related services
- Introduce specialised courses at both Certificate and Diploma level.

To answer the question raised above, it is worth to use information stated in this ICT policy document. Obviously, KIE has identified areas of intervention in the form of statement of good principles and ideal guidelines entrenched in national ICT policy. However, while KIE has made the commitment to use ICT in supporting and facilitating the successful pursuit of its mission, there is no coherent and detailed strategy to fully support the pedagogical integration of ICT in the teaching and learning events.

4.3. Equipment, connectivity and access of/to ICT facilities at KIE

4.3.1. ICT Equipment/facilities

Although the core purpose of this study was to analyse the pedagogical integration of ICT in teaching and learning events at KIE, it is worth to point out that, in the process of integrating ICT in teaching and learning, some of the more challenging questions planners and educators must answer have to do with infrastructure issues (Rusten & Heather, 2009). That is why the second theme of this study dealt with the determination of the current level of ICT equipment, accessibility, and connectivity of ICT-related facilities at KIE. This theme was initially addressed in the Dean Questionnaire, items 12, 20, 21, and 26. After realizing that this information could not be obtained at the Faculty level, the researcher removed these questions from the Dean Questionnaire and sought for this information by approaching the Head of KIE ICT Directorate. The form used to collect this information can be found in Appendix 7.

KIE has 830 functioning stand-alone computers. 150 computers were available for lecturers (used for lesson planning, teaching, etc.), and 610 were available for student-teachers (used during class time, assignments, etc). Of 610 computers available for Student-teachers, 415 are distributed in 7 Computer Labs with 4 labs comprising 80 computers each, and 3 labs comprising respectively 25, 30, and 40 computers. The Computer Labs are controlled and managed by both KIE ICT Directorate (for setting up the labs, maintenance, and installations), and KIE Computer Science Department (responsible for the management of the labs on daily basis thanks to the lab attendants' work). Other ICT facilities/tools that are available at KIE and meant to be used in teaching and learning or in other administrative activities are presented in the Table 5 below:

Table 5. ICT facilities/tools available at KIE and meant to be used in teaching and learning

Type of ICT facilities/tools	Number	Comments
Radio/cassette player	About 6	
Television sets	2	
DVDs	10	Rarely used
CDs	10	Rarely used
LCD (Liquid Crystal Display) projectors	24	
Computer printer	60	
Teaching software	Math lab + statistica	
Public address	4	
Video Cameras	2	
Digital photocopiers	10	
Scanners	6	
Loudspeakers	16	Big: 6, individual:10
Smart board	1	Exploring the area
Wireless System		Lecturers and students who have their own laptops can access the network over some Campus premises

Source: KIE ICT Directorate, February-2010

4.3.2. Connectivity

At the time of data collection, that is January-February, 2010, all KIE computers were stand alone computers and connected to a dial-up Internet connectivity. In addition, according to the KIE ICT Director, lecturers and students who have their own laptops could access the Internet trough wireless connectivity (see Table 5). However, during that time of data collection, Internet could be found only in few offices of administrative staff and in one computer lab meant to be used by visually impaired students. There was no Internet in any other computer labs and for all other computers available to lecturers (in their offices) and students (in some classrooms and lecture halls), internet could not be accessed.

This issue of Internet connection was also investigated in item 2 of the Lecturer Questionnaire. When asked whether they have access to Internet, 46 of 61 (75.4%) of surveyed lecturers affirmed that they were not accessing Internet at KIE. And those lecturers (15 of 61) who confirmed that they were having Internet access, some of them added: "*very limited* (3 of 15), *I use my own modem [my own Internet connection]* (4 of 15), and *sometimes* (6 of 15).

In brief, the general lack of Internet access or poor Internet connectivity is a serious problem at KIE.

4.3.3 Access to ICT facilities

A good initiative was made some years back to provide every KIE lecturer with a computer. This is confirmed by the data the researcher got from the KIE ICT Directorate: 150 computers were available to be used by a total number of 165 lecturers. Given the fact that these computers are put in lecturers' offices, it is obvious that only 15 lecturers did not have computers in their offices. The results obtained from the lecturer survey corroborated information obtained from the KIE ICT directorate. In fact, only 2 of 61 (3.2%) surveyed lecturers stated that they did not have access to computers and the great majority of the 15 lecturers who did not have computers were visiting lecturers who come to teach for a short while. These lecturers were not supplied with computers in their offices.

The ratio student to computer was not very high at KIE. There are 610 computers available for a total number of 5801 (part-time and full-time) students. This means that as many as 9 to 10 students had access to a computer for their academic activities. Information from interviews with lecturers and student discussions revealed that the computer labs within the institution were not well managed. Students affirmed they were not aware of the time table about computer class sessions and free sessions for access to the computer labs. One third year student stated expressively:

> "*I only accessed computer labs in first year at the time when I was attending computer basic skills course and I have never had the time or opportunity to practice what I learned because each and every time I go to the computer labs I found that they are either being used or closed*" (student D, from group discussion II)

Accessibility of ICT facilities at KIE also interconnects with other important problems relating to the fluctuation of power supply and frequent blackouts that, in some cases, disrupt, delay, or even prevent access and cause damage to sensitive ICT equipment.

At this level of analysis, it is noticed that although the current level of ICT equipment, accessibility, and connectivity of ICT-related facilities at KIE was not perfect enough to allow the effective integration of ICT in teaching and learning activities, the findings revealed that there is a certain ICT foundation (in terms of equipment, accessibility and connectivity) that would support the pedagogical integration of ICT in teaching and learning to a certain extent. Are KIE lecturers and students exploiting this more or less good ICT foundation in their academic activities? The "Pedagogical ICT use" at KIE, analysed in the following section, will help to answer this question.

4.4. Pedagogical ICT use at KIE

The third research theme was about the pedagogical ICT use at KIE. This theme helped the researcher to find answers to research questions 1 and 2 that respectively investigated whether KIE lecturers and student-teachers were utilizing available ICT-related facilities for academic purposes. To find out, four sources of data; questionnaires, interviews, student-teachers' discussions, and documentary analysis (teaching modules, students' course works and assignments) were used.

4.4.1. Integration of ICT in teaching and learning at KIE

To investigate whether KIE lecturers were using ICT in their teaching, the researcher used varied sources. The Dean Questionnaire, survey items number 8, 13, 14, 15, 22, and 23; the Lecturer Questionnaire, survey items, 7, 8, 16, 17, 18, 19 and 22; and the Lecturer interview in its number 1, 2, and 5 survey items. The researcher also analyzed teaching materials and learning modules produced by the lecturers using different ICT facilities.

When asked to indicate the number of courses/modules in which lecturers were integrating ICT in their teaching, 2 of 3 Faculty Deans who answered this question did not give the actual figure but wrote "almost all modules are taught by integrating ICT."

As the researcher realised that that answer was not satisfactory, he wanted to have further details and approached one of the two deans who elaborated:

> "*Firstly, all modules have to be word-processed; no hand-written module can be accepted in this Faculty. Secondary, module developers are asked to include in their core referenced sources certain Internet links. Thirdly, due to the big class sizes we have in this Faculty, almost all lecturers use Power point presentation, public address and loudspeakers*."

The ways in which ICT was being utilized by KIE lecturers in their teaching was also investigated using the Lecturer Questionnaire and Lecturer interview. The 22nd item of the Lecturer Questionnaire asked lecturers to identify the level of their competencies in regard to Basic Teacher Computer Use. The self-evaluation rubric covered a number of computer based skills in various domains including: Basic computer operation; File management; Word processing; Spreadsheet use; Database use; Graphics use; Hypermedia use; Network use; and Student Assessment. The results of this lecturer self-evaluation are presented in the Table below:

Table 6. Results of lecturers' self-evaluation in regard to the Basic Teacher Computer Use

Computer-based skill	Skill level	Frequency n=60[7]	Percentage
Basic computer operations	Level 1	0	0
	Level 2	10	16.6%
	Level 3	26	43.3%
	Level 4	24	40%
File management	Level 1	0	0
	Level 2	4	6.6%
	Level 3	50	83.3%
	Level 4	6	10%
Word processing	Level 1	0	0
	Level 2	4	6.6%
	Level 3	42	70%
	Level 4	14	23.3%
Spreadsheet use	Level 1	10	16.6%
	Level 2	20	33.3%
	Level 3	24	40%

[7] 1 of the 61 surveyed lecturers did not do the self-evaluation

	Level 4	6	10%
Database use	Level 1	12	20%
	Level 2	24	40%
	Level 3	20	33.3%
	Level 4	4	6.6%
Graphics use	Level 1	22	36.6%
	Level 2	6	10%
	Level 3	30	50%
	Level 4	2	3.3%
Hypermedia use	Level 1	36	60%
	Level 2	11	18.3%
	Level 3	8	13.3%
	Level 4	5	8.3%
Network use	Level 1	6	10%%
	Level 2	20	33.3%
	Level 3	31	51.6%
	Level 4	3	5%
Student Assessment	Level 1	40	66.6%
	Level 2	18	30%
	Level 3	2	3.3%
	Level 4	0	0

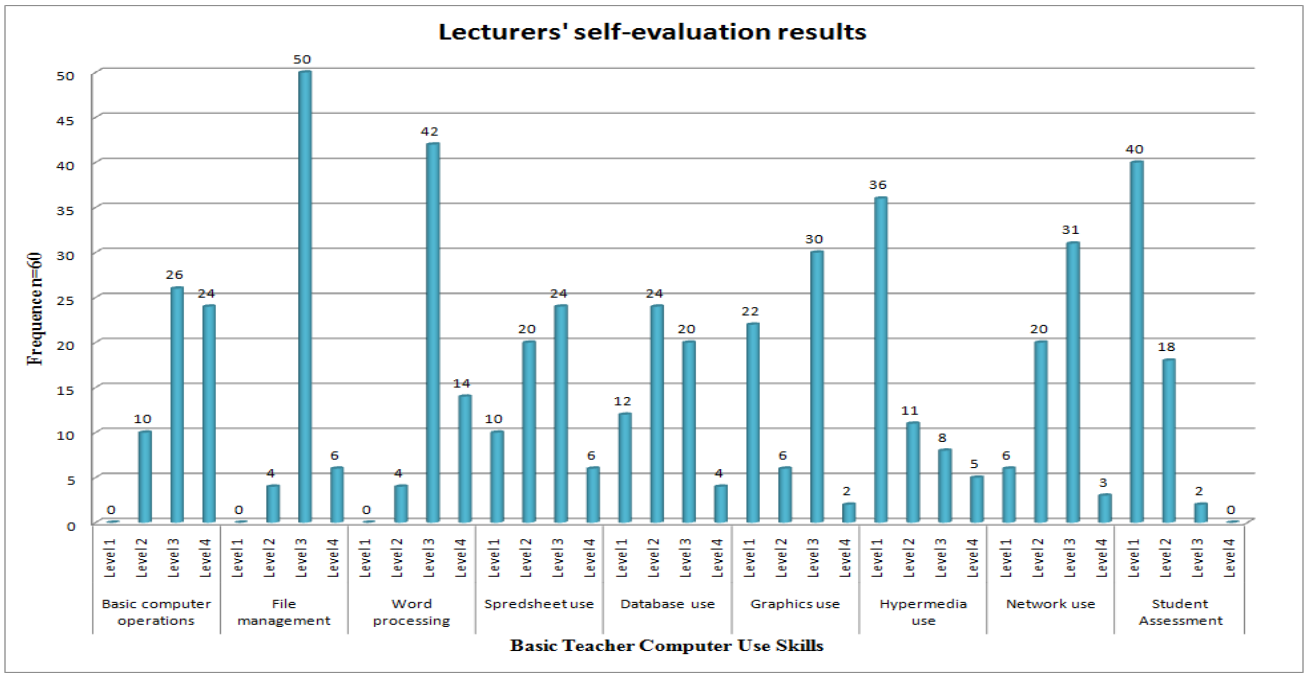
The analysis of the self-evaluation rubrics used in this study shows that, for each computer-based skill, level 1 represents those lecturers who were not able to use, nor to identify any uses or features the skill in question might have which would have benefited their work. Level 2 represents lecturer who were able to understand and/or use the skill in question but at the basic or rudimentary level. Level 3 represents those lecturers who were able to understand and/or use the computer-based skill at an advanced level, and level 4 represented lecturers who were able to use the computer-based skill in question not only in their work but also with students (in teaching and learning activities).

As depicted in Table 7, at the time of this study, there were few lecturers who confirmed not being able to use or to identify the uses or features of most of the computer-based skills in the self-evaluation rubrics. In fact, apart from graphic use, hypermedia use, and student assessment computer-based skills in which respectively 22 (36.6%), 36 (60%), and 40

(66.6%) of 60 surveyed lecturers who ranked themselves level 1; for other skills the number of lecturers who positioned themselves at level 1 is not significant and varies between 0 and 12 (20%) of 60 surveyed lecturers. The same observation was also made for level 4 of each computer-based skill in which lecturers were asked to confirm whether or not they were able to use those skills in their work and with their students as well. Apart from basic computer operations in which 24 (40%) of the 60 surveyed lecturers put themselves at level 4; the result revealed that for other skills, the surveyed lecturers acknowledged that they were not able to use those computer-based skills in their work or use them with students. The figures in table 7 show that a small number of lecturers placed themselves at level 4 and their number varies between 0 and 14 (23.3%) of 60 surveyed lecturers.

Likewise, the number of lecturers who affirmed that they were capable of understanding and using those computer-based skills but at elementary level (level 2), was not too high. Only 24 (40%), 20 (33.3%), and 18 (30%) of 60 surveyed lecturers ranked themselves level 2 respectively in database use, spread sheet use, network use, and student assessment (in which 66.6% of surveyed lecturers placed themselves at level 1). It was therefore noticed that a significant number of lecturers (see Figure 2) confirmed that they were capable of using most of computer-based skills in the self-evaluation rubrics at an advanced level (level 3).

Figure 2. Results of lecturers' self-evaluation in regard to the Basic Teacher Computer Use



Except for student assessment and hypermedia use in which the good majority of surveyed lecturers (36/60 and 40/60) placed themselves at level 1, hence they were not using these skills. For other skills, the number of lecturers who stated that they were using them (the skills) at an advanced level (level 3) was generally high compared to other levels. The figures in Table 7, shows that this number varies between 20 (33.3%) and 50 (83.3%) of 60 surveyed lecturers.

The issue of lecturers' competencies was also investigated in the Dean Questionnaire in the 8th item, and 5th item of the lecturers' interview protocol. When asked to broadly describe the ability of lecturers to use ICTs with regard to the pedagogical integration, all (3) Deans indicated that lecturers were competent to use in their teaching activities Microsoft Word, PowerPoint Presentation, and Microsoft Excel programs.

During the interviews, lecturers were asked to describe the skills/competencies they had and/or need to effectively integrate ICT in their teaching. The responses given by the 8 interviewees covers a range of competencies including the use of basic computer skills: MS Word, MS Excel, and PowerPoint presentation (100%), use of Internet to search for information and learning materials in preparation for classes (62.5%) and integrating them in teaching (37.5%), guiding and helping students in using ICT facilities in their learning activities (25%), using Internet communication tools (mostly email) to collaborate with other lecturers and researchers (75%).

When asked about the competencies they would require for the effective integration of ICT in their teaching, their responses were varied and can be reflected into two lecturers' statements who said respectively:

> "*Of course learning is a process; you can't say you have enough competencies. What I have is just the minimum. I need to go through a series of training to sharpen and deepen what I know in terms of general ICT uses but I also need the pedagogical skills to effectively use ICT in my teaching*" (lecturer C), and "*There should be some kind of support may be from the institution to keep on upgrading teachers' knowledge in the use of ICT and integrate it in teaching. So, training is needed*" (lecturer H)

The views of these two lecturers show that KIE lecturers are aware of the low level of their competencies to effectively use ICT in their teaching. Thus, they express the need for improvement.

As was pointed out earlier in this report, lecturers, no matter how competent they would be, will not be effective facilitators if the students' side in terms of IT-related skills is ignored. In this study, the student-teachers competencies to use ICT in their learning activities were investigated using student discussions protocol in its 5th item. Students were asked to describe the skills/competencies they had for effectively using ICT in their learning activities and their responses are summarized in Table 7.

