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Notice

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Meet the editor

Paul Birevu Muyinda is a Senior Lecturer and Head, Department of Open and Distance Learning, in the School of Distance and Lifelong Learning at Makerere University, Uganda. He holds a PhD in information systems specialising in mobile and electronic learning. In his PhD, Paul developed a Framework for Deploying and Utilising Learning Objects on Mobile Phones. This Uganda Communications Commission award winning framework has culminated into the development of several mobile learning applications. His research interests lie in mLearning, ICT4E, ICT4D, distance education, OER, and social media for student support. Paul is currently pursuing a two year postdoctoral research that shall lead to the total integration of mobile learning in the distance education student support system of Makerere University.

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Preface

Education has become the number one demanded commodity for social and economic transformation for both developing and developed economies. Thus the number of persons going and returning to school has become too big to be handled by existing brick and mortar learning institutions. Besides, the majority of lifelong learners do not have the time to become full-time students. Distance education is becoming the solution to the aforementioned challenges. Distance education has been defined as the mode of study where the learner is separated in time and space from the institution and tutors providing the tuition. In the early formation of distance education, the 'gap' between the distance learner and their institution was covered by self instructional paper based study materials. The emergence of information and communications technology (ICT) has changing the horizon of distance education. More and more of the distance learning programmes and courses are being ported onto online learning platforms. This is particularly so for distance learning programmes from developed countries where access to the Internet presents no particular challenges. In developing countries, blended distance education is still pervasive. In these nations, paper based self instructional materials still form the bulk of the distance learner support media. These materials are augmented with ICT support. The support ICTs used include: offline CDs, online learning management systems and mobile devices. The choice of support ICTs is occasioned by their accessibility to the learners. Mobile devises are increasing permeating the support sphere for distance learners in developing countries because, in most of these countries, mobile phone ownership amongst university students if averaging at over 99%. As distance learning massifies education, its critics are increasingly arguing that the quality of graduates from this mode is not as good as those from the conventional mode. This criticism has triggered a massive wave of research into frameworks for improving the quality of distance learning graduates. Therefore, distance learning. unlike other modes of delivery, boosts of a wealth of quality assurance frameworks which have increasingly boosted its quality. Besides, by its very nature, distance education, is learner centred. Learner cantered approaches breed a workforce with the badly needed 21st century skills. Further, anyone who has pursued studies through distance education will testify that it provides a rich learning experience as it permits an interplay of various learning experiences from different learning contexts. Thus, contrary to the 'belief' of the critics of the distance education mode of delivery, the employment world continues to absorb graduates from distance

education programmes and courses without a fuss. As more and more people get to know the potential of distance education, conventional universities will have no choice but to adapt most of their conventional programmes into distance education programmes.

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Chapter 1

Strategic Decision of Non-Profit State Universities: Turning to Open and Distance Education

Ali Rıza Erdem

Additional information is available at the end of the chapter

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1. Introduction

> "The King Philippoemenis, the king of Akhaia people who fought with Troyans, is one of the praises modern historians about that always, even in peace time, dealt with management techniques. While walking in the area, he frequently asked his friends about war "*If the army of the enemy were located on the hill over there and our army was located here, which of us would have more advantages? How could get near them without changing our war order? Or, what would we do to withdraw? How would we run after them if they attempted to withdraw?*" Namely, he frequently used to talk to his friends over such matters on the land, trying to know about their opinions and telling them about his opinions and the reasons for his own opinions. Undoubtedly, thanks to such reasoning efforts, he would almost never face to a solution-free problem to drive his army in war-times. For me, that's the clever king! He never wastes his time during the peace time and makes every possible preparation in time to benefit when necessary."
>
> Nicollo Machiavelli

Undoubtedly, the 21st century has been exposed to an incredible pace and changes could be realised in many ways ranging from econimics and politics to administration. However, such a fast change has brought ambiquity together which invariably leads to sudden variations for inner and outer layers of organizations. However, such a case is likely to mean both opportunities and threats.