Table 7. KIE Student-teachers' competencies in using ICT for learning activities

More or less mastered competencies	Required competencies (according to students' views)
Basic computer skills: MS Word, MS Excel, PowerPoint Presentation, MS Access	Mastery of basic computer programmes
Using Internet : searching for information (using Google) and using email to communicate with teachers and other students	Language skills
Using some computer peripheral devices like printers, DVDs, CDs, Memory Sticks	Hardware-related skills
Browsing some websites hosting learning resources and materials	The use of ICT in teaching
Downloading documents/files from Internet	Searching and retrieving information on Internet and using it in course works and assignments

Some of student-teachers' comments, about certain competencies are worth being presented here. Thus, commenting on basic computer skills, one student-teacher said:

> "*Actually, I studied basic computer skills MS Word, Excel, and others when I was in level one. But now these things (skills) seem to have disappeared because I did not keep on practising them*" (student-teacher F, Group discussion II).

Stressing the importance of language skills, another student-teacher commented:

> "*It is not easy at all to use ICT facilities when you do not really understand the language in which they are set. For example, we have been talking about searching information by browsing Internet, but if you do not know English, sometimes you are stuck*" (student-teacher A, discussion group I).

At this stage of analysis, it can be noticed that interview results shared similarities with the results obtained from the survey in regard to lecturers' competencies to use ICT in teaching. The results generally revealed that the level of lecturers' (who participated in this study) competencies in using ICT in teaching ranges from those lecturers who confirmed "they do not master or understand" the skill under evaluation and therefore do not use it" to those lecturers who confirmed "they do master" the skill under evaluation

and use it in their work and with their students. Other lecturers took an in-between position and confirmed that "they do master and understand" the skill under evaluation but do not use it (or use its basics) in their work and with their students. The study results show that the majority of lecturers were in this last category.

On the students' side, the findings showed that their competencies to use ICT in their learning activities were limited and they [students] expressed their wishes to further enhance those competencies in terms of mastery.

4.4.1.1. Pedagogical use of ICT by KIE lecturers and Students

First of all, it is important to point out that as far as this study was concerned; the researcher opted for a combined analysis of both KIE lecturers' and students' pedagogical use of ICT in academic activities. Lecturers and students were asked to estimate the number of hours per week they were using ICT for academic purposes (Lecturer Questionnaire, item 7 and student discussion form, item 3). 60 of the 61 surveyed lecturers answered this question and their answers show that they were using ICT for academic purposes at an average of 10 hours per week and per lecturer. For students, 17 student-teachers or 70.8% (N=24), answered the question and their answers show that they (students) were using ICT for academic purposes at an average of 4 hours per week and per student.

Lecturers were asked to describe the various ways they were using ICT for academic purposes (which software, for planning, teaching, marking, etc.). The results obtained from interviews and surveys indicated that they (lecturers) were variously using ICT for academic purposes. All the interviewees (8 lecturers) and all surveyed lecturers (61) were using computers for preparing lecture notes by typing or word-processing, typing exams (7 interviewees or 87.5% and 32 surveyed lecturers or 52.4%), processing student's examination results using spreadsheet/excel (5 interviewees or 62.5% and 28 surveyed lecturers or 45.9%); and typing research papers (4 interviewees). Internet was mostly being used for searching for teaching materials or/and information (8 interviewees or 100% and 43 surveyed lectures or 70.4%); referring students to further references or further readings (5 interviewees or 62.5% and 30 surveyed lecturers or 50.8%); doing research (3 interviewees or 37.5% and 9 surveyed lecturers). Internet (email) was also used for

communicating with other lecturers and researchers. In responding to two items (see 16th and 17th items in Lecturer Questionnaire) which sought information on whether respondents knew and used any specific computer program or websites (portals, web pages, electronic magazines, dictionaries, search engines…) related to their teaching specialties). 49 or 80.3% of surveyed lecturers reported that they knew a number of software products, web pages or computer programs (summarized in Table 8) but some were not necessarily linked to any teaching specialties.

Table 8. Computer programs and websites used by KIE lecturers in their teaching specialties

Computer programs and websites	Used for
Google	Searching English language exercises for practice, searching information, video, pictures to use in teaching, research
Wikipedia	Checking facts
Librecours.org	Finding free online courses prepared by other lecturers who are more knowledgeable
Online French –English Dictionary Encarta encyclopedia	Searching meanings, translation, spelling and grammar
Online linguistic encyclopedia	Finding meanings of certain specialized linguistic terms
Electronic Journals/research publications Web portals like: ERIC, SOSIG, British Journal of Educational Technology, Blackwell Publishing Ltd Journal of Computer Assisted Learning	Searching additional teaching resources, referring them to students, research
CHEMDRAW and ISIS DRAW	Drawing some tricky chemistry-related molecular structures
ChemLab	Carrying out some chemical experiments on the computer. This is used as a good alternative to the lack of necessary and required chemical reagents to effectively carrying out chemical experiments in laboratories.
Dynamic Chemistry	Plotting a graph of a given chemical function and transferring it into my word documents (lecture notes)
SPSS: Statistical Package for the Social Sciences	Research (Data analysis)
They also mentioned other software without indicating how they were being used: MATHEMATICA, MAPPLE, and MATHTYPE	-

It is, however, important to point out that information provided by lecturers in Table 8 above did not corroborate other findings obtained from other sources and it was not clear whether the lecturers indicated/described how they were *actually* using these software products, computer programs, and web pages in their teaching activities or they

(lecturers) just described how these ICT tools *would* or *could* be used in teaching. In fact, in response to an item (1st item, in student discussion protocol) that required student-teachers to describe/list the various ways that they were using ICT in their academic work, most of ICT tools indicated in table 8 were not referred to. The students mentioned some web pages and search engines. If those software products and computer programs were actually being used in teaching, students would have mentioned them because in most of their interventions, they usually started by "*our teacher/lecturer uses,…"*, "*when we are studying X course, our lecturer asked us to,…", "this is used by our teacher when he/she,…"*. Likewise, the closer analysis of some copies of learning modules and other learning materials produced by lecturers did not lead the researcher to ascertain the actual use of most of ICT tools indicated in Table 8. The researcher realised that those lecturers who confirmed that they actually used some specific software products, they were doing it for preparation of teaching materials and not with students. One interviewee said, for example:

> "*I am teaching mathematics and when I am teaching some mathematical functions, I use GEOMETER'S SCETCHPAD. I enter the function and it gives me immediately the graphics*" (lecturer A).

The use of PowerPoint Presentations in teaching delivery was also mentioned by many lecturers (7 interviewees and 48 surveyed lecturers). This extensive use of PowerPoint presentations (using LCD projector) coupled with public addresses and loudspeakers was due to the big class sizes at KIE and some lecturers see it as the only alternative:

> "*Imagine, and you know it very well, a teacher addressing a class of 300 hundred students using the traditional chalk and talk approach! It can't work and this is why we are obliged to summarize the learning content using PowerPoint and present it [the content] in class by projecting so that we can reach a big number of learners*" (lecturer B).

The surveyed lecturers identified other individual initiatives in pedagogical ICT uses and those included: recording video or video-related materials to use in teaching (1 lecturer), using DVDs, CDs, and Memory Sticks to store instructional materials (for future use) and share information between lecturers, "*using some e-programmes (paint, adobe Photoshop) I can develop my own diagrams for illustrations*", and "*I sometimes set up storyboards to illustrate some aspects of my teaching process*"

In this study, the use of ICT was analysed by looking at not only lecturers and their teaching but also the students and their learning. Therefore, the use of ICT by KIE student-teachers for academic purposes was investigated using student discussion groups. The first item of the student discussion protocol asked respondents to describe/list the various ways that they used ICT in their academic work. The results from three discussion groups lead the researcher to identify the types of ICT commonly used by KIE student-teachers for academic purposes and these are: computers, the Internet, Memory Sticks, CDs, and cell phones. The most used computer software is Microsoft Word processing, and students use it to type their assignments. Microsoft PowerPoint presentation and Excel are not usually used.

Findings that emerged from these discussions revealed that KIE student-teachers use Internet for academic purposes when, in most cases, it is asked for by their lecturers. The latter do this by:

- Referring students to a given web site hosting additional and detailed information or readings related to the course content
- Asking students to go and find information on web pages and then discuss it in classroom sessions and
- Providing web sites hosting information that will help students in doing their assignments.

Student-teachers also reported that they sometimes use Internet even if their lecturers do not ask them to. Two fourth level B.Ed students and one second level computer science student commented respectively:

> "*Internet helps me sometimes when I am stuck"; "…before going to library, I first of all search in Google since, even if I go there, I most of the times do not find what I want".*

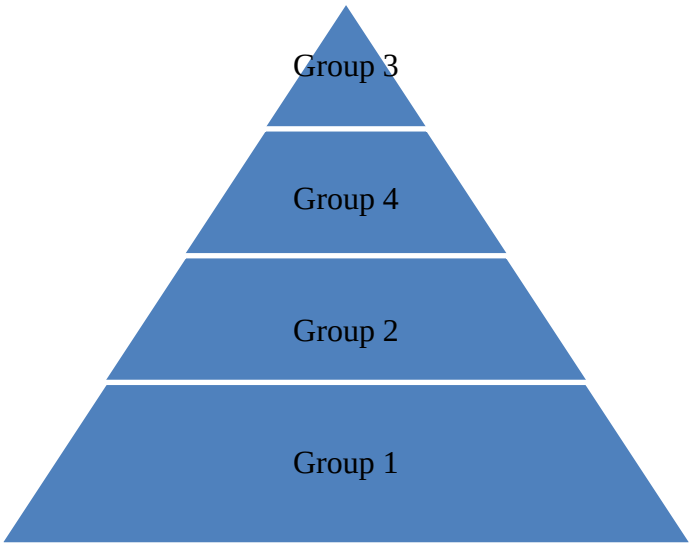
And the third student-teacher said the opposite:

> "*When I go to library and do not find the books which can help me in doing my assignment, the last resort I have is to go and search on Internet."*

When asked whether they used Internet search engines like Google, AltaVista, Yahoo search or other web sites hosting educational resources (see student discussion form , item 2) all student-teachers said that, except for Google, they were not aware of any other search engine. Individually, they gave a number of other web sites hosting educational resources and, in most cases their responses showed 'Google'.

Some student-teachers reported that they were using email and Yahoo messenger to communicate with other KIE students or students from other Universities but this communication is in most cases exclusively related to other purposes other than academic ones. All student-teachers said they had never used email to communicate with their lecturers. Cell phones remain the most common ICT tool for lecturer-student communication and, according to some students; this was exclusively done by class representatives. The last ICT tools that emerged from student discussions are CDs and Memory Sticks that are used to save information retrieved from Internet and their pieces of work and assignments. Memory Sticks are also usually used when students are exchanging files. KIE student-teachers vary considerably in terms of use of ICT in their learning. The analysis of some of their assignments coupled with information obtained from student discussions led the researcher to categorize them into 4 groups (see estimated proportion in each group in Figure 3)

Figure 3. Categories of ICT uses in KIE student's assignments production



- Group 1: comprised of those students who are uncomfortable in basic ICT uses (basic computer skills) and do not usually use ICT in their assignments but use it because their lecturers asked them to: documents

produced by these students are, in most cases, characterized by some problems pertaining to font style and size and formatting

- Group 2: represented those students who are comfortable in basic ICT uses (basic computer skills) and do not usually use ICT in their assignments but use it because their lecturers asked them to: documents produced by these students are characterized by few problems pertaining to font style and size and formatting, the use of images and other basic illustrations retrieved from Internet

- Group 3: comprised of those students who are quite comfortable in ICT uses and who usually use ICT in their assignments (where it is possible) even if their lecturers do not ask them to: documents produced by these students present fewer (sometimes none) font size/style and formatting problems, the use of well chosen Internet-based illustrations, the use of graphs, charts and diagrams.

- In addition to these three groups, there is another category of students (group 4) who never engage themselves in using ICT in their assignments even if when the lecturer asked them to. They simply ask their fellow students to help them or they take their handwritten work to people who run secretarial and/or typing services and they have to pay a certain amount of money.

4.4.2. Other findings: Ongoing Projects

Two projects are currently being conducted at KIE and ICT is used as an enabling factor in their day-to-day running.

4.4.2.1. Education for Community Cohesion[8]

This project brings together teacher trainees from the University of Nottingham's School of Education and students from Kigali Institute of Education in Rwanda and aims at developing teachers who can employ a range of pedagogies to promote community cohesion in both formal and non-formal educational settings.

Supported by their tutors and lecturers, teacher-trainees from both institutions develop pedagogies for teaching for community cohesion in history lessons, other subjects and whole school areas. Students from both institutions are working together by exchanging information about ways to develop appropriate pedagogies for teaching about sensitive issues such as the Holocaust or the 1994 Rwandan genocide. The project is using information and communication technologies to link students and university staff via video conferencing, blogging, chatroom and Moodle facilities.

So far, through a Moodle (password protected) website, History teacher-trainees from Kigali Institute of Education in Rwanda and from the University of Nottingham's School of Education have been able to collaborate. Throughout the academic year 2009, for example, students have been able to exchange information and experiences about teaching sensitive issues such as the Holocaust or the Tutsi Rwandan genocide.

4.4.2.2. Pan African e-Network (Tele-Education)[9]

The Pan African e-Network is a project which is being conducted under an Indian and African partnership. The project's services are provided by Indian Universities to the participating countries in the educational programmes (post-graduate, under-graduate, certificate and diploma courses) selected by African Union. Kigali Institute of Education is one African Higher Institutions of Learning that is participating in this project. Post-

[8] Further details about this project can be found at the Project's web site : http://www.edcoco.org/project-team.php

[9] Rwanda Development Board (2010), *Pan African e-Network (Tele-Education),* Project Charter.

graduate, under-graduate, certificate and diploma courses are being delivered to approximately 210 Rwandan students.

These courses are being delivered in a "learning studio" where teachers (from these Indian universities) interact with students in a sequenced and synchronous collaboration using the collaborative tools, like a return IP link, for providing audio, video and data connectivity to KIE Learning Studio and enabling students to have a live interaction thanks to a Satellite Broadcasting (VSAT) connection. In addition, the satellite transmission is supplemented by the use of Internet; the lecturer's PowerPoint slides; recorded videos; CD-ROMs and DVDs; and other learning materials hosted on the Pan-African Online Learning Portal.

At this level of analysis, there are a number of important observations to point out. The first point to note is that the level of ICT equipment and connectivity at KIE (though not flawless) allows KIE lecturers and students to use ICT pedagogically in their academic activities to a certain extent. Secondly, the findings have shown that a high number of KIE lecturers reported that they understand the Basic Teacher Computer Use skills and use them at an advanced level, but only a few teachers are using them in their teaching. Notwithstanding the latter observation however, some instances of ICT use initiatives for academic purposes have emerged throughout this analysis. Thirdly, the findings also revealed that many initiatives to use or adapt ICT in teaching and learning events at KIE come from individual lecturers who have special interests in the ICT-pedagogy field. Having said that, one must now question the pedagogical rationale behind the use of ICT for academic purposes at KIE.

When asked whether the choice of a given ICT resource to use is based on any pedagogical principles (interview protocol, item 2), 3 of the 8 interviewed lecturers confirmed that their choice of ICT resource to use in teaching was driven by the learner-centeredness approach to teaching and learning. Asked to elaborate on their answers, only one lecturer gave a certain convincing comment when he said:

> "*My choice of using GEOMETER'S SCETCHPAD is driven by the wish to see my students exploring more the Math concepts on their own. So, the students can explore much more the concepts with my support of course*" (Lecturer B).

Other lecturers' responses were related more to class management features than on any clear pedagogical principles.

In addition to these findings from interviews, the pedagogical rationale behind the use of ICT in teaching and learning events at KIE was analysed by confronting the findings and the existing literature on ICT-pedagogy integration. More precisely, the researcher contrasted his findings with the Laurillard's conversational framework and the Association of European Universities' guidelines to support ICT Application in education and the results of this confrontation lead him (the researcher) to conclude that the actual pedagogical use of ICT at KIE can be understood through three Teaching & Learning Events (Acquisition, Discovery, and Dialogue) as it is shown in Table 9.