Actually, not only Chance, the ambiquity evolving with the change but also opportunities and threats appearing with the ambiquity play a pivot role in maintenance of the organization. Thus, the earlier an organization figures out these opportunities and threats in

the changing process and develops a strategy and makes up a rigorous vision, the more likely it could develop its existence and role. Otherwise, maintenance of an organization will be at considerable risk.

For a system (an individual or an organization), change refers to transformation into another dimension, regardless that it is on purpose or not. Thus, change means an inevitable process of maintenance in which the major consideration is transformation into another state (Sağlam, 1979; Çelebioğlu, 1988; TDK 1992; Özdemir, 1996; Yeniçeri 2002). Therefore, organizations cannot remain without contacting to their environment and so they are expected to keep the pace of ever-changing conditions. In that way, the maintenance of organizations in such conditions plays a pivot role in seeing what they are supposed to offer rigorously.

According to Şimşek (1997) organizational change were explained through several theories. According to "*classical-functional perception",* the organization could only keep the pace of change step by step. However, "*new functional perception"* suggests that the organization should adopt itself to the changes in its environment by taking radical and methamorphic methods of change. On the other hand, according to *"system theories"* the organization is exposed to change as in the biological change process of an organism: the birth (inception), maturity (transformation) and death (deterioration or undermining). Ones suggesting *"organizational ecology"* judging from Darwin's theory that "*only the most flexible ones could remain*", claim that only the system adopting the environment at best could maintain whereas the others will disappear over time through "*natural selection*". According to *"organizational development approach"*, remaining could be realized only by controlling the 5 variables (strategy, consruction, technology, culture and administration) which play major role in the system. According to the *"commentator and symbolist"* approach, realist is not objective as objectivity is not available to bring a satisfying explanation for the individual nature of the human beings. To make conclusion, it seems probable that social systems are a collection of the meanings which are purposed by the human beings to contribute the reality. Thus, the change is to start by considering the individdl in the system and his point of view about the world. According to *"paradigmatic change",* change is an interconnected process of evaluational and revolutional changes and so prolonged evolutional processes are disrupted by revolutions at short intervals.

"*Change*" is not invariably a phenomenon which is merely native to our age, but the major source of power which makes "*change*" invariable is that the knowledge we have is exposed to constant change and its coverage area have continuously enlarged. Thus, the term "*change*" seems to have forced every society, institution, corporation and organization and everybody to take the warning of Prahalad seriously "*you'll die if you do not change"*. As a result, the pace, power and effect of change has reached today to incredible levels. However, what the term "*change*" means to organizations as a whole could still be explained as "*risk*" while its opposite refers to "*stability*" which will essentially mean the least change possible in the organization (Gibson, 1997, Gates, 2000). Therefore, the most advisable trend between the systems are usually known as the "*balance*"and because the changes (in other systems) around every organization will necesssarity disrupt the current balance, the case will make

another state of balance almos inevitable. In this respect, our age – the 21st century – will surely be a remarkable period in which we will be exposed to a great many of changes. In fact, within the new respect, for individuals and organization, "*the change*" has become a must now to remain rather than development or advancement (Şimşek, 1997; Ceyhan & Summak, 1999; Tabancalı, 2000). Briefly, management of the innovation and even being the pioneer of this process (performance of new changes) seems crucial as a part this inevitable process.