Table 9. Teaching and learning events, pedagogical tactics, and associated ICT facilities and strategies at KIE

Teaching & Learning Event	Examples of pedagogical tactics used at KIE		ICT-related facilities and strategies used
	Teaching activities (Lecturers)	**Learning activities (Student-teachers)**	**Learning activities (Student-teachers)**
Acquisition	**1.Lecturing/demonstrating**: lecturers show, demonstrate, describe, and explain	Students attend lectures apprehend, and listen to their lecturers	**Audiovisual presentation** • computer presentation software (at KIE PowerPoint Presentation is used), • LCD projectors connected to PC for use with overhead projectors, • Microphones and loudspeakers
	2. Broadcasting[10]	Students attend lectures apprehend, and listen to their virtual lecturers from remote universities	**Extension of conventional lecturing by a satellite broadcasting** • PCs • Webcams • Internet • CDs and DVDs • videoconferencing systems in a dedicated rooms (learning studio) • cameras, • microphones, and • PPT slides, recorded video • Learning portal

[10] Pan African e-Network Project

Discovery	**Hypermedia resources** Lecturers find and identify some resources hypermedia Internet-based instructional resources and refer them to students	Student investigate, explore, browse, and search Internet-based information for: (a) further understanding, (b) doing their works/assignments, (c) class discussion, and (c) learning curiosity	**Web-based course resources for self-paced, self-directed learning or for private study** • PC • Internet
Dialogue	Lecturers moderate, lead, and facilitate discussions	Student discuss, collaborate, reflect, argue, analyse and share. They interact with other students from abroad.	**Synchronous and asynchronous dialogue using email and discussion forums**[11] • PC • Internet • Moodle learning Management system

As shown in the Table 9 above, all aspects of ICT uses for academic purposes at KIE are not represented in this table. As a matter of fact, some of these ICT uses are exclusively related to either lecturers' administrative tasks and preparation for classes (for example, typing lecture notes; preparing classroom lessons; doing research on the Internet; processing students exam results; communication with other lecturers and researchers or students' uses course work/assignment preparation and production).

4.5. Teacher training and professional development

It is a well known fact that professional teacher development is a key to a successful integration of ICT in teaching and learning. According to Carlson (2002):

> "Teachers remain the gatekeepers for students' access to educational opportunities afforded by technology: they cannot and should not be ignored. Moreover, providing technical skills training to teachers in the use of technology is not enough. Teachers also need professional development in the pedagogical application of those skills to improve teaching and learning (p.7)."

In this study at KIE, teacher professional development was investigated using various sources that include the Dean Questionnaire, Lecturer Questionnaire, and Documentary Analysis. All the 3 Deans confirmed that they had had ICT training and that ICT was present in both academic staff professional development and in initial (pre-service)

[11] Education for Community cohesion Project

teacher-training curriculum in their Faculties. When asked to give the number of lecturers who had completed 1-50 hours and above of professional development which included ICT training, Faculty Deans' responses were not clear and only 1 Dean (Faculty of Education) of 3 said "almost all" of the lecturers from his Faculty had completed 1-50 hours of training which included ICT; and 17 of 31 lecturers had completed this training for more than 50 hours. However, only 26 (or 42.6%) of the 61 surveyed lecturers affirmed they had had any training in pedagogical integration of ICT in teaching and learning for an average of 90.5 hours of training. The remaining 35 (or 57%) of the 61 surveyed lecturers said they had never had such training.

Both the deans and lecturers were asked to describe the kind of training in ICT-pedagogy integration they went through by outlining the skills and or/competencies in which they were supposed to be trained and listing the various ICT skills/competencies that they considered they had mastered. The Dean's and lecturer's responses revealed a varying range of ICT skills or competencies in which they were supposed to be trained and these include: Basic computer skills (23 lecturers); e-Learning: Resource Development and Student support (2 Faculty Deans and 4 lecturers); Search and use Internet-based information in the process of teaching and learning (1 Faculty Dean). Some KIE lecturers also identified a wide range of ITC-pedagogy skills in which they were supposed to be trained in different training sessions or during their under graduate or post graduate studies. The skills they indicated include:

- database use
- graphics use
- network use
- designing websites
- preparing teaching materials using computer
- using ICT in primary and secondary schools in Rwanda
- planning simulated lessons/courses
- using LCD projector in teaching
- affordance of tools (PhD studies)
- teaching Mathematics with dynamic geometry software (PhD studies)
- using software Dreamweaver and Inspiration in teaching

- integration of ICT in teaching and learning processes
- the use of TWIK (Teaching with ICT Kits) and
- integrating ICT into Mathematics-Education teaching

As it was pointed out earlier, the range of ICT-pedagogy skills in different training programmes that some KIE lecturers went through is varied. So, in the 6th and the 11th items respectively of the Lecturer Questionnaire and the Dean questionnaire the researcher sought to know the competencies that were mastered following different training programmes. The analysis of the answers to these items led the researcher to categorize the (mastered) competencies into two (see Table 10) categories: IT literacy-related competencies and teaching/learning (pedagogical)-related competencies.

Table 10. Summary of ICT-related skills mastered by some KIE lecturers following different training programmes

IT literacy-related competencies	Teaching/learning (pedagogical)-related competencies
Basic computer skills (MS Word, MS excel, MS PowerPoint)	Creating e-learning resources
Internet Explorer	Using PPT in teaching , TWIKS
Creating a websites	Using simulations in teaching
Differentiating between static and dynamic websites	The us TWIKS
Developing website with good ergonomics	Using Internet for academic activities
Using search engines	Using dynamic geometry in teaching Euclidian geometry
Using email	Organizing classroom interactions within ICT environment
Burning CDs	Using computer in preparing teaching notes and preparing written exams
Speedy Typing	
Accountancy software such as SAGE Pastel and Tally	
Downloading and save Internet-based materials	
Statistical Package for the Social Sciences (SPSS)	
Data base use and network use	
Installing, maintaining, and repairing computers and their accessories	
Troubleshooting scanners and printers	
Computer programming using C/CH languages, PHP, and Java	
Installing, maintaining, repairing, and administering computer networks	

It is important to observe from the results summarized in Table 10 that, in most cases, KIE lecturers (those who have had ICT-pedagogy training) have mastered informatics-related skills at the expense of competencies in teaching/learning-related skills. These findings corroborate the information obtained from the lecturer self-evaluation on Basic

Teacher Computer Use skills where the researcher noticed that a high number of lecturers (ranging from 33.3% to 83.3% of surveyed lecturers) affirmed that they were capable of using most of computer-based skills at an advanced level but unable to use them in their work and with their students. Furthermore, the researcher went through KIE policy and strategic documents and did not find any documents detailing the staff development program. The sole document the researcher came across is about Teaching and Learning in Higher Education. The programme is run by the KIE Centre for Academic Practice and Development. As far as the use of ICT in teaching and learning is concerned, one course dealing with e-Learning: Resource Development and Student Support has been delivered so far. The course started in 2009 and was attended by KIE Faculty Deans, some lecturers and senior lecturers within KIE or from other higher institutions of learning and universities. The researcher analysed this course's Learning Module related to e-learning and found that the emphasis is put on 'informatics' at the expense of 'pedagogics'. Lecturers are currently being taught how to create web sites.

4.6. Impact of ICT use on teaching and learning

The third research question of the present study investigated whether KIE lecturers and students perceived any impact attributable to ICT Pedagogical integration into teaching and learning. The analysis was done on both students and learning, and lecturers and their teaching.

4.6.1. Impact of ICT on lecturers and teaching

The impact of ICT on lecturers and their teaching was investigated using Dean and Lecturer Questionnaires and interviews in the areas of lesson planning and production of teaching materials, in-class teaching, evaluation strategies, lecturer-lecturer/ lecturer-student communication, and reflection on teaching.

In responses to the item (17^{th} item) relating to the description of the impact ICTs have had on teaching and learning in their Faculties, Faculty Deans gave four impacts: Lecturers have access to up-to-date instructional materials (2 of three deans); learning modules are regularly improved and enriched (1 Dean); students can access online materials for further readings (1 Dean); students are more motivated and active when presentation software like PowerPoint is used in classroom (1 Dean). In the area of lesson

planning, the use of Internet-based resources (e-journals, e-books, free online courses) to update teaching content was stated by most (52 of 61) of surveyed lecturers; 41 of the 61 lecturers stated the regular and easy updating of teaching notes. One interviewed lecturer supported this idea when he said:

> "*Editing and updating my course and preparing handouts are made very easy because my course is typed and saved on the computer. I think this would be much more difficult if the course were handwritten*".

Other lecturers said that teaching preparation was made easier and facilitated by the use of PowerPoint slides while preparing for classes (15 of 61 lecturers) and by accessing Internet-based ready-to-use instructional resources (5 of 61) which otherwise would have been impossible by using textbooks.

KIE lecturers have identified other ways in which ICT has impacted their teaching preparation and these include: the learning content is well structured, easily and clearly presented when one uses PowerPoint Presentation; ICT-based resources help in the effective and enriched illustration of the teaching content by adding pictures, images, photos, videos taken from Internet; and more improved accuracy and precision of graphs and diagrams compared to when it is done manually.

With regard to in-class teaching, KIE lecturers stated that integration of ICT has helped them in improving the teaching methods, saving time and get students more involved and motivated. As it was said before, a good number of KIE lecturers use PowerPoint slides and LCD projector together with microphones and loudspeakers in their in-class teaching. So, in most cases, the impact of ICT use (as stated by lecturers) on in-class teaching was related to the use of PPT presentation. Thus, lecturers' responses included: illustrations and demonstrations are made clear; PPT is a good alternative to teach big classes rather than writing on the chalkboard; the use of PPT presentation helps in saving time by speeding up teaching and covering the entire program/curriculum in a reasonable time frame; students are motivated, interested, active, enthusiastic, and follow attentively; using PPT makes it easier to go back and forth between different parts of the lesson and to give more clarifications.

The interviewed lecturers elaborated on their answers and went beyond the use of PPT for presentation purposes and emphasized some teaching and learning approaches like learner-centeredness, cooperative and collaborative learning. Thus, one mathematics teacher stated:

> "*When I give them (students) assignment in which they will be necessarily using Internet, they will have to browse, search, retrieve, and use information they find. In that case, they are just exploring knowledge for themselves, on their own, and this is part of learner-centeredness approach.*"

Another lecturer put this in another way:

> "*Again, I wish we all had access to these ICT facilities. But even with the little we have I can still say that there has been student-student cooperation. Because if I give them an assignment, I insist they go and search and the only effective way they can do this is by browsing Internet because our library cannot help a lot. Somehow, they collaborate because some of them would tell me that we had divided our works in pieces: some of us go and search on this part of assignment, and finally we put together our pieces. So I think they collaborate*" (lecturer C).

In responding to the question related to the impact of ICT use on Assessment strategies, most of the lecturers (91.1% or 55 of 61) said that they had never used ICT in student assessment. Two of the 61 surveyed lecturers said that the use of Internet-based resources has helped student to improve the quality of their assignments by diversifying the sources instead of relying only on the limited number of textbooks in the library. Another lecturer said that computer helps him to create a bank of items which can be used over and over in different tests or exams. Another lecturer wrote that the use of spreadsheet (or Excel) has also facilitated the processing and the keeping of exam results.

As far as lecturer-lecturer/student communication is concerned, all lecturers who participated in this study confirmed that they had personal email addresses. The findings revealed that the communication via email is common between lecturers. However, this communication is rare between lecturers and students. Lecturers stated that the use of email has improved communication by sharing and exchanging information, resources, files and experience between them and between other lecturers and researchers from other universities in the country or outside the country.

When asked whether the use of ICT has helped them with reflecting on their teaching, only 5 lecturers answered this question and their answers fall within the thematic cluster of lesson planning and teaching preparation above. Only one lecturer wrote:

"*I am used to contrast and compare what I teach with Internet-based information, resources, and learning materials for making possible adjustments*".

4.6.2. Impact of ICT on students and learning

When asked to generally describe the impact that ICT has had on their studies (6th item of the student discussion form), student-teachers gave various responses falling into three categories including easy access to (up-to-date) knowledge and information; saving time; further exploration of knowledge; and improved and facilitated production of assignment. The student-teachers declared that the use of Internet allow them to easily access up-to-date information and learning resources. Thus, one English-Education student said:

> "*Internet has enabled me to get access to more and up-to-date information and own it, keep it and reuse it whenever and wherever I want. For example, in Literature I am used to access some online novels and other literature works and download them, keep them and re-use them which, in my opinion, is not possible when you use books from the library."*

Another English Education student intervened to support his/her fellow one and declared:

> *"I do remember last year, we were given a number of assignments relating to classical texts of Shakespeare and there were only two books in the library for more than 30 students. It was then frustrating. Our group was tasked to work on Romeo and Juliet and we were stuck. Then, one student came up with an idea and proposed to look for this information on Internet. We did it, downloaded the texts and I saved them on my Memory Stick.*"

This student's declaration is supported by one interviewed lecturer who stated:

> "*When I give them (students) say an assignment to be presented in class, most of them use Internet because we have few and relatively old books in our library*" (lecturer E)

Stressing the fact that ICT facilitates the learning process another students added:

> "*First, I think the impact of all these ICTs is that they ease my learning, because it is more tiresome to go and get a book in the library and use it than just typing some key words in Google and you immediately get what you want.*"

The first part of this student's intervention has to do with another student's idea who said that ICT helps him in saving time:

> *"For me, using ICT helps me to save my time because for example when I am dealing with online information I spend less time than when I am dealing with books because online information is organized in a way so that you can easily and quickly access and use it."*

Both lecturers and student-teachers acknowledged that Internet has helped students in exploring further information/knowledge and thus going beyond what the lecturers present during classes. Thus, one student had this to say:

> "*(...) when the lecturer comes in the class, he/she has only limited time. He/she cannot explain extensively the learning concepts. So, when we go to Internet we get additional information; compare it with what we know, what we see and what has been said or presented by the lecturer*."

Corroboratively, lecturers F, D, and A said respectively:

> "*Students do not rely only on what is given during classes; they can complement the lecture notes by additional information hosted on different websites*";

> *"When I am teaching in class, I indicate them (students) some websites and ask them to go and search a little bit more information. I always tell them that what I am presenting or what I am giving in class is just, maybe, a small bit and ask them to go and look for further information on different websites that I have identified before*"; and

> "*There are some students who are very knowledgeable in searching for information. When you ask them to go and find more information on Internet, they take initiatives and read. When you go to teach you find that some students already have some knowledge and this makes teaching and learning good because you are not just imparting knowledge to people who have empty heads, who know nothing"*.

The most striking example that reflects the way the use of ICT has helped students to further explore knowledge and information was given by one computer science student in his assertive statement:

> **"***As far as I am concerned, ICT has had great impact on my learning. I remember in first year when we were studying the C++ programming, I asked our lecturer to tell me about the practical uses of this computer program? How could I produce for example simple software? The lecturer said, 'oh I see, it is too early at your level to think about such complicated matters'. May you wait until you get to higher levels? But I wasn't satisfied by the lecturer's response. I told myself, 'ok even if the lecturer does not tell me what I want, I have to find out'. I have googled on Internet and I asked a question: 'How is it possible to produce a software using C++ program?' I continued doing research and finally came across with useful and complete information about how to produce software***."**

Findings from student discussions also revealed that the use of ICT has helped in producing documentation such as written assignment and presentations. Many students agreed that ICT has helped in improving academic performance in relation to assignments. According to them, the more they use ICT in their work the more marks they get.

Notwithstanding the fact that ICT has positively impacted KIE students' learning, some lecturers have identified some concerns related to some student's addiction to Internet. Thus, one interviewee said worriedly:

> "*For some students, Internet has become their only source of information and I am wondering how they would manage if they had to work in an environment where computers and Internet are not available.*"

Another lecturer complained:

> "*Nowadays, students have become lazy; they no longer work hard since they hope to get all the ready-made and ready-to-use information they want from Internet.*"

By the end of this analysis of ICT impact on KIE students and learning, it is necessary to point out that some lecturers reservedly commented on this point. One lecturer in the Faculty of Education, for example, acknowledged that she encourages her students to use ICTs in their learning activities so that they can enhance and improve the ICT-related skills and continued by saying that:

> "*So far, my students have typed their course works using computers, they have researched by browsing Internet, but I have not really gauged or seen the impact on their learning or whether they have learned something more*".

From this analysis about the impact of ICT use on teaching and learning activities at KIE, it is noticed that the views expressed by both lecturers and trainee-teachers revealed that, in most cases, ICT has provided new ways of dealing with teaching and learning process in terms of facilitating the teaching and learning traditions (the traditional way of teaching preparation and delivery as well as the traditional learning pathways and processes). Little has been shown about how the use of ICT at KIE would have provided lecturers with the new pedagogical repertoires enabling the shift from the teacher-centered to student-centered learning (see Adel & Mounir 2008) and leading to increased learning gains for students, creating and allowing for opportunities for learners to develop their creativity, problem-solving abilities, informational reasoning skills, communication

skills, and other higher-order thinking skills (Trucano, 2005: 5).

4.7. Barriers and challenges to pedagogical integration into teaching and learning events at KIE

The fourth research question of this study investigated the major barriers and challenges that hindered or inhibited the adoption and the pedagogical integration of ICT in teaching and learning at KIE. This research question was dealt with by using information collected through interviews, surveys and student discussions. The researcher also noticed that Faculty Deans and surveyed lecturers, in most cases, used the space on the questionnaire reserved to additional comments (see 20th and 27th items of respectively the Lecturer Questionnaire and the Dean Questionnaire) to list the barriers and challenges that hinder the integration of ICT in teaching and learning at KIE. This study revealed a range of different barriers; the most common are summarized in Table 11 and divided into two categories: the non-manipulative[12] and manipulative school/institution and teacher (and students) factors (Mojgan et al., 2009) with each category having its sub-categories.