1.1. Strategic decision

> "So it is said that if you know others and know yourself, you will not be imperiled in a hundred battles; if you do not know others, but do know yourself, you win one and lose one; if you do not know others and do not know yourself, you will be imperiled in every single battle."
>
> *Sun Tzu*

According to Bursalıoğlu (1991) "*making decision*" is the first major step is management, and so any organization is supposed to have the ability for decision to be more effective. Therefore, "*making decision*" starts with the perception of the state to reach a decision. It could also be expossed as a method or a process of an ability to make choise among two or more options by taking all possibilities into consideration. As a management concept which refers to making a choise, "*making decision"* is an indispensable part of the administrational process, so it is quite usual to see this process in any level or funtions of the administration. In addition, management is a function of making decisions. That's why, making decision in administration level is of a vital role to reach organizational aims in an efficient way because the decisions given by administrators are, at times, likely to affect the staff, the partners as well as related social groups even through these decision many indicate differences depending on their administration status (Koçel, 1995; Lucey, 1991; Aydeniz, 2002). According to Koçel (1995), "*Making decision is a process which has a starting point, it but differs after this point due to many different professions, activities and ideas and this process ends up with a choice. Therefore, it is impossible for an administration to give up "making decision" wherever he takes place in the organization, no matter what he deals with, whether he loves his profession or not. In that way, "making decision" is such a prior responsibility of the administrator that administration could now be explained as the profession of "making right decision" as the succes or failure of the organization is directly relevant to his decision; therefore, in modern organization "making decision" is regarded as the basic element of administration*". Namely, as "*making decision*" about what to do, who to do as well as when, where and what to do will take up much of their time, they consider "*making decision*" their most inevitable mission.

Organizations may, at times, need to reach different decisions depending on the situation and such decisions could vary ranging from being strategic, routine or non-routine to being operational, sub-level or upper-level. Organizational decisions could vary ranging from

ones under certain conditions to uıncertain situations. In that way, strategic decision is a large combination of upper-level decisions arranging the relations of the organization with its environment (Eren, 2008).

In making strategic decisions, the most crucial step is the performance of "*SWOT Analysis*" referring to: *(S) Strengths* (Strength aspects of the organization), *(W) Weaknesses* (weak aspects of the organization), *(O) Opportunities* (the opportunities which the organization obtains), *(T) Threats* (the threats and dangers which the organization faces). SWOT analysis makes up an analysis as to inner and outer case because any organization must be aware of the developments in their environment. Therefore, obtaining remarkable success in today's world which is exposed to non-stop winds of change in economic, socio-cultural and technological respects, as well as newly appearing performance criteria, organizations are supposed to develop new strategies which will provide them the maximum advantage possible, taking their weak and powerful sides. Today, this point is undoubtedly of critical importance for many organizations which are in jeopardy. At this point, organizations should be familiar with into their own bodies so as to strategic vitality of "*SWOT Analysis*" and adopt it come up with new strategies in addition to using their sources and capacities at highest level possible by performing rigorous and systematic analysis. When seen in this respect, SWOT analysis could be considered a technique used to underline the weak or powerful sides of the condition as well as figuring out outside-inspired opportunities and threats to the organization. SWOT analysis, therefore, consists of a comprehensive study of positive and negative factors thriving in organizational and environmental factors. Initially, an "*inside-analysis*" is performed to put forward both weak and powerful sides. At this stage, the organization is exposed to "*self-cirticism*" in terms of sources (input), current strategy (the process) and so-far performance (output). As a result, such self-respect will allow the organization gets through a process of "*outer analysis*" so as comprehend the position of the organization compered with other organizations as well as imminent threats and oppurtunities in the future. It should be noted that organizations fail to percivbe in time such outer threats, developments and as a result because they couldn't make up required strategies in time, they mostly tens to close themselves to innovations, falling in a feeling of relief. Such a risk is notably much more serious even for many organizations which enjoyed great success in the past. As a result, for any organization, "*outer-analysis*" must refer to a comprehensive analysis of the recent developments in global and national politics, social, economic and technologic power conditions of outer-competition as well as judgement and perceptional changes native to the groups which are served. Undoubtedly, such an analysis aims at considering what should be seen as an opportunity or threat in outer environment (Ansoff & Declerck & Hayes, 1976; Mintzberg, 1994; Bryson, 1995; Steiner, 1997).