Table 11. Summary of barriers faced by KIE Lecturers and Students in Using ICT for academic purposes

Levels		Non-manipulative	Manipulative
Institution-level barriers		-	Lack of necessary software and ICT facilities; poor maintenance; insecure ICT facilities and resources; lack of Vision, Plan, and framework about the integration of ICT in teaching and learning; lack of enough time; big class sizes; lack of real commitment and involvement of KIE top management; poor

[12] Non-manipulative factors are factors that cannot be influenced directly by the school, such as age, teaching experience, computer experience of the teacher or governmental policy and the availability of external support for schools whereas manipulative factors refer to the attitudes of teachers towards teaching and ICT, ICT knowledge and skills of teachers, commitment of the school towards the implementation process and availability of ICT support (Brummelhuis in Mojgan et al. (2009)

			Internet access and connectivity; lack of technical support; poor and unreliable electricity supply
Human-level barriers	*Lecturer-level*	Age, lack of confidence and experience with ICTs, individual resistance to change; lack of adequate mastery of English language.	Lack of lecturers' competencies and expertise in using ICT in pedagogical practices; lack of effective training and staff development; lack of lecturers' awareness.
	Student-level	Lack of experience with ICT due to educational background; lack of adequate mastery of English language	Lack of competencies and skills in using ICTs; lack of competencies and skills in using ICTs in learning activities.

4.7.1. Institution-level manipulative barriers

The lack or limited access of/to ICT-facilities (like LCD projectors, public addresses, microphones and loudspeakers) and the lack of adequate teaching and learning software was mentioned by most (48 of 61) of surveyed lecturers as one of the major barriers impeding the use of ICT in teaching and learning events at KIE. This was also confirmed by all 8 interviewees and some of their declarations are worth being presented:

> "*For me, most of the challenges are related to lack of specific software to use in teaching/ learning and to a limited number of ICT equipment. For example, I can say, in our Faculty, there are a few LCD projectors. There are not readily available, you do not find it (LCD projectors) each and every time you need to use it*" (lecturer C).

Lecturer D supported this and said:

> "*Most of ICT facilities we commonly use in teaching like LCD projectors, microphones, etc. are kept somewhere. There are some people who are supposed to help us. So, one thing is that we have to constantly remind them to provide these facilities. At a time when these people are not around we fail to access them because there are kept somewhere.*"

This lecturer's point of view depicts one aspect of the poor management of available ICT facilities and resources that was also mentioned as one of the challenges to ICT integration in academic activities at KIE. Other aspects, identified by both lecturers and trainee-teachers, were poor management of ICT facilities which appears to be related to the mismanagement of computer labs including the lack of clear guidelines and timetable

for computer labs use and the failure to balance the use of computer labs in terms of both teaching/learning classroom sessions and free sessions. Some students strongly complained:

> "*I remember, the last time I used the campus computers goes back in 2008 when we were studying computer basic skills. After this course, I entered into the computer room and there were level 4 students and other students from Computer Science Department. Those students were very terrible! They couldn't allow other students who were not doing computer science or fourth year students to enter the labs. So, from then, I did not go back to computer labs. Because I realised that only computer science and level 4 students were only allowed access to computer labs*".

This student's view, and shared by most of the students who participated in this study, is supported by some of their surveyed lecturers who affirmed that students do not have free access to computer labs (8 of 61 lecturers); students have a restricted access to computer labs (12 of 61 lecturers), and inadequate access hours to computer labs (3 of 61 lecturers).

Another student (who was also supported by his colleagues) expressed his frustration by saying that "*even though you manage to get into the computer labs you are surprised to find out that almost all computers are locked.*" To answer the question 'who locks them?' all the students said "computer science students"

However, the Computer-Education student-teachers who participated in a group discussion from the Faculty of Science refuted these allegations and described the situation differently. One fourth level computer-education student said:

> "*No, I strongly disagree with those students. They should know that, sometimes, even for us who are doing computer science, apart from during class time, we are not allowed to go in these labs. I think the main problem here is the poor management of ICT tools here at KIE. Here we have seven computer labs, I think these labs are enough given the number of students. But they way these ICT tools are managed is not the good one. You will sometimes find that all the labs are closed at the same time*." (Student-teacher B, discussion group III).

Another Computer-Education student supported his fellow student in these terms:

> "*I do not understand them, because sometimes computer science students are doing a course which needs to remain saved on computers for a certain time. We have to do our works and then the lecturer comes to collect them for marking. If you allow these students from French, History and whatever - who in most cases*

> *know nothing about the computers - to access the computers, when they start clicking and do whatever, they can delete your work. So, the best solution for that, you lock the computer for a moment, after the course is finished you unlock it. For them, according to what I know, they do not know when the labs are accessible. Because you will find that they come during class time. When you tell them that you still have a work to do, they won't go or they will say that students from computer science are not cooperative*." (Student E, discussion group III).

After explaining how the Institution has unsuccessfully tried to resolve this problem by hiring Computer Lab attendants, one student said:

> "*For KIE authorities, their concern is about maintenance and I understand them. But the solution is not to keep the labs closed. Instead, they should try other alternatives like involving students in the management of these computer labs*."

Student-teachers raised other aspects related to the poor management of computers labs and those include: the lack of clear a timetable of computer labs use (when they are open for both classes and free sessions); and the use of computer labs in some non-academic external activities.

Another institution-level manipulative barrier is the poor computer and other ICT facilities maintenance and services as well as insecure computers. Both surveyed and interviewed lecturers stated that the computers they have are obsolete or old-fashioned and that they are frequently broken down. And, because of the shortage of trained ICT personnel to deal with repairs and providing guidance, the support and services from IT Directorate are very poor. In addition to the poor maintenance, both KIE students and lecturers raised the problem of corrupt and insecure computers due to many viruses.

The lack of real commitment and involvement of KIE top management was also identified by lecturers as one of the main barriers to integrating ICT in teaching and learning at KIE. One surveyed lecturer wrote "*KIE authorities do not put serious attention on the use of ICT in teaching.*" Other interviewed lecturers also affirmed that KIE top authorities are not fully committed:

> *"(…) as I know, KIE top authorities do not tell us what to do, what software to use or how to use ICT in our teaching. It is up to lecturers to use or not to use ICT in their teaching activities*", another added: "*they are just encouraging us to use ICT but they do not take the next step of providing the necessary facilities. Some of good ideas and promises are advanced but unfortunately, the implementation does not follow the move, their intentions and promises do not materialize*".

The poor Internet access and connectivity was the most stated barrier to ICT integration into teaching and learning at KIE. It was mentioned by all this research participants as source of their grievance, frustration. This problem of poor Internet connectivity led a significant number of lecturers to buy their own 3G modem they use but, as one lecturer said, the use of one's 3G modem for academic purposes is very limited because Internet is very expensive. For student-teachers, the only possible resort is Internet-Cafés and the problem is that not every student can afford the Internet fees at these cafés. At the time of data collection, "*works were underway to irreversibly fix this problem*" (IT Director).

Research participants raised other institution-level manipulative barriers and these are : lack of vision, plan, and framework about the integration of ICT in teaching and learning; lack of enough time; big class sizes; lack of technical support; and poor and unreliable electricity supply.

4.7.2. Lecturer-level non-manipulative barriers

In this category three barriers were identified: the age; the lack of confidence and experience with ICTs; and individual resistance to change. The age of this research participants ranges from 24 to 74 years. At the time of data collection, 5 questionnaires were returned unanswered. The lecturers who returned these questionnaires have one characteristic in common: they are all over 55 years old and the analysis of their apologetic statements revealed that they lacked confidence and prior experience in using ICT. They said for example: "*I am sorry; I cannot help in answering this questionnaire. It is out of my knowledge as a lecturer. May be the IT department, which deals with ICT matters, can help you*"; another lecturer presented his excuse by saying: "*Come on! Do you think I am the right person to answer such questions? Please approach these young teachers like X, Y, Z...*" and another one said explicitly "*I am really sorry, I tried to answer some of your questions but, as I was flipping through your questionnaire, I came to realise that either I do not have information you need or I do not have the right information. May be lecturers from Computer Science Department can help you*".

The lack of confidence and experience in using ICT was also mentioned by one interviewed lecturer who said that some lecturers have little knowledge about ICT especially when it comes to searching information on Internet, retrieving it, and using it

in their teaching. He especially emphasized on those lecturers who are quite elderly. For individual resistance to change only 10 of 61 surveyed lecturers perceived it as a barrier to ICT integration but 6 of 8 interviewed lecturers stated that some KIE lecturers are not using ICT in their teaching because they resist changes. One interviewee who supported this idea said:

> "*Some lecturers may resist changes and refuse to integrate ICT into their teaching because, I think, integrating ICTs would require them additional efforts to change and rethink the way they produce teaching materials and to some extent the way they teach*."

These lecturers showed a preference to stick to "doing teaching as business as usual" and are reluctant to embrace, not only ICT-related changes but also any other change, that would require them the re-engineering of their teaching practices and as Miller (et al., 2000) put it, this inertia is the result of expression of their feelings that "the old ways are the best ways." "If it ain't' broke, do not fix it".

But, one of the two lecturers, who opposed the idea that some KIE lecturers do not want to integrate ICT in teaching due to resistance to change, had this to say:

> "*The resistance to change is not there because lecturers are not forced to use ICT in their teaching. That is why one cannot easily detect whether they resist changes. Lecturers are voluntarily using ICT; those who are not using it are not blamed because there is no official or institutional binding policy or guidelines that formally require lecturers to use ICT in their teaching"*.

Another lecturer-level non-manipulative barrier is related to the inadequate mastery of English Language by French speaking Lecturers. The Rwandan Instructional Language Policy has recently undergone radical changes. Since the academic year 2009, all Rwandan Higher Institutions of Learning shifted – without any transition period, whatsoever – from using both English and French as Instructional Languages to the exclusive use of English in teaching delivery. This issue is common to both Lecturers and Students and was recently identified in the Rwandan Parliamentarian ad hoc committee's (2010) [13] report as one of the major challenges faced by Rwandan Higher Institutions of

[13] The establishment of this ad hoc committee came as a result of a report initially compiled by the parliamentary Standing Committee on Education Science, Culture and Youth which unearthed several shortcomings within public and private universities.

Learning. Three out of the 8 interviewed lecturers and almost all French speaking trainee-teachers, identified the lack of adequate mastery of English Language as one of the challenges hindering the use of ICT in their academic activities.

4.7.3. Lecturer-level manipulative barriers

In this category, three barriers were identified and these are the lack of lecturers' competencies and expertise in using ICT in pedagogical practices (41 of 61 surveyed lecturers and 6 of 8 interviewees); the lack of effective training and staff development; and the lack of lecturers' awareness.

The lack of lecturers' competencies to use ICT in their teaching can be thought of as the result of the poor or the lack of effective training and academic staff development. The latter was mentioned by a significant number of the surveyed lecturers (38 of 61) and 5 of 8 interviewees. Earlier in this report, the findings revealed that only 26 (or 42.6%) of 61 surveyed lecturers confirmed they had received training in pedagogical integration of ICT in teaching and the remaining 35 (or 57%) lecturers said they had not been trained.

The lack of awareness for some lecturers was mentioned by 5 surveyed lecturers and 3 interviewees as one factor that prevents some lecturers from using ICT in their teaching. In response, one of lecturers wrote:

> "*Although I cannot speak on behalf of anybody, but I think some lecturers do not perceive the rationale or the importance of using/ integrating ICT in teaching and learning and they do not commit themselves.*"

Another interviewee put this in another way and said:

> "*I am trying to use some aspects of ICT like Internet, and some software products because I am convinced that they can help me in bettering my teaching activities. I do not see how another lecturer who is not aware of the benefits ICT can bring about would bother using it*."

4.7.4. Student-level non-manipulative and manipulative barriers

In this category, two non-manipulative barriers (the lack of experience with ICT due to educational background and the lack of adequate mastery of English language) and two

manipulative barriers (the lack of general competencies and skills in using ICTs and lack of competencies and skills in using ICTs in learning activities) were identified by both lecturers and student-teachers who participated in this study. (65.5%) of surveyed lecturers stated that KIE students are not sufficiently trained for them to use ICT in their learning activities. In addition, 4 of 8 interviewees declared that students are not using ICT in their learning activities due to lack of competencies in ICT uses.

This challenge related to the lack of competencies was the commonest concern of student-teachers who participated in this study. Quotations from a few of students' comments convey their feelings:

> "*I would like to inform you that even if we are using these different websites to search information. This is not done by every student here. When we are given works, we organize ourselves so that in each group there is someone who is capable of searching information on the Internet because everybody here is not capable of doing this*."

In criticizing the way the Computer Basic Skills Module is being taught, two students added:

> "(….) *not only the number of students but also some lecturers' teaching strategies are not helpful. For example, we have here a module dealing with ICT in first level. When they (lecturers) are dealing with it, they do not explain much to students. We probably passed without knowing much about computers.*" and another said:

> "*I would like to emphasize this issue because it seems very important for me. The way ICT or computer skills are taught here is not the good one; the theoretical part is more emphasized to the expense of practices. This is why you will see students passing the module without problems but when we get to the second level and if we are given assignments in a group of say 8 students, not more than 3 students are able to look for information on Internet or even type their assignments using a computer*"

In previous sections of this report, it was mentioned that the extent to which KIE student-teachers use ICT in learning activities vary considerably. The gap or the differences between the four different categories (see Figure 3) resulted not only from the differences in student's performance on Computer Basic Skills Module, but also on the differences in student's prior experience with ICT before they come to KIE. As one lecturer put it:

> "*Some lecturers no longer accept handwritten assignments but for me, it is unfair. I know some of my students have difficulties in using computer because, you know, a good number of them come from rural secondary schools where they had never had any experience in using ICT. I know they have done the ICT-related Module here at KIE but still they are struggling. So, in my assignments, to use or not use ICT is optional*"

Summary

This chapter analysed data collected from survey questionnaires, interviews, student-discussions, as well as documentary analysis on 7 broad themes. Although the study findings revealed that KIE has the basics in terms of ICT equipment and connectivity, the absence of ICT framework/policy, which would guide the integration of ICT in teaching and learning led to a certain under- exploitation/underutilization of these ICT resources. However, in relation to research question 1 and 2 which sought to know whether KIE Lecturers and students use ICT for academic purposes, some individually uncoordinated initiatives of KIE lecturers and trainee-teachers in using ICT in their academic activities emerged from this analysis. The findings have also revealed that, in the context of integrating ICT in teaching and learning events, a good number of KIE lecturers placed themselves on an advanced level in terms of informatics (on Basic Teacher Computer Use skills self-evaluation rubrics) and on a wanting level when it comes to pedagogics. The students' skills in using ICT in both technological and academic related activities are still wanting too. The lack or poor staff training and development coupled with many other manipulative and non-manipulative barriers on both institutional and human level and which were investigated in research question 4, are undermining the effective pedagogical integration of ICT into teaching and learning events at KIE. Thus, the pedagogical ICT use at KIE did not impact the teaching and learning processes in terms of shifting from the teacher-centeredness to student-centeredness; rather ICTs are being used as adds-on to traditional way of teaching and learning.

CHAPTER 5: DISCUSSION OF FINDINGS

This chapter provides an in-depth discussion of the issues raised during the study carried out on the pedagogical integration of ICT in teaching and learning events at KIE. This discussion is divided into two main parts. The first part is the discussion of the findings relating to the context of pedagogical ICT integration into teaching and learning events at KIE and covers three main themes including KIE ICT policy; Equipment, connectivity and access of/to ICT facilities at KIE, and the teacher training and professional development. The second part discusses the findings relating the pedagogical use of ICT in teaching and learning at KIE as well as the associated impact on both lecturers and teaching, and students and learning. Besides examining the pedagogical use of ICT at KIE, this part also discusses the findings relating to the barriers and challenges to ICT integration in teaching and learning at KIE. The discussion in the second part addresses the following guiding questions of the study:

- Are KIE lecturers using available ICT facilities and resources to help them to pedagogically improve their teaching practices?
- Are KIE student-teachers using available ICT facilities and resources for academic purposes (in their various academic activities)?
- What is the impact, if any, (as perceived by both lecturers and student-teachers), attributable to ICT Pedagogical integration on teaching and learning - on (a) student and their learning (b) lecturers and their teaching – at KIE?
- What are the major barriers (as perceived by both student-teachers and lecturers) hindering ICT integration in teaching and learning events at KIE?

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

5.1. KIE ICT Policy

A successful integration of ICT into teaching and learning events of any Instution of learning has to be based on a comprehensive ICT policy framework in which answers to some critical questions like Why? Who? How? Which? Where and When? (Haşlaman et al., 2008) which are explicetly detailed in policy documents and implemeted in classrooms. Mojgan et al. (2009), after reviewing a number of researches in ICT integration in education, pointed out that a school's ICT vision is essential to effective ICT integration. According to these authors, "a well-defined mission that describes technology's place in education is of great importance: a vision gives us a place to start; a goal to reach for; as well as a guidepost along the way". Specifically, an effective institutional and or sector-wide higher education ICT policy that seeks to promote the effective use of ICT should identify specific ways in which ICT will be used and the ways in which ICT equipment/facilities and connectivity will be dealt with and specify how collaboration with education institutions in ICT-related activities will be done, and identify ways in which the capacity of Faculty and other relevant personnel will be built (*cf* UNESCO, 2002: 8)

Putting the findings on KIE ICT policy side by side with the literature, it is clear that KIE still has much to do. KIE has identified areas of intervention in the form of a statement of good principles and ideal guidelines entrenched in national ICT policy. Although KIE has made the commitment to use ICT in supporting and facilitating the successful pursuit of its mission, there appears to be a lack of coherent and detailed strategy or framework to fully support the use of ICT pedagogical tools in the teaching and learning events. In other words, KIE has identified a set of broad principles to guide the integration of ICT into teaching and learning without providing clear answers to the questions underpinning a good institutional education ICT policy. The KIE ICT integration strategy can rather be seen as an attempt "to profile the institution as visionary, to catch up with the technological developments and provide an answer to the pressure from external (especially the Ministry of Education) and internal stakeholders" (Stensaker et al., 2006). The KIE ICT policy statement should rather focus on finding detailed answers to some critical questions like: Why should ICT resources and applications be used? For whom are ICT resources and applications used? How are ICT resources and applications used

with appropriate teaching methods and learning strategies? Which ICT resources and applications should be used? Where are ICT resources and application supplied from and where shall they be used? And when should ICT resources and applications be used? (Haşlaman et al., 2008)

5.2. Equipment, connectivity and access of/to ICT facilities at KIE

In the process of integrating ICT in teaching and learning, some of the more challenging questions planners and educators must answer have to do with infrastructure issues (Rusten & Heather, 2009). In describing ICT infrastructure needs, these authors use four organizing themes: physical configuration options; networking technology options; Internet access options; and software and operating system considerations. The physical configuration is about different ways computers can be distributed in schools to meet educational goals. According to these authors, computers can be provided to individual classrooms; installed in central computer labs, libraries, and teachers' planning rooms; or moved from room to room on mobile carts (p.80).

Networking technology is about connecting computers to form a network. There are essentially three ways to connect computers to form LANs: cables LANs, wireless LANs, and power line LANs ibid. (p.85). There is variety of Internet access options that can be used in many educational applications: simulated Internet, dial-up connection, dedicated connection, wireless connection, and Internet via satellite (pp 86-89). The discussion about software for educational computer systems is organized into four broad categories: operating system (OS) software for computers; basic computer application software, including software for word processing, spreadsheets, presentations, and graphics; educational software applications; and Internet-related and -delivered software, including browsers, Java applications, and interactive tools on Websites (p. 90).

As far as KIE is concerned, the physical configuration of ICT infrastructures is a combination of two of the above configuration options. Computers are provided to some individual classrooms, and computers are installed in 7 central computer labs, 1 library and teachers' planning rooms (offices). However, for the case of computers installed in some individual classrooms, there was only one computer per classroom which is solely for the use of lecturers during lecture time for presentation purposes.

The findings of this study showed that computers at KIE are stand-alone and are not networked into a LAN. At the time of data collection all KIE computers were connected to fixed line dial-up Internet connectivity by which Internet access is provided to a single computer in a lab, in library, and in teachers' offices. Wireless connection was also at its inception phase at KIE. The software products for educational computer systems at KIE fall within the four categories provided by Rusten & Heather. KIE computers are using Window Vista operating system, Microsoft Office package comprising software for Word processing, spreadsheets, presentations, and graphics; 2 educational software : Math lab and Statistica (officially recognised by KIE IT Directorate); and a variety of Internet-related software that are being used by individual lecturers on their own isolated initiatives.

As far as access to ICT-related facilities is concerned, the findings of this study concur with one aspect and diverge from another of Farrell's et al. (2007) views on ICT uses in African universities. According to these authors, most African universities face insurmountable problems in the use of ICT due to lack of computers and a lack of access to affordable high-speed Internet connectivity (cited in Nyirongo, 2009: 108). There is no glaring shortage of computers at KIE. In fact, only 15 of the 165 lecturers do not have computers in their offices and the ratio student to computer was not very high. As many as 9 to 10 students are supposedly using one computer in their academic activities. However, the findings concur with these authors' view about the lack of Internet access. KIE lecturers and students identified the lack of or poor and unreliable Internet connection as one of major barriers in using ICT in their activities. In addition, at the time of data collection, the researcher found that there was no Internet connection in 6 of 7 computer labs and in all computers available to both lecturers (in their offices) and students (in some classrooms and lecture halls).

In terms of students' access to computers, the findings revealed that the problem is not the lack of computers but rather the flawed management of computer labs pertaining to the lack of clear guidelines and regulations governing the use of computer labs. As a result, two problems associated to the use of computer labs were identified by both KIE lecturers and students and fall in with some of Rusten & Heather's (2009:82) views about

the challenges related to the use of computer labs. These include the scheduling conflicts that can frustrate students and inhibit their use of computer labs (the Cold War between computer science students and students from other departments over the use of computer labs), and implementation of policies designed to keep the computers safe at the expense of using them (closing the labs in order to keep the computers safe at the expense of letting students have access to them).

In concluding this section, based on the findings related to the ICT infrastructures and on UNNESCO's (2002) matrix of indicators to determine a school's stage of progress in implementing ICT in terms of four approaches (emerging, applying, infusing, and transforming) to ICT development, one can confidently say that KIE is at an applying stage in terms of ICT facilities and resources including 'Computer lab or individual classrooms for ICT specific outcomes; stand-alone computers, printers and limited peripherals; Word processing, spreadsheets, databases, presentation software; ICT software; and Internet access' (p.28)

5.3. Teacher training and professional Development

According to UNESCO, educational technology is not, and never will be, transformative on its own—transformation requires teachers who can integrate technology into the curriculum and use it to improve student learning (UNESCO, 2002: 119). And teachers cannot integrate ICT in their teaching activities by simply being provided with or exposed to ICT facilities and equipment. So, a comprehensive teacher development and training program in educational applications of technology is needed. However, according to UNESCO (2002), designing such program "is neither easy nor inexpensive. There are more cases of inadequate and ineffective training programs than there are success stories".

The findings from KIE policy documents and lecturers who participated in this study indicated that KIE is not a "success story". Only 26 (or 42.6%) of the 61 surveyed lecturers affirmed they had had any training in pedagogical integration of ICT in teaching and learning, the remaining 35 (or 57%) of the 61 surveyed lecturers said they had never had such training. However, during casual conversation the researcher had with some lecturers, he came to find out that some training opportunities are offered by the

institution usually in the form of basic computer skills (offered by KIE IT Directorate), and the use of electronic journals (offered by KIE Librarians). But most of KIE lecturers did not attend these training sessions because either there were not aware of them or simply lacked interest in these training opportunities that are, according to them, limited in their scope.

The findings also showed that some lecturers had participated in ICT-pedagogy training programmes during their university studies and during other training opportunities offered by the institution (e-Learning: Resource Development and Student Support) or by other institutions and organizations. However, the results of the analysis of the findings about various ICT skills/competencies targeted before training sessions and the skills/competencies mastered as result of these trainings align with Farrell's et al. (2007) findings from a survey of African countries' ICT activities and initiatives. They found that most countries had made some efforts to develop Faculty's capacity to use ICTs as a tool for teaching and learning through in-service and pre-service programs.

> "However, such programs mostly involved the development of basic skills mostly deemed as ends in themselves and not a means for integrating the ICTs in teaching and learning"(cited in Nyirongo, 2009).

It was observed that, in most cases, KIE lecturers (those who have had ICT-pedagogy training) have mastered informatics-related skills at the expense of teaching/learning-related skills (see the results summarized in Table 10). The central problem is the absence of an ICT-related staff development policy framework or program. This situation 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 (see also Chitiyo, 2006).

In conclusion, based on these research findings and on UNESCO's (2002) matrix of indicators to determine a school's stage of progress in implementing ICT in terms of four approaches (emerging, applying, infusing, and transforming) to ICT development, this study can say, with confidence, that KIE is at both emerging and applying stages in terms of professional development for school staff whereby ICT training emphasizes the need to learn to operate a limited range of software for teaching and administration;

concentrates on the management of ICT; emphasizing personal ICT skill development; and Internet-based training emphasizes the identification of information, with direct support for the existing curriculum in a range of subjects.

5.4. Pedagogical use of ICT

- Are KIE Lecturers using available ICT facilities and resources to help them to pedagogically improve their teaching practices?

In this study, the analysis of the teacher pedagogical uses of ICT started by looking at the level of KIE lecturers' competencies vis-à-vis the Pedagogical integration of ICT into teaching and learning. For an effective integration, lecturers need to demonstrate a set of competencies related to IT-skills and pedagogical knowledge and according to García and Tejedor (2006), "lecturers have to be ready to make use of the possibilities that ICT offer". The results from lecturer's self-evaluation on the Basics Teacher Computer Use Skills, interviews and survey revealed that, in most cases, KIE lecturers were able to understand and/or use the computer-based skill at an advanced level but unable to use those skills in their work or use them with students. Therefore, of the 12 most important competencies, identified by García and Tejedor, that lecturers should acquire and make use of regarding ICT, only 5 competencies emerged from the findings: most of KIE lecturers know how to use the Internet to look for information and resources in the preparation of classes; they know websites (portals, web pages, electronic magazines, dictionaries, search engines…) related to their teaching specialties; they elaborate and use presentations to explain topics in classes; they know how to use e-mail, one of the Internet tools to communicate; and they collaborate through email with other teachers in their teaching fields.

For the actual use of ICT in teaching activities, the study findings indicated that KIE lecturers are mostly using basic computer software (MS Word, MS excel, PowerPoint Presentation) for preparing lecture notes by typing or word-processing, typing exams, processing students' examination results using spreadsheets, typing research papers, and presenting and explaining lecture notes in classes. Internet is mostly being used for searching teaching materials or/and information, referring students to further references or further readings, doing research, and communicating (email) with other lecturers and researchers. The surveyed lecturers identified other individual initiatives in pedagogical

ICT uses and these include: recording video or video-related materials to use in teaching, using DVDs, CDs, and Memory Sticks to store instructional materials (for future use) and share information between lecturers. KIE lecturers' use of DVDs and CDs is very limited. The effective use of CDs and DVDs would be used to help lecturers and students to get access to simulated Internet (Rusten & Heather, 2009) and thus overcoming some problems and frustrations related to poor Internet connection by selecting valuable Internet resources and websites, copy, and save them onto CDROMs. Lecturers and students can then use the CDs to access these resources and sites, thus simulating Internet.

What is the conclusion that can be drawn from the findings on KIE lecturers' use of ICT in their teaching activities? Are they using available ICT facilities and resources to help them to pedagogically improve their teaching practices? The response was affirmative to the first part and, maybe, the problem would be to what extent?

Based on the findings of this study and on AAU's (2002) Guidelines for Institutional self-assessment of ICT maturity in African Universities and other literature, KIE lecturers can be divided into three categories. In the majority of cases, the ICT use by KIE lecturers in their teaching activities is at an adoption level where some academic staff members have access to appropriate ICT tools in the institution's work areas; some academic staff use ICT sporadically as an add-on, supplementary educational tool; and Internet use is limited and sporadic. The second category of KIE lecturers comprises of those lecturers who use ICT to enhance personal productivity and technology is used as substitute for manual work (entry level). The last category comprises the non-users, not because there is a perceived lack of access to technology-based tools (Moersch, 1998), but because of their age and the lack of experience with ICT; the lack of time to pursue electronic technology implementation (heavy teaching loads); or simply because of their resistance to change.

- Are KIE student-teachers using available ICT facilities and resources for academic purposes (in their various academic activities)?

As for lecturers, the analysis of the student's use of ICT in their learning activities started by looking at the level of KIE students' competencies vis-à-vis the pedagogical

integration of ICT into teaching and learning. Results from discussions with students and documentary analysis revealed that KIE students do the compulsory module for basic IT literacy whereby students are taught basic IT skills in the first semester of the four year degree course. This module appertains to basic computer skills (MS Word, MS Excel, PowerPoint Presentation, MS Access); Internet; and using some computer peripheral devices such as printers, DVDs, CDs, Memory Sticks.

Although KIE student-teachers (who participated in this study) challenged the way this module was being delivered (insufficient explanations; the theoretical focus at the expense of developing core competencies in ICT), the analysis of this module showed that it (module) affords 15 credits equivalent to 150 hours with 60% of contact hours and 40% of self study (practices). The findings also revealed that the level of mastery of the basic IT literacy taught in this module is wanting because, as soon as the module is completed, students do not have the opportunity to get access to computer labs for practice. As a results, in most cases, KIE student-teachers' competencies to use ICT fall into one of the three categories (general competencies, the capacity to use ICT for academic purposes, and the capacity to use ICT for other learning purposes) of the students' required competencies in order to effectively be involved in the process of pedagogical ICT integration identified by Karsenti (2009). In fact, most of KIE students' competencies to use ICT fall into the first category of general competencies: knowledge of different parts of the computer; familiarisation with basic software (word processing; spreadsheet; presentation software; browsers); and email communication with teachers and other students. A small number of students can also use ICT for academic purposes by using search engines (Google) to search for learning materials, navigating on the websites (proposed by lecturers) hosting educational resources, downloading documents from websites, and using CDs, DVDs, and Memory Sticks to save and share files. So, based on the findings of this study and on the existing literature, ICT teaching at KIE is to ensure students are ICT literate. The curriculum is structured to teach students a sound basic understanding of available software applications. The curriculum is planned and delivered by individual teachers (UNESCO, 2002)

The level of KIE students' competencies to use ICT determines the actual use in their learning activities such as production of assignments, doing research, and

communication. Findings from students' discussions, interviews and surveys, showed that KIE student-teachers are using computers to type their assignments. Microsoft PowerPoint Presentation and MS Excel are not usually used. The findings also indicated that KIE student-teachers are using the Internet for academic purposes when, in most cases, it is asked by their lecturers. KIE student-teachers said that they use email to communicate with other students but not with their lecturers.

In conclusion, this study findings help in answering the question raised above. Are KIE student-teachers using available ICT facilities and resources for academic purposes (in their various academic activities)? The answer here is not straightforward and somehow limited. The study findings showed that some students are while others are not. The researcher referred, once again, to the AAU's (2002) Guidelines for Institutional self-assessment of ICT maturity in African Universities and to the study findings and concluded that some students have access to ICT tools (adoption stage) and students learn how to be computer literate (entry stage).

In the final discussion of the findings drawn from interviews, survey, student discussions and documentary analysis about the pedagogical use of ICT at KIE, the researcher contrasted the findings on use of ICT in teaching and learning events at KIE and the Laurillard's conversational framework and the Association of European Universities' guidelines to support ICT Application in education. The results showed that some features of the actual pedagogical use of ICT at KIE can be understood through 3 teaching and learning events including Acquisition, Discovery, and Dialogue (see Laurillard conversational Framework). In addition, the results of this study led the researcher to conclude that the process of ICT integration in teaching and learning at KIE is following the teacher-centered approach to teaching/learning. The focus is still on the lecturers as the source of knowledge. Lecturers are trying to use technologies (overhead projectors slides for example) to aid in their presentation and performance and capture and retain the learner's attention while the learners are expected to receive the knowledge being dispensed rather passively. The teacher talks, the learner listens. The teacher acts, the learner watches (see UNESCO, 2005).

5.5. Impact of ICT Pedagogical use on KIE students and their learning, and on Lecturers and their teaching

- Is there any impact (as perceived by both lecturers and student-teachers), attributable to ICT Pedagogical integration into teaching and learning, on KIE (a) student and their learning? (b) lecturers and their teaching?

5.5.1. Impact of ICT use on lecturers and teaching

According to Jagdish (2006), teachers are a key component in the learning environment and therefore the impact of ICT on teachers and the strategies they employ to facilitate the environment are critical. This author summarizes the impact of ICT on teachers and pedagogy as being strategies that are more learner-centered; more cooperative and collaborative; more active learning; and based on greater access to information and sources of information. In this study, teachers were asked whether they perceived any impact that ICT had had on them and their teaching practices.