1.2. Non-profit state universities

> "Being free of dependency by knowledge shouldn't mean the overall superiority in the world, but it should refer to be free of imaginative mistakes and mis-beliefs a along with allowing the mind to be free in order to criticize our own opinions."
>
> *Karl. R. Popper*

In Latin language, the term "*university*" derives from "*universitas*" which refered to "*uniformity*" in the Medival Age. During the period, at "*church-centered university*" between 12th and 15th centuries, education was performed based on a certain programme including scientific, political and theological subjects. Initially, the original universities which are thought to have evolved in Paris and Bologna we under the pressure of both the Holy Rom Empir of the civil outhority and the Papal which meant the theologic outhority. Nevertheless, the theologic outhority of Papal was gradually replaced beginning in the 16th century, by the state's own outhority. The new programmes aimed rather at training administrators for the state's own instutions than the ecclesiastic population. Then, it was the 19th century that universities became an important means all walks of life, offering an advantage for individuals to reach higher status consistent with their own skills. Then, it was in the early 19th century that universities established the philosophic foundations of getting social status complying with the individual's own skills. Throughout the late 18th century and early 19th century, a greaty many of European universities were demolished by Napoleon and Frenh universities were turned out to be a state organ and the aim of them was re-defined as the training of elite staff consistent with the central government's own ideology. In that way, the higher education system of Europe experienced a re-established process as the national higher –education system of countries. In the early 19th century, the main function of the university was keeping the knowledge and transmitting it to prosperities, namely, it was called "*training & education*". However, over time, intellectual responses evolved in Prussia against Franch domaince. For that reason, Prussian King Frederick appointed William Vom Humboldt to re-organize the education system in the country Humboldt, who initially conducted the establishment project of Berlin University (then called as Humboldt University) come up with a system named for his name. According to the system: (1) Universities should be bodies in which the training & education is conducted as a whole in all scientific reals consistent with research activities. (2) Major functions of the university, apart from the vocational & technical higher schools; is its performance ability in education & training and research without addressing to a profession. Thus, the major aim is allowing individuals to build up a novel concept about them. In this respect, "*seminars*" provide a large spectrum of freedom to the education staff and the student in chosing any subject freely which they wish to teach and to learn. As a result, the aim of the study is "*science for science*". (3) The owner of the university not the state, but the nation itself and what the state is supposed to do is to meet the need for education staff, to pay wages and to provide ideal conditions requied for their study. In addition, the academic staff and students should be able to conduct their search and training without having any religious and politic pressure by which the concept of modern university evolved in Germany with effects of French Revolution and Napolean Wars and the new concept was based on accumulation of scientific knowledge within the principal of universal education for free of charge. By the second half of the 20th century, this new university system Humboldt form was reviewed and shaped compabitable with a modern concept. Then, as of the second half of the last century, ever-increasing universities in the USA have had two following major characteristics: (1) Inclusion of fundamental scientific and

practical studies with "*social services*" into major responsibilities of the university. (2) Enhancement of vocational training and ever increasing investments reserved by the public and private business in the maintenance of universities' functions. Moreover, granting the right of education to each individual within mass higher education mentality coincides in the same period. Beginning in this period, university pulpits have been increasingly replaced by more flexible departments (Güler, 1994; Gürüz ve diğerleri, 1994; Gürüz, 2001; Korkut, 2001; Arap, 2010).