The findings from the lecturer survey and interviews indicated that the perceived impact of ICT on KIE lecturers and teaching covers different aspects including: easily getting access to up-to-date instructional materials and thus regularly updating, improving, enriching learning modules; using online learning materials for students' further readings; students are more motivated, active when presentation software such as PowerPoint is used in the classroom; the teaching preparation is made easier and facilitated by the use of PowerPoint slides and by accessing the Internet-based ready-to-use instructional resources which otherwise would have been impossible by using ordinary books; the learning content is well structured, easily and clearly presented when one uses PowerPoint Presentation; improved illustrations of the teaching content by adding pictures, images, photos, videos taken from Internet; and more improved accuracy and precision of graphs and diagrams compared to when it is done manually; saving time; and improved communication between lecturers and researchers (using email).

Basing on these findings, it was noticed that ICT has not helped lecturers to rethink their teaching practices in order to shift from the teacher-centeredness to the learner-

centeredness approach to learning that emphasizes cooperation, collaboration, and active learning. The perceived impact is mostly related to the greater access to information and sources of information (Jagdish 2006), to the improved ways of dealing with lecturers' productivity works and administrative tasks.

5.5.2. Impact of ICT use on students and learning

"The whole purpose of using technology in teaching is to give better value to students" (Daniel in Miller et al., 2000). The value embedded in teaching events should impact on the learners/students performance. Significantly, findings of this study concur with Adel and Mounir's (2008) view on this issue. For these authors, the relationship between the use of ICT and student performance in higher Education is not clear. Most of the results from all research participants did not provide evidences or proof of whether ICT impacted KIE students' academic performance. In fact, findings from KIE student discussion, surveys, and interviews led the researcher to organize the perceived impact of ICT on student learning into four categories including: easy access to (up-to-date) knowledge and information (by using Internet-based learning resources); saving time; further exploration of knowledge and improved and facilitated production of assignments.

These findings align with Oliver's (2000) view on the impact of ICT on 'what is learned' and 'how student learns'. It was noticed that ICT has not yet exerted a strong impact on what KIE student-teachers are learning in terms of competency and performance-based curricula and information literacy; and how their learning has moved away from teacher-centered forms of delivery to student-centered forms of learning.

5.6. Barriers and challenges to pedagogical integration of ICT in teaching and learning at KIE:

- What are the major barriers hindering ICT integration in teaching and learning events at KIE?

Many studies (Mee & Zaitun, 2006; Khalid, 2009; Miller et al., 2000; Darrel & Sellbom, 2002; and Goktas et al., 2009) have identified a number of obstacles hindering the effective integration of ICT in education and these include lack of equipment; out-of-date

equipment; poorly maintained equipment, poor network infrastructure; insufficient provision in training; inadequate and inappropriate training; poor technical support; absence of ICT vision and plan; scarcity of time available to commit to the time-consuming nature of developing technology-based material; lack of management commitment and support; lack of teacher and students competencies in using ICT; resistance to change; and lack of awareness.

In many cases, results of the present study provide evidence to support these findings. In fact, a number of obstacles, to the effective integration of ICT in teaching and learning at KIE have been identified from the results of this study. These obstacles are clustered into four categories. The first category comprises the institution-level manipulative barriers that include the lack of or limited access to ICT-facilities; lack of adequate teaching and learning software; poor management of available ICT facilities and resources; poor computer and other ICT facilities maintenance and services; old-fashioned and insecure computers; lack of real commitment and involvement of KIE top management; and poor Internet access and connectivity. The second category relates to the lecturer-level non-manipulative barriers. In this category, three barriers were identified: the age; the lack of confidence and experience with ICTs; and individual resistance to change. The third category consists of lecturer-level manipulative barriers pertaining to lack of lecturer's competencies and expertise in using ICT in pedagogical practices; lack of effective training and staff development; and lack of lecturers' awareness. The fourth and last category combines the student-level non-manipulative and manipulative barriers this includes respectively the lack of experience with ICT due to educational background; and the lack of competencies and skills in using ICTs in general and in learning activities.

It is worth mentioning that this study revealed that inadequate mastery of English language for KIE French speaking lecturers and students was identified as another non-manipulative barrier to the effective integration of ICT in teaching and learning. This finding aligns with the UNESCO's (2002) postulation on sharing open-source educational materials and resources: "Sharing is easier for countries with the same language and similar customs and (…) sometimes, for non-English-speaking countries, language is a barrier".

Summary

This chapter dealt with the discussion of the major findings on important features investigated in the present study: KIE ICT policy; equipment, connectivity and access of/to ICT facilities, teacher professional training and development; pedagogical ICT use; impact of pedagogical ICT use; and the barriers and challenges to integration of ICT in teaching and learning at KIE. The findings on these topics were interpreted and given meanings.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

The main purpose of this study was to analyse and understand the pedagogical integration of ICT at Kigali Institute of Education (KIE) and find answers to the following guiding research questions:

- Are Lecturers at KIE using available ICT facilities and resources to help them to pedagogically improve their teaching practices?
- Are KIE student-teachers using available ICT facilities and resources for academic purposes (in their various academic activities)?
- Is there any impact (as perceived by both lecturers and student-teachers), attributable to ICT Pedagogical integration into teaching and learning, on KIE (a) student and their learning? (b) Lecturers and their teaching?
- What are the major barriers (as they are perceived by both student-teachers and lecturers) hindering ICT integration in teaching and learning events at KIE?

To do this, the literature that had a direct bearing on the purpose of this study was reviewed. The reviewed literature covers a number of issues including: Definition of ICT and integration ICT into teaching and learning**;** Frameworks to pedagogy-ICT integration; Impact of ICT use on teaching and learning; Teachers/lecturers' and students' competencies vis-à-vis the pedagogical integration of ICT into teaching and learning; and the Barriers to pedagogical integration of ICT in teaching and learning.

In this study, both qualitative and quantitative approaches were used through a number of research instruments that included: survey questionnaires, interviews, student discussions, and documentary analysis.

The study findings revealed that while KIE has made the commitment to use ICT in supporting and facilitating the successful pursuit of its mission, there is no coherent and detailed strategy or framework to fully support the integration of ICT pedagogical tools in the teaching and learning events. As far as equipment, connectivity and access of/to ICT facilities at KIE are concerned, this study showed that although the current level of

ICT equipment, accessibility, and connectivity of ICT-related facilities at KIE was not flawlessly conducive to the effective integration of ICT in teaching and learning activities, there was a certain ICT foundation (in terms of equipment, accessibilities and connectivity) that would allow KIE academic members to integrate ICT in their activities to a certain extent. However, the lack of or inadequate and inappropriate teacher training and development coupled with other institution-level and human-level manipulative and non-manipulative barriers identified in this study are impeding the effective integration of ICT into teaching and learning events at KIE. As a result, KIE lecturers and students are sporadically using ICT as an add-on to their traditional "teaching and learning as usual" with no real impact leading lecturers to "rethinking new ways of reengineering their teaching strategies resulting in increased learning gains for students; creating and allowing for opportunities for learners to develop their creativity; problem-solving abilities; informational reasoning skills; communication skills, and other higher-order thinking skills" (Trucano, 2005).

6.2. Recommendations

Based on the findings and discussions presented in this study, several recommendations are offered.

To KIE senior managers:

1. Develop and implement a comprehensive ICT vision and an inherent detailed action plan
2. In-service teacher training in Pedagogical integration of ICTs in teaching and learning should be improved in both quantity and quality
3. Rethink the management of ICT-related facilities, mainly computer labs

If 2 and 3 are done, this will help to rule out the *under-utilization* or *under- exploitation* of both knowledge-based resources (a good number of lecturers are knowledgeable in informatics but this knowledge is not being used to help in training quality 21st century teachers due to the lack of the *know-how*) and ICT-based facilities (almost all KIE lecturers have computers in their offices, ratio computer to student is 1: 9 or 10, the institution has access to more than 3000 e-journals, and the library is digitized).

4. Putting much more effort into solving the frustrating problem of poor and unreliable Internet connection
5. Rethink (in terms of improvement) the teaching strategies of the IT Basic Literacy module;

To KIE lecturers:

1. Take advantage of many training opportunities in ICT-pedagogy that are freely accessible online and
2. For those who are comfortable in using ICT to improve quality teaching and learning; do not wait, take action and show others *how to*. Continue with the small scale ICT-pedagogy integration initiatives to encourage faculty members with ICT-pedagogy knowledge and skills.

6.3. Areas for Further Study

This exploratory study provides a basis on which further research needs to be done in pedagogical integration of ICT in teaching and learning events at KIE. Given the fact that the small size of the sample of trainee-teachers who participated in this study does not warrant the generalization of findings, there is need to carry out a similar study to conclusively establish the perspectives and experiences of KIE student-teachers in pedagogical ICT integration in teaching and learning events.

In addition, one of this study's recommendations is the improvement (in both quantity and quality) of in-service teacher training in pedagogical integration of ICTs in teaching and learning. There is, therefore, an urgent appeal to carry out a needs assessment which should precede the creation of and participation (of KIE Lecturers) in teacher professional development activities pertaining to the pedagogical integration of ICT in teaching and learning events.

REFERENCES

AAU[14] (2002). Guidelines for Institutional self-assessment of ICT maturity in African Universities, available online at: http://www.aau.org/english/documents/ICT-GUID.pdf, accessed on August 10, 2009.

Adel, B., Y., & Mounir D. (2008). The Impact of ICT on Student Performance in Higher Education: Direct Effects, Indirect Effects and Organisational Change, Monograph "*The Economics of E-learning, RUSC* vol. 5 no. 1 (2008), (5) n.º 1 (2008), Retrieved from http://rusc.uoc.edu on August 15, 2009.

Achacoso, M. (2003). Evaluating technology and instruction: Literature review and recommendations, The University of Texas at Austin, Division of Instructional Innovation and Assessment, online at http://www.utexas.edu/academic/diia/research/measurement/iac/assessment_lit_review.pdf, retrieved on 17 July, 2009

Anja, B., Roger, B. & Stella K. (2006). The ICT Impact Report A review of studies of ICT impact on schools in Europe, *European Communities*: European Schoolnet.

Association of European Universities (1998). Restructuring the University: New Technologies for Teaching and Learning: Guidance to Universities on Strategy, CRE GUIDE No.1. Geneva in UNESCO & Academy for Educational Development (AED) (2002), *Technologies for Education: Potentials, Parameters, and Prospects*, Paris & Washington DC.

Barrell, L.-B. & Sellbom, M. (2002). *Barriers to Adopting Technology for Teaching and Learning,* Education Quarterly, number 2.

Carlson, S. (2002). The Missing Link in Educational Technology: Trained Teachers, *TechKnowLogia***,** October - December 2002, Knowledge Enterprise, Inc. Online at http://www.techknowlogia.org/TKL_Articles/PDF/435.pdf, retrieved on March 12, 2010.

Carlson, S. & Gadio, T. (2002). Teacher Professional Development in the Use of Technology in UNESCO & Academy for Educational Development (AED) (2002), *Technologies for Education: Potentials, Parameters, and Prospects*, Paris & Washington DC.

Castells, M. (1998). *End of Millennium.* Malden, MA: Blackwell.

Chitiyo, R. (2006). *Integration of Instructional Technology by University Lecturers in Secondary School Teacher Education Programs in Zimbabwe*, (Doctoral Dissertation, College of Education, Georgia State University.), available from

[14] Association of African Universities

http://digitalarchive.gsu.edu/cgi/viewcontent.cgi?article=1005&context=msit_diss, retrieved on January 10, 2010.

Czerniewicz, L., & Brown, C. (2005). The uses of information and communication (ICT) in teaching and learning in South African higher education practices in the Western Cape, *Perspectives in Education*, Volume 23(4), December 2005

Donna L. R, (2000). A Paradigm Shift: Technology Integration for Higher Education in the New Millennium, *Educational Technology Review*, Spring/Summer 2000

Earle, R.-S. (2002). The Integration of Instructional Technology into Public Education: Promises and Challenges, ET Magazine, Vol. 42, No. 1, January-February, 2002, p. 5-13

Gajarag, D. (2002). Objectives and Strategies for Effective Use of ICTs In UNESCO & Academy for Educational Development (AED) (2002). *Technologies for Education: Potentials, Parameters, and Prospects*, Paris & Washington DC.

García, A. & Tejedor, F.-J. (2006). Use of Information and Communication Technology in Higher Education and Lecturers' Competencies, *Current Developments in Technology-Assisted Education*, p. 1787-1791.

Goktas, Y., Yildirim, S., & Yildirim, Z. (2009). Main Barriers and Possible Enablers of ICTs Integration into Pre-service Teacher Education Programs. *Educational Technology & Society*, 12 (1), p. 193–204.

Golafshani, N. (2003). Understanding Reliability and Validity in Qualitative Research, *The Qualitative Report*, 8(4), 597-606, retrieved on April 21, 2010, from http://www.nova.edu/ssss/QR/QR8-4/golafshani.pdf.

Government of Rwanda (2006). *An Integrated ICT-Led Socio-Economic Development Plan for Rwanda 2006-2010,* retrieved from http://www.rita.gov.rw/docs/NICI%202010.pdf, accessed on July 21, 2009.

Hannan, A. (2007). Questionnaires in Education Research, Faculty of Education, University of Plymouth base on Munn, P. & Drever, E. (1999) *Using Questionnaires in Small-Scale Research: A Teachers' Guide.* Scottish Council for Research in Education, Edinburgh.

Haşlaman, T., Kuskaya-M.-F. & Kocak-U.-Y. (2008). Integration of ICT Into The Teaching-Learning Process: Toward A Unified Model. In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2008 (p. 2384-2389).* Chesapeake, VA: AACE. Retrieved from *http://y*unus.hacettepe.edu.tr/~kocak/yayinlar/kongre/edmedia_2008.ppt, on July 15, 2009.

Jagdish, R. (2006). ICT for Curriculum Support and Teaching, *DRTC*[15] *Conference on ICT for Digital Learning Environment*, 11th – 13th January, 2006, Indian Statistical Institute Bangalore, retrieved from http://drtc.isibang.ac.in:8080/bitstream/handle/1849/224/paperQ_jagdish_rai.pdf?sequence=1, on July 9, 2009.

Karsenti, T. (Ed.). (2009). Pedagogical Use of ICT: Teaching and Reflecting Strategies, Ottawa, IDRC[16]

Keengwe, J., Onchwari, G. & Wachira, P. (2008). Computer Technology Integration and Student Learning: Barriers and Promise, *J. Sci Educ Technol* 17: p. 560–565

Khairul B.-M.-N. (2008). Case study: a strategic research methodology, *American Journal of Applied Sciences*, Retrieved on 21 April, 2010, from http://findarticles.com/p/articles/mi_7109/is_11_5/ai_n28551353/.

Khalid, A-B. (2009). Barriers to the Successful Integration of ICT in Teaching and Learning Environments: A Review of the Literature, *Eurasia Journal of Mathematics, Science and Technology Education*, 2009, 5(3), 235-245

Khirwadkar, A. (2007). Integration of ICT in education: pedagogical issues**,** Faculty of Education Review: A Bi-Annual International *Journal of Education* vol. 1 No. 1(January-June, 2007) p. 85-103, available online at http://www.journal.au.edu/edu_journal/jan2007/article06_vol1no1.pdf, accessed on July 10, 2009.

KIE ICT Policy statement, March - 2006

Kitzinger, J. (1995). *Qualitative Research: Introducing focus groups,* BMJ 1995; 311:299-302, Glasgow University Media Group, Department of Sociology, Glasgow.

Kumar, N., Raduan C.- R. & D'Silva, J.-L. (2008). Teachers' Readiness to Use Technology in the Classroom: An Empirical Study, *European Journal of Scientific Research*, Vol.21 No.4 (2008), pp.603-616, EuroJournals Publishing, 2008, retrieved from http://www.eurojournals.com/ejsr_21_4_04Naresh.pdf, on March 20, 2010.

Kwadwo Gyambrah, M. (2007). E-Learning Technologies and Its Application in Higher Education: A Descriptive Comparison of Germany, United Kingdom and United States, Inaugural-Dissertation, PhD Dissertation, Maximilians-Universität München.

[15] Documentation Research and Training Center
[16] International Development Research Centre (Canada)

Laurillard, D. (2002). *Rethinking university teaching: A conversational framework for the effective use of learning technologies.* 2nd Edition, London: Routledge/Falmer.