According to Kwiek (2002), the concept of modern university is a combination of intellectual studies of German philosophers ranging from Kant and Fichte to Schiermacher and Wilhelm Von Humboldt. According to them: (1) The University was left by the German philosophers to the nation–state's initative. (2) University is traditionally, as a whole, a considerable consumer of public income. Gürüz (2001), suggests that because modern universities largely depend on public income, autonomy of seems impossible. Therefore, Gürüz argues conversion into "*enterprising university model*" which is largely based on the variation of activities and income sources. The major reason, according to Gürüz, for the inevitable conversion is that: "*Today's contemporaray, universities are bodies which shape their activities often considering social expectations and requirements as well as the sources allocated to themselves rather than personal judgemenets of their own academic staff. In other words, modern universities are heavily contemporary institutions which have been accepted by all sides of the society, open to social inspection onto how much they perform their ressibilites. They also allow their activities to be driven by the society itself along with creating additional financial sources by evaluating any equipment, facility, knowledge, experiment and human sources they have. Modern universities are, meanwhile, highly sophisticated bodies driven by modern administrational techniques*". According to Didou (2002), the USA and Canada, both of which have an upper level of higher education system, regard education as an item to market, and as a financial source marketing mentality. According to Scott (2002), the considerable increase in the number of business university should be seen a remarkable sign the commercialized university education. On the other hand, according to Slaughter & Lselie (1999), university has recently driven within marketing mentality like huge corporations, too. More, universities have gradually seen knowledge as a marketable item on the market. Thus, it is the market itself which will decide on what courses to be given, what kind of studies to be performed or which student profile to be served along with which registration policy to be follow. In that way, the mentality of strategic planning, total quality managemenet and ISO documents have increasingly been institutionalized in many universities, too. On the other hand, the number of part-time of temporary employed academic staff has incredibly boomed so as to enhance productivity and efficiency in universities. In addition, it is now an undeniable fact that the academic staff is exposed to great pressure to perform new attempts for an enhanced academic staff program spectrum (cited by Lee 2002). According to Kwiek (2002), such a trend refers that: "*universities making steps neoliberal mentality will, over time, invariably turn into business corporations as a whole and this case will never satisfy them. This could be, nevertheless, will mean the end of the university as a modern body*".

2. Changing status of state universities in our globalizing world

> "You cannot have a shower in the same river once more, because the water runs continuallly."
>
> *Heraklitus*

It is a common claim that the modern world has entered into the globalisation era. While globalization discourses are increasing nowadays, the debates have centered on transformation and re-structuring of economy, culture and politics in global perspective. The process called "*globalization*" has nearly been an inevitable part of our routine. In other words, "*globalization*" includes with both its effects and comments of it, enlarged and more developed economic, social and political affairs of countries, increased capital activities, the end of all kinds of polarizations that are based idelogic discrimination, well-awareness of different social cultures and their beliefs and expectations as well as intensed relations of countries. Globalization theories are heavily placed in Giddens (1994, 2000), Harvey (1997) and Robertson's (1999) spectrums. Giddens (1994, 2000), defines the globalization as a process in which remote habitats could be related to each other, local phenomena could sometimes be affected by events occurring in remote places and intensified social relations. According to him, globalization is a conversion process which comes true in places over time. Therefore, social action should be taken out of local dimensions and reshaped within the place and time it occurs. Thus, globalization does not only or primarily refer to economic inter-depency of countries but also mean the conversion of the place and time in which we live. Whether they are financial or not, undoubtedly, the events occurring in remote locations affect us now more directly and instantly than the ones in the past. Therefore, it could be assumed that globalization is comprised of certain sophisticated processes evolving with the combination of political and ecoınomic effect as. Harvey (1997), defines globalization as gradually increasing discrepancy in terms of time and location while. Robertson (1999) expresses globalization by underlining the relevant process. In his view, the mutual effection between local and global factors is major factors and in global process, the local ones built up. Robertson, in addition, suggests that globalization is not a newly appearing term, but it is of gradually increasing phases beginning in as early as the 15th century. It seems possible to divide the approaches as to globalization into three groups: (1) Ones who are *golalized perspective* consider globalization to be a dynamic shaping the contemporary world and therefore they generously support the approach. To them, such approaches will inevitable know priority to economy whereas matters like politics and cultures are sub-variables depending on the economy. (2) *The sceptic perception* is of a negative point of view about globalization and therefore, it harshly ciriticizes the establishment of economic hegemonia, suggesting that globalization is a totally deceptive concept and so it is necessary to talk about making globalizaed instead of globalization (3) *The transmissive perception* sees globalization as a process which both consists of numerous opportunities and risks. As a result, almost all walks of life are essentially affected by the globalization process which mainly leads cultural, politics, economic and social affairs to undergo considerable changes. Today, unprecedented