Lewis, M. (2000). Focus Group Interviews in Qualitative Research: A Review of the Literature. *Action Research E-Reports*, 2. Available at: http://www.fhs.usyd.edu.au/arow/arer/002.htm, retrieved on March 21, 2010

Lloyd, M. (2005). Towards a definition of the integration of ICT in the classroom. In AARE 2005, AARE, Eds. *Proceedings AARE '05 Education Research -Creative Dissent: Constructive Solutions*, Parramatta, New South Wales.

Maxwell, A.-J., (1996). *Qualitative Research Design: An Interactive Approach*, Thousand Oaks, CA: Sage.

Mee C.-W. & Zaitun, A.-B. (2006). Obstacles Towards the use of ICT Tools in Teaching and Learning of Information System in Malaysian Universities, *International Arab Journal of Information Technology*, Vol.3, number 3.

Miller, J., W., Martineau, L., P. & Clark, R., C. (2000). Technology Infusion and Higher Education: Changing Teaching and Learning, *Innovative Higher Education*, Vol. 24, No. 3, Spring 2000.

Moersch, C. (1998). Levels of Technology Implementation (LoTi): A Framework for Measuring Classroom Technology Use, International Society for Technology in Education/Learning and Leading With Technology, *Policy & Leadership*, available at www.iste.org.

Mojgan, A., Kamariah, A.-B., & Wong, S.- L., Bahaman , A.-S., & Foo Say F. (2009). Factors Affecting Teachers' use of Information and Communication Technology, *International Journal of Instruction*, January 2009, Vol.2, No.1.

Murenzi, R. (2008), *ICT in Higher Education: Cultivating Innovation & Expanding Access*, Serena Hotel Kigali, October 23rd, 2008,

Nyirongo, Kate, N. (2009). *Technology Adoption and Integration: A Descriptive Study of a Higher Education Institution in a Developing Nation* (Doctoral Dissertation, Virginia Polytechnic Institute and State University), available from http://scholar.lib.vt.edu/theses/available/etd-04132009-095508/unrestricted/Nertha_etd_2009.pdf, retrieved on January 10, 2010.

Oliver, R. (2002). The role of ICT in higher education for the 21st century: ICT as a change agent for education. *Proceedings of the Higher Education for the 21st Century Conference*. Miri, Sarawak: Curtin University.

Christie, P. (2008). *Changing Schools in South Africa: Opening the Doors of Learning*, Heinemann Publishers, Johannesburg. South Africa

Panafrican Research Agenda on the Pedagogical integration of ICT (2008). *Methodology Guide*, Université de Montréal.

Risjord, M.-W., Dunbar, S.-B., Moloney, M.-F. (2002). A New Foundation for Methodological Triangulation, *Journal of Nursing Scholarship*. Third Quarter 2002, online at http://www.ruralhealth.utas.edu.au/gr/resources/docs/a-new-foundation-for-methodological-triangulation.pdf, retrieved on May 15, 2010.

Rogers, L.-P. (2000). Barriers to Adopting Emerging Technologies in Education, *Journal Educational Computing Research*, vol. 22(4) 455-472, 2000.

Rusten, E. & Heather E. H. (2002). Infrastructure: hardware, networking, software, and connectivity In UNESCO & Academy for Educational Development (AED) (2002), *Technologies for Education: Potentials, Parameters, and Prospects*, Paris & Washington DC.

Sally T. (2000). Data analysis in qualitative research, *Evid. Based Nurs*. 2000, 3, p. 68-70, Downloaded from ebn.bmj.com on 11 January, 2010.

Sandelowski, M. (2000). Focus on Research Method: Combining Qualitative and Quantitative Sampling, Data Collection, and Analysis Techniques in Mixed-Method Studies, *Research in Nursing & Health*, 2000, 23, p. 246–255, John Wiley & Sons, Inc.

South African Department of Education (2007). *Guidelines for Teacher Training and Professional Development in ICT*

Stensaker, B., Maassen, P., Borgan, M., Mette, O. & Karseth, B. (2006). Use, updating and integration of ICT in higher education: Linking purpose, people and pedagogy, *Higher Education* (2007) 54:417–433, DOI 10.1007/s10734-006-9004-x, Springer 2006.

Trucano, M. (2005). *Knowledge Maps: ICT in Education*. *What do we know about the effective uses of information and communication technologies in education in developing countries?* Washington, DC: infoDev / World Bank. Available at: http://www.infodev.org/en/Publication.8.html, retrieved on February 25, 2010.

UNESCO (2009), *ICTs for Higher Education: Background paper from the Commonwealth of Learning*, UNESCO World Conference on Higher Education, Paris, 5 to 8 July 2009.

UNESCO (2005). *Regional Guidelines on Teacher Development for Pedagogy-Technology Integration*, Based on a Series of Workshops in Pedagogy-Technology Integration , UNESCO Asia and Pacific Regional Bureau for Education.

UNESCO, (2003). *Building Capacity of Teachers/Facilitators in Technology-Pedagogy Integration for Improved Teaching and Learning*, Experts' Meeting on Teachers/Facilitators Training in Technology-Pedagogy Integration 18-20 June 2003, Bangkok, Thailand, Final Report, Asia and Pacific Regional Bureau for Education.

UNESCO (2002). *Information and Communication Technology in Education: A curriculum for schools and Programme of Teacher Development*, Division of Higher Education, Paris.

Voce, A. (2005). *Data collection methods*, Handout for the Qualitative Research Module. Drawn from: Patton (2002) *Qualitative Research and Evaluation Methods*, 3rd Edition, Sage Publications. USA, available at: http://familymedicine.ukzn.ac.za/Uploads/ed7fefdd-8fc8-40c1-a9f0-793d4a425581/Data%20collection%20methods.doc, retrieved on March 22, 2010.

Wadi D. Haddad & Draxler, A. (2002). The dynamics of Technologies for Education In UNESCO & Academy for Educational Development (AED) (2002), *Technologies for Education: Potentials, Parameters, and Prospects*, Paris & Washington DC.

Wolff, B., Knodel, J., & Sittitra, W. (1993). Focus groups and surveys as complementary research methods. In Morgan DL (ed.), *Successful Focus Group*s. Newbury Park. USA, Sage Publications, pp 118-136.

Wang, Q.Y., & Woo, H.L (2007). Systematic planning for ICT integration in topic learning. *Educational Technology and Society* (SSCI), 10 (1), 148-156., online at http://www.ifets.info/journals/10_1/14.pdf, retrieved on July 11, 2009.

Woods, P. (2006). *Qualitative Research*, Faculty of Education, University of Plymouth.

APPENDICES

APPENDIX 1

DEAN QUESTIONNAIRE[17]

This research's aim is to analyze and understand the ICT-pedagogy integration into teaching and learning events at Kigali Institute of Education (KIE)

Faculty: ……

1. Do you have your personal Email Address? Yes…….No……..
2. Number of functioning computers in this faculty: Total:……available for lecturers (lesson planning, teaching, etc.):……..available for student-teachers (during class time, assignments, etc):…….
3. Number of computers connected to Internet: Total:…….available for Lecturers:……available for student-teachers:…….

4. Total number of lecturers in your faculty:……
5. Indicate the number of lecturers, in this faculty, who have their personal email address: ……
6. How many teachers, in this faculty have completed 1-50 hours of professional development which included ICT training? :…….
7. Number of lecturers who have completed more than 50 hours of continuing education/professional development which included ICT integration
8. The ability of lecturers to use ICTs (describe, in general, the capacity of lecturers in this faculty with regard to the pedagogical integration of ICT) – try to include specific examples :

   ……

   ……

   ……

[17] Extended and adapted from Panafrican Research Agenda on the Pedagogical integration of ICT (2008), *Methodology Guide*, Université de Montréal

……

……

……

9. Have you had any ICT training? Yes:……No: …….
10. If so, briefly describe the kind of training in ICT you have had :……

……

……

……

……

……

11. List the various ICT skills/competencies that you consider you have mastered :

……

……

……

……

……

……

12. Provide the list of the names and types of software (computer applications) used for academic purposes in this faculty:

……

……

……

……

……

13. Indicate the total number of all courses taught in this faculty:…….
14. Indicate the total number of courses taught in this faculty that integrate ICT in teaching and/or learning: …….
15. Provide the list of course names, and a brief description of the way in which ICT is used in teaching these courses:

……

……

……

……

……

……

……

16. Describe the impact of ICT on professional/continuing education programs (if any) for lecturers from this faculty:

……

……

……

……

……

……

17. Describe the impact (if any) of ICTs have had on teaching and learning in this faculty:

……

……

……

……

……

……

……

……

18. Does your institution have a plan or policy for the integration of ICTs in teaching and learning?
19. If yes, attach a copy, and/or description, of the integration plan, if not, describe the context of absence of a plan
20. Number of pre-service educators (student-teachers) in this faculty: ……
21. Number of pre-service educators (student-teachers) who have their own email address: …….

22. Is ICT present in the initial (pre-service) teachers training program/curriculum in this faculty: Yes:……No:…...
23. If Yes, describe the presence of ICT in initial (pre-service) teacher-training curriculum in this faculty:

    ……
    ……
    ……
    ……
    ……
    ……
    ……
24. Is ICT present in "academic staff professional development/continuing education" program in this faculty? Yes: ……No:……

25. If yes, describe the presence of ICT in "academic staff professional development/continuing education" program in this faculty:

    .....
    .....
    .....
    .....
    .....
    .....

26. The type of ICT equipment, connectivity, and other resources made available to Pre-service teachers (student-teachers) and their lecturers during teacher-training (list type of equipment) :

    ……
    ……
    ……
    ……
    ……
    ……

……

……

27. Are there any other additional comments to raise with regard to pedagogical integration of ICT in teaching and learning events at KIE?

……

……

……

……

……

……....

Thank you very much for your cooperation!

APPENDIX 2

LECTURER QUESTIONNAIRE[18]

This research's aim is to analyze and understand the ICT-pedagogy integration into teaching and learning events at Kigali Institute of Education (KIE)

Faculty: ……Department:…….Course taught:…….

1. Do you have access to computer in your institution? Yes:…….No:……
2. Do you have access to Internet: Yes:……..No:……
3. Do you have a personal email address? Yes:…….No:……
4. Have you had any training in the pedagogical integration of ICT in teaching and learning? Yes:…….No:……

[18] Extended and adapted from Panafrican Research Agenda on the Pedagogical integration of ICT (2008), *Methodology Guide,* Université de Montréal

5. If yes, indicate the total number of hours of training:…… and outline the skills and or/competencies in which you were supposed to be trained:
   ……
   ……
   ……
   ……
   ……
   ……

6. List the various ICT skills/competencies that you consider you have mastered:
   ……
   ……
   ……
   ……
   ……
   ……
   ……

7. How many hours per week do you use ICT for academic purpose:…….

8. Indicate the names/subject matter of any course you teach in which you integrate ICT: if possible attach a copy.
   ……
   ……
   ……
   ……
   ……

9. Describe any impact that ICT has had on your course planning (how you prepare for classes):
   ……
   ……
   ……
   ……
   ……
   ……
   ……

10. Describe any impact that ICT has had on your in-class teaching (what you teach, how you teach it, etc.):
    ……
    ……
    ……
    ……
    ……
    ……

……
……

11. Describe any impact that ICT has had on your evaluation strategies (how you evaluate your students):

……
……
……
……
……
……
……
……

12. Describe any impact that ICT has had on communication between yourself and other educators as well as your students (do you encourage questions asked via email, submission of assignment via email, etc?)

13. Do you think that ICT helps you reflect on your teaching (what you teach, how you teach) – if so, explain briefly with examples:

……
……
……
……
……
……
……
……
……

14. Explain briefly how ICT has helped you in producing teaching materials. Attach example of material if possible.

……
……
……
……

15. Do you know any specific computer program, websites (portals, web pages, electronic magazines, dictionaries, search engines…) related to your specialty? Yes: ……..No:…….**...**

16. If yes, would you describe the way you are using it in your teaching?

……
……
……
……
……
……

……
……

17. Is there any other way you use available ICT resources – at KIE – in your teaching? Yes:…….No:……..
18. If yes, would you describe how you are using these resources:
……
……
……
……
……
……
……
19. In your opinion (as lecturer in this institution), what are the major barriers hindering ICT integration in teaching and learning events at KIE?:……
……
……
……
……
……
……
……
20. Are there any other additional comments to raise with regard to pedagogical integration of ICT in teaching and learning events at KIE? :
……
……
……
……
……
……
21. How competent are you in using ICTs in your teaching? Would you please answer this question by circling the number which best reflects your current level of ICT use? (see the annexure)

APPENDIX 3

SELF-EVALUATION RUBRICS FOR BASIC TEACHER COMPUTER USE[19]

Circle the number which best reflects your current level of ICT use?

I. Basic computer operation

Level 1 I do not use a computer.

Level 2 I can use the computer to run a few specific, preloaded programs. It has little effect on either my work or home life. I am somewhat anxious I might damage the machine or its programs.

Level 3 I can set-up my computer and peripheral devices, load software, print, and use most of the operating system tools like the, clock, note pad, find command, and trash can (recycling bin). I can format a data disk.

Level 4 I can run two programs simultaneously, and have several windows open at the same time. I can customize the look and sounds of my computer. I use techniques like shift-clicking to work with multiple files. I look for programs and techniques to maximize my operating system. I feel confident enough to teach others some basic operations.

II. File management

Level 1 I do not save any documents I create using the computer.

Level 2 I save documents I've created but I cannot chose where they are saved. I do not backup my files.

Level 3 I have a filing system for organizing my files, and can locate files quickly and reliably. I back-up my files to floppy disk or other storage device on a regular basis.

Level 4 I regularly run a disk-optimizer on my hard drive, and use a back-up program to make copies of my files on a weekly basis. I have a system for archiving files which I do not need on a regular basis to conserve my computer's hard drive space.

III. Word processing

Level 1 I do not use a word processor, nor can I identify any uses or features it might have which would benefit the way I work.

Level 2 I occasionally use the word processor for simple documents which I know I will modify and use again. I generally find it easier to hand write or type most written work I do.

[19] U.S. Department of Education, Office of Educational Research and Improvement (1998), An educator's Guide to Evaluating the Use of Technology in Schools and Classrooms.

Level 3 I use the word processor for nearly all my written professional work: memos, tests, worksheets, and home communication. I can edit, spell check, and change the format of a document. I can paginate, preview and print my work. I feel my work looks professional.

Level 4 I use the word processor not only for my work, but have used it with students to help them improve their own communication skills.

IV. Spreadsheet use

Level 1 I do not use a spreadsheet, nor can I identify any uses or features it might have which would benefit the way I work.

Level 2 I understand the use of a spreadsheet and can navigate within one. I can create a simple spreadsheet which adds a column of numbers.

Level 3 I use a spreadsheet for several applications. These spreadsheets use labels, formulas and cell references. I can change the format of the spreadsheets by changing column widths and text style. I can use the spreadsheet to make a simple graph or chart.

Level 4 I use the spreadsheet not only for my work, but have used it with students to help them improve their own data keeping and analysis skills.

V. Database use

Level 1 I do not use a database, nor can I identify any uses or features it might have which would benefit the way I work.

Level 2 I understand the use of a database and can locate information within one which has been pre-made. I can add or delete data in a database.

Level 3 I use databases for a personal applications. I can create an original database – defining fields and creating layouts. I can find, sort and print information in layouts which are clear and useful to me.

Level 4 I can use formulas with my database to create summaries of numerical data. I can use database information to mail merge in a word processing document. I use the database not only for my work, but have used it with students to help them improve their own data keeping and analysis skills.

VI. Graphics use

Level 1 I do not use graphics in my word processing or presentations, nor can I identify any uses or features they might have which would benefit the way I work.

Level 2 I can open and create simple pictures with the painting and drawing programs. I can use programs like *PrintShop* or *SuperPrint*.

Level 3 I use both pre-made clip art and simple original graphics in my word processed documents and presentation. I can edit clip art, change its size, and place it on a page. I can purposefully use most of the drawing tools, and can group and un-group objects. I can use the clipboard to take graphics from one application for use in another. The use of graphics in my work helps clarify or amplify my message.

Level 4 I use graphics not only for my work, but have used it with students to help them improve their own communications. I can use graphics and the word processor to create a professional looking newsletter.

VII. Hypermedia use

Level 1 I do not use hypermedia (Hyper-Studio), nor can I identify any uses or features it might have which would benefit the way I work.

Level 2 I can navigate through a pre-made hypermedia program.

Level 3 I can create my own hypermedia stacks for information presentation. These stacks use navigation buttons, sounds, dissolves, graphics, and text fields. I can use an LCD projection device to display the presentation to a class.

Level 4 I use hypermedia with students who are making their own stacks for information keeping and presentation.

VIII. Network use

Level 1 I do not use the on-line resources available in my building, nor can I identify any uses or features they might have which would benefit the way I work.

Level 2 I understand that there is a large amount of information available to me as a teacher which can be accessed through networks, including the Internet. With the help of the media specialist, I can use the resources on the network in our building.

Level 3 I use the networks to access professional and personal information from a variety of sources including networked CD-ROM reference materials, on-line library catalogs, the ERIC database, and the World Wide Web. I have an e-mail account that I use on a regular basis.

Level 4 Using telecommunications, I am an active participant in on-line discussions, can download files and programs from remote computers. I use telecommunications with my students.

IX. Student Assessment

Level 1 I do not use the computer for student assessment.

Level 2 I understand that there are ways I can keep track of student progress using the computer. I keep some student produced materials on the computer, and write evaluations of student work with the word processor.

Level 3 I effectively use an electronic grade book to keep track of student data and/or I keep

portfolios of student produced materials on the computer.

Level 4 I rely on the computer to keep track of outcomes and objectives individual students have mastered. I use that information in determining assignments, teaching strategies, and groupings.

APPENDIX 4

LECTURER INTERVIEW FORM[20]

This research's aim is to analyze and understand the ICT-pedagogy integration into teaching and learning events at Kigali Institute of Education (KIE)

Faculty: ……Department:…….Course taught:…….

1. Describe the various ways that you use ICT for academic purposes (which software do you use, for planning, teaching, marking, etc.)

2. Is your choice of a given ICT resource to be used based on pedagogical principles (learning strategies, teaching methods, evaluation processes, etc)? if yes, please describe how and give examples

3. What are the challenges you experience (to) using ICT in your courses?

4. What skills/competencies do you have and/or require to effectively integrate ICT in your teaching?

5. Please describe, in general, the impact ICT has had on students' learning: on what is learned and how students learn.

6. Please describe, in general, the impact that ICT has had on students' access to knowledge/information

7. How has ICT helped your students in producing documentation related to learning – such as written assignments, presentations, etc.?

8. Please describe, in general, the impact that ICT has had on your teaching practices: learner-centeredness; cooperation and collaboration (student-student and lecturer-student); active learning; greater access to information and sources of information)

[20]Extended and adapted from Panafrican Research Agenda on the Pedagogical integration of ICT (2008), *Methodology Guide*, Université de Montréal

9. In your opinion, what are the major barriers hindering ICT integration in teaching and learning events at KIE?

10. Are there any other additional comments to raise with regard to pedagogical integration of ICT in teaching and learning events at KIE?

Thank you very much for your cooperation!

APPENDIX 5

STUDENT-TEACHERS GROUP DISCUSSION FORM[21]

This research's aim is to analyze and understand the ICT-pedagogy integration into teaching and learning events at Kigali Institute of Education (KIE)

1. Describe/list he various ways that you use ICT in your academic work (which software, computer programme do you use: for assignments, presentations, communication, etc.)

2. Do you use Internet search engines like Google, Altavista, etc. or other web sites containing educational resources to use in your academic work?

3. How many hours per week on average do you use ICT for academic purposes?

4. What factors challenge/are barriers to your use of ICT in this institution: teacher-level factors, institution-level factors, system-level factors, and student-level factors, etc.

5. What skills/competencies do you have or do you require to effectively use ICT in your learning?

6. What, in general, has been the impact of ICT on your studies?

7. How has ICT helped you in producing documentation: written assignment, presentations, etc. (copy of examples)?

8. Does ICT help you to collaborate on a project or exchange information with students from another school in Rwanda or another country? If yes, please describe and give examples.

9. Are there any other additional comments to raise with regard to pedagogical integration of ICT in teaching and learning events at KIE?

[21] Extended and adapted from Panafrican Research Agenda on the Pedagogical integration of ICT (2008), *Methodology Guide*, Université de Montréal

APPENDIX 6

Wits School of Education

27 St Andrews Road, Parktown, Johannesburg, 2193 • Private Bag 3, Wits 2050, South Africa
Tel: +27 11 717-3000 • Fax: +27 11 717-3039 • E-mail: enquiries@educ.wits.ac.za • Website: www.wits.ac.za

STUDENT NUMBER: 416588
Protocol: 2009EGE131

29 October 2009

Mr Bernard Bahati
Kigali Institute of Education
KIGALI
5039

Dear Mr. Bahati

Application for Ethics Clearance: Master of education

I have pleasure of advising you that the Ethics Committee in Education of the Faculty of Humanities, acting on behalf of the Senate has agreed to approve your application for ethics clearance submitted for your proposal entitled:

Is ICT being integrated pedagogically into Teaching and Learning at Kigali Institute Of Education?

Recommendation:

Ethics clearance is granted

Yours sincerely

M Mosetle,
Malsie Mabeta
Wits School of Education

Cc: Supervisor: Prof. I Moli (via email)

APPENDIX 7

ICT facilities Survey Form

This research's aim is to analyze and understand the ICT-pedagogy integration into teaching and learning events at Kigali Institute of Education (KIE)

1. Number of functioning computers in this Institution: Total:……available for lecturers (lesson planning, teaching, etc.): total:……..available for student-teachers (during class time, assignments, etc): total:…….
2. Number of computers connected to Internet: Total:…….available for Lecturers: total ……available for student-teachers: total …….
3. Number of Computer Labs: ……..Number of Computers in each lab:……..Number of Computer labs with Internet connection:……How are these computer labs managed? (Who is in charge?, students' access, opening hours, usage regulations). Please attach a copy of the document (if any) describing the management of computer labs or of any other ICT-related facilities.
4. Other ICT facilities/tools available at KIE and meant to be used in teaching and learning or in other administrative activities at KIE

1. ICT facilities/tools	Number	Comments
1. Radio/cassette player		
2. Television sets		
3. DVDs	Estimates:	
4. CDs	Estimates:	
5. LCD (Liquid Crystal Display) projectors		
6. Computer printer		
7. Teaching software	Types and number:	
8. Public address		
9. Video Cameras		
10. Photo Cameras		
11. Digital photocopiers		
12. Multimedia projectors		
13. Scanners		
14. Loudspeakers		
13.Etc.		

By Bernard BAHATI, University of the Witwatersrand-Johannesburg.

Email: bahafatu@gmail.com or babefatu@yahoo.com

APPENDIX 8

Kigali Institute of Education
P.O. Box : 5039 Kigali – Rwanda
Tel: (250) (0)255100591/(0)252586823 (reception)
Fax: (250) (0)252586890/(250)(0)252586885
E-mail: admin@kie.ac.rw

9th October 2009

Mr. Bernard Bahati
University of the Witwatersrand
M.Ed. Student: Educational Technology
Humanities, Private Bag 3, WITS 2050
South Africa

Dear Mr. Bahati,

RE: **Permission to conduct research at KIE**

Your e-mail dated 7th October 2009 refers.

Reference is made to your request for permission to carry out your research at Kigali Institute of Education. I am pleased to let you know that you have my permission to carry out the research here at KIE. However, participation of the mentioned members of staff will be subject to an understanding between you and the participants.

Yours sincerely,

KIGALI INSTITUTE OF EDUCATION B.P. 5039 TEL: 86892 KIGALI RWANDA REMERA

Prof. George K. NJOROGE (PhD)
Rector

CC.

- Vice Rector Academic
- Vice Rector Administration and Finance

APPENDIX 9

ICT Applications to support education

Technology strategy to support pedagogical approaches	Pedagogical tactics and examples	Technology infrastructure requirements
Using tools and templates	*Individual or group projects by students* > Course work preparation, building models, simulations, programming > Web page construction	> PC (non-multimedia) > Pentium multimedia > Stand-alone or networked > Individual ownership or provided on campus
Using models/simulations	*Individual self-paced learning* > Enhancing textbook and other resources; > "Virtual" laboratories/workbenches > Typically developed by publishers or consortia of university	> PC (non-multimedia) > Pentium multimedia > Stand-alone or networked; possibly accessed via Web (e.g., Java applets) > Individually owned PC, subject to ability to license individual copies; otherwise confined to campus-based PC workstations
CSCW environments (computer-supported collaborative work)	*Collaborative learning* > Support for group work > Mediated class discussion > Group & individual projects	> PC (nonmultimedia) > Pentium multimedia > Connected to a network, accessible on-campus only or accessible from off-campus > University must maintain host server; CMC (computer-mediated communications) software (groupware) required > Can be Web-based (e.g., TopClass) or proprietary
Electronic mail	*Student-teacher and student-student communication* > Improved access to academic staff, submission of course work, feedback, advice, and discussion > Allows asynchronous dialogue	> PC (non-multimedia) > Connected to a network, accessible on-campus only or accessible from off-campus > University must maintain host mail server
Video- and/or audio-conferencing and audio graphics	*Outreach to remote tutorial groups; institutional collaboration* > Use generally confined to small groups at senior, undergraduate, or graduate level	> High-quality videoconferencing systems require dedicated rooms, typically 2 or 3 cameras, microphones, and some form of electronic "whiteboard" or method displaying computer-projected images at both ends; high-grade telecommunications links are typically required—e.g., ISDN. > Small-scale videoconferencing can be achieved using PC with video card and top-mounted camera. Subject to networking, control software can be used to allow shared working on files in standard formats—e.g., word processing, spreadsheet, CAD. > High-grade telecommunications lines are normally required.
Lecturing/demonstrating	*Audiovisual presentation* > Support for lecture-style presentations incorporating	> Fixed projection installations in large or medium-size auditoria. > Fixed video and/or PC consoles or

	audiovisual/multimedia elements	facility for presenter to connect laptop computer; portable projection devices for smaller rooms: LCD projection panels, connected to PC for use with overhead projectors. > Data projectors: self-contained units with built-in light source.
Broadcasting	*Extension of conventional lecturing* > Elements of distance education programs, providing off-campus access to traditional stes of teaching. Sometimes used in combination with audio-conferencing or simple telephone to provide feedback/questions from remote sites. Lecturer frequently delivers lecture simultaneously to live audience on campus. Broadcast can be terrestrial or by satellite.	> TV technology > Normally uses dedicated classroom, with 2 or more cameras, controlled by lecturer
Hypermedia resources	*Course resources for self-paced, self-directed learning or for private study directed by teacher* > Corpus of loosely structured documentation, including multimedia (sound, graphics, animation, and video) with embedded hypertext links > Can be made available on CD-ROM or via the Web	> Pentium multimedia PC > Stand-alone (CD-ROM) or networked (WWW)
Didactic courseware	*Self-paced learning* > Computer-based training (CBT) or computer-assisted learning (CAL) resources, typically used in highly structured didactic format, with sequential lessons, examples, and tests; may replace or supplement aspects of conventional teaching	> PC (non-multimedia) > Many CBT applications do not require multimedia facilities and may be loaded directly from floppy disk > Pentium multimedia > Stand-alone or networked, for CBT/CAL courseware that makes use of multimedia—typically distributed on CD-ROM > Use off-campus may be limited, depending on terms of copyright or site licensing
Automated testing/feedback	*Assessment* > Can be used for systematic objective testing > Useful where large class groups are to be tested and where subject matter lends itself to this type of test > Includes banks of test questions, automatic marking and generation of feedback to students, summary information on student performance for teachers	> PC (non-multimedia) > Connected to a network, accessible on campus only or accessible from off-campus (depending on provision of site license for relevant test management software)

Adapted from Association of European Universities (1998)

APPENDIX 10

Suggested matrix for analysing application of ICT in teaching and learning

ICT in teaching and learning	Entry Stage	Adoption Stage	Adaptation Stage	Appropriation Stage	Invention Stage
Technology access and Usage patterns of academic staff	-Most academic staff do not have access to appropriate technology in the institution's work areas -A few academic staff use technology to enhance personal productivity - Technology used as substitute for manual work	-Some academic staff have access to appropriate ICT in the institution's work areas -Some academic staff use ICT sporadically as an add-on, supplementary educational tool -Internet use is limited and sporadic	-Most academic staff have access to appropriate ICT in the institution's work areas -Most academic staff use ICT for chat rooms, threaded discussions, etc with colleagues and for interacting with students	-Most academic staff have access to appropriate ICT in the institution's work areas -Most academic staff use ICT to develop teamwork, communication and problem solving skills of students -Most academic staff use ICT for online course management	-All academic staff have access to appropriate technology in the institution's work areas -All academic staff select, use, and evaluate information technology tools as needed -Technology is fully integrated into the curriculum and changes process of teaching and learning.
Technology access and usage patterns of students	-Most students do not have access to ICT -Students learn how to be computer literate	-Some students have access to ICT -Mastery of basic skills through drill and tutorial software	-Greater information resources available through the Internet and CD-ROM but Constricted due to lack of access -Most students use ICT for chat rooms, threaded discussions, etc	-Greater access to information resources available for research and education -Most students use ICT to develop teamwork, communication, and problem solving skills -Most students demonstrate improved higher order thinking and research skills	-Universal access to greater information resources available for research and education from Internet -Student-centered authentic project-based learning -Most students demonstrate improved higher order and thinking skills

Adapted from AAU (2002: 34-35)

APPENDIX 11

Research themes, criteria/indicators, and literature

Theme	Criteria/indicators	Literature
KIE ICT policy	• availability of Vision and Plan about the Contribution of ICT to Teaching and learning at KIE; • Does the ICT policy addresses questions like: why, how, when, what, who, where with regard to ICT integration in teaching and learning?	-A unified Model of ICT integration into teaching and learning - UNESCO (2009): ICT for Higher Education
Equipment, connectivity and access of/to ICT facilities at KIE	• Number of ICT-related devices (computers, LCD, projectors, etc.) • Ratio Lecturers/ and student/ computer • Number of Computers connected to the Internet • Number of Lecturers/Students using the Internet • Number of pieces of educational software available for teaching and learning	- AAU[22] (2002), Guidelines for Institutional self-assessment of ICT maturity in African Universities - UNESCO & Academy for Educational Development (AED) (2002), *Technologies for Education: Potentials, Parameters, and Prospects*
Teacher professional development/continuing education/in-service training	• The presence of professional development (in-service training) plan: does the focus lie in teaching and learning rather than hardware and • Software alone? Is the capacity building sustained, continuing and lifelong process?, etc. • Does the teacher professional development in ICT use takes into account pedagogical, technological, and collaboration & networking dimensions?	UNESCO (2005): Basic Strategies Towards Professional Development of Teachers South African Department of Education (2007)
Pedagogical ICT use	Can some of the following features related to ICT-pedagogy integration be found at KIE? • Lecturers design effective learning environments supported by technology, • Lecturers implement plans that include methods for applying technology to maximize student learning, • Lecturers apply technology to facilitate assessment, • Lecturers can use technology to enhance their own Productivity, • Linking teaching events, learning experience and ICT-related tools to be used, • Selecting ICT resources by taking into account, learning strategies, teaching methods, evaluation processes, etc., • Lecturers use the Internet to look for information and resources in the preparation of classes, • Lecturers know websites (portals, web pages, electronic magazines, dictionaries, search engines…) related to their specialty; • They elaborate and to use presentations (Power Point…) to explain topics in class; • They know how to use specific computer programmes in their professional field; • Know how to use the main tools of the Internet to communicate (e-mail, routing slips, forums…); • they know how to use a virtual platform to design activities that are complementary to the face-to-face ones; • They design multimedia resources (integrating text, image, audio…) for their didactic use; • Students learning to search for information, process data, and present information using ICT resources,	- Laurillard's conversational framework - Haşlaman et al's Unified Model - AAU's suggested matrix for analysing application of ICT in teaching and learning - García & Tejedor (2006) - Karsenti (2009) - AEU' s (2002) guadelines. - UNESCO's (2005)Pedagogical Approaches or Teaching Styles vis-à-vis the Use of Technology

[22] Association of African Universities

	• Students being responsible for controlling their own learning progress by using ICT resources, • Students learning and/or working during lessons at their own pace while using ICT resources, • ICT resources help students to effectively be involved in cooperative and/or project-based learning, • Does ICT help Students to collaborate on a project or exchange information with students from another school in Rwanda or another country? • Student-teachers are using ICT to Gather and analyze resource materials on a problem or topic • Does ICT help Student-teachers to use graphics in their reports report? • etc.	
Impact of ICT use on educators and teaching (as it is stated by lecturers)	• Is there any perceived Impact of ICT on Lecturers and their teaching?	Oliver (2002) Jagdish (2006)
Impact of ICT use on learners and learning (as it is stated by lectures and students)	• -Is there any perceived impact of ICT on Learners and their learning	Oliver (2002) Jagdish (2006)
Barriers to ICT integration in teaching and learning at KIE (as they are perceived by all the participants in this research)	• Teacher-level barriers • Student-level barriers • School-level barriers • System-level barriers	Anja et al. (2006