changes in communication, transportation and computes technologies have raisen a new impedus in the globalization process. For this reason, circulation of the capital power has inevitably forced huge corporations to re-organize themselves, as well as demolishing rules, as it doesn't care much about local and national policies. In the meantime, changes in society and the population, economic, changes, family types and changing life styles are only some of the major changes caused by globalization. On the other hand, positive and negative effects of globalization process have also been traditionallty discussed. In this respect, the establishment of common values of human beings, the spreading of new concepts such as human rights, fredoom and justice, the understanding of the global need the qualified human source, the enhancement of opportunities for a healthy life, the chance for free-travel, the establishment of common education policies between countries are surely considered among major positive impacts of globalization. On the other hand, among positive effects are the undermining of such concepts as fredoom or national sovereignity considering national boundries non-existent acceleration of poverty and misery as well as distribution of wealth and prosperity, the dilemma for countries between being a part of globalization and the maintenance of national solidarity (Giddens, 1994; Harvey, 1997; Robertson, 1999; Giddens, 2000; DPT, 2000; Çoban, 2002; Balay, 2004; Çalık & Sezgin, 2005; Zengingönül, 2005; Dağlı, 2007; Şen, 2008; Çeken & Ökten & Ateşoğlu, 2008; Erol, 2010).

Undoubtedly, today's world is exposed to fast changes and ever-changing conditions bring a great many of innovations together, as well. Such national and international changes and innovations have inevitably affected almost all individuals and institutions in the society. Political, social, economic and technologic changes which have notably gained impetus from the last quarter of the 20th century on have increasingly continued in the 21st century, too. In this process, it is certain that the lessening cost and spreading of information technologies have eliminated such concepts as distance and borders as of the very beginning of the 21st century, universities have undergone an unprecedented innovation process which cannot be considered as not only the simultaneous results of efforts to reach more functional system in global higher education compatible with the 21st century and the third millennium, but also the process based on pure technology which could afford to affect all walks of life. Such a case could probably be caused by the coincidence of technologic abilities leading to changes and the 21st century. In this process, higher education has also gradually been a lobal field, leaving its old traditional concepts native to countries. Thus, higher education system of developed nations has increasinly been exposed to a constant flux of students, due to ever-increasing demand from developing countries. For instance, the numbers of foreign students at higher education instutions of OECD countries have reached 1.6 million, doubling in the last two decades. On the other hand, developments in information technologies have evolved a novel situation in global higher education which is completely free of student circulation. Thus, the most remarkable form of such a new case could be named as "*programme mobility*" by which students could register their name and get a university degree through virtuall programmes without needing to go or stay abroad for another country's education programmes. Another form which has recently evolved is that universities of developed nation's offer education service by establishing new campuses in other countries, which

could be assumed "*institutional mobility*". As a result, we could conclude that globalization is of great effects on higher education ranging from ever-lessening bufgets allocated to higher education service, I wish for benefiting from opportunities, training with technologic support, gradually increased volume of student market on global based and newly appearing challenges and dictations over ones who are in this field. Meanwhile, among major factors compelling the university to changes / innovations are financial challenges needs of the changing society as well as effects of the market. To obtain a considerable status, almost each new university has aspired new titles such as "*the university of the 21st century*" or "*multiversity*". In such a competitive process, it seems hardly inevitable for state universities, as non-profit bodies, to presume any opportunity and threat so as to develop promising strategies and vision, bing derminers at instable times (Erdem, 2002; Günay 2007; YÖK, 2007; Çınar, 2009; Odabaşı & Fırat & İzmirli & Çankaya & Mısırlı, 2010).

2.1. Globalization and its effects on state universities

> "…..planning, management and achieving success could never be more challenging than establishment of a new system. Ones who prefer the conventional system on will surely be against and defend themselves against revolutionists."
>
> *Nicollo Machiavelli*

Undoubtedly, one of the most prominent winds of change in the 20th century is the globalized world which is, in fact, highly new term surging originally in the 1960s. Then, the use of the term "*globalization*" gradually increased until the 1980s. Even though, as a concept, "*globalization*" initially referred to the "*globalized village*" in the 1960s, beginning in the 1980s, scientists increasingly turned their attention to "*globalization*" to study it in a systematic way along with a theoretical respect based on the process itself. When it came to 1990s, "*globalization*" proved to be a key term for scientists. Today, too many people, "*globalization*" should refer to a phrase related to liberalism in terms of economy or universality of democratic concepts while some others regard "*globalization*" as universal human rights, ecological problems or everything that includes all above. One the other hand, one supporting ever-changing see "*globalization*" as a process containing both opportunities and risk. In this respect, it seems true that explanations concerning "*globalization"* do not match with the each other. Namely, on one hand, "*globalization*" may refer to the close affairs of nations in terms of politics, economics and communication and so which is getting smaller and smaller. On the other hand, "*globalization*" refers to a worldwide capitalism, the effort to create a global market as well as the way of capitalists to establish an absolute sovereignty all over the world (DPT, 1995; DPT, 2000; Erdem, 2002; Gündüz, 2002; Kızılçelik, 2002; Sönmez, 2002; Gürak, 2003; Tural, 2004; ILO, 2006; Milli, 2006; Çeken & Ökten & Ateşoğlu, 2008; Erol, 2010; Balkar & Özgan, 2010). Meanwhile, "*globalization*" is also claimed to be as the inevitable result of modern science and new technologies which is mainly based on economic power and has four major dimensions of politics, culture, technology and economics. All systems in the society are necessarily

affected by these four dimensions (Karlsen, 2002; McBurnie, 2002). With the globalization, it seems now indisputable that globalization has also accelerated regional collaborations and projects by which all social institutions have experienced changes and such collaborations and project have invariably caused all social institutions including economics to experience considerable changes, as well (DPT, 1995; DPT, 2000; Didou-Aupetit, 2002). Moreover, it could be concluded that such changes have also affected the traditional approach to democracy which makes up the society itself. Moreover, globalization will allow certain democratic movements and bodies to urge more commonly while regional collaborations and projects will contribute democracy to appear more frequently. However, it seems probable that certain movements against democracy will also become more often in the society and this also likely to limit the development and expansion of democracy.

According to Kwiek (2002), here as three major factors contributing the transformation of higher education: (1) The collapse of the vital role of nation-state in social and economic development as well as the notion that higher education is a national fortune contributing the national awareness. (2) Re-establishment of the functions of the social-welfare referring to a new point of view concerning the public sector which will be financed by the state itself. (3) All over the world, the whole public sector has been occupied by private company mentality. As a result, higher education is not considered a public sector any more. More, problems related to higher education are not native to the Middle and Eastern Europe, but they are now global ones which are in need of solutions through global organizations such as IMF and OECD.

Undoubtedly, as regional collaborations have gained speed with the effect of globalization, they have opened up new changes in education, notably in higher education. According to Didou-Aupetit'e (2002), NAFTA (North America Free Trade Agreement), this was signed between the USA, Mexico and Canada and introduced on 1st of January 1994 has been a turning point in re-establishment of the Higher Education System in Mexico. Thanks to the programs conducted by NAFTA, model accreditation system, mutual recognition of academic diplomats and development of professional competition has been realized in the country. Globalization is also claimed to have affected higher education system in many ways. According to Yang ve Vidovich'e (2002), we could see the effects of globalization over higher education system at four points: economic benefits (close observations on universities due to their considerable economic contributions), decline in budget and financial pressure, and teaching with technological support and with the enlarged share of international student market, establishment of the rules over the ones who offer this service. However, it is also true that globalization has affected higher education systems in developed countries. According to Johnstone, there are two major headlines affecting the agenda of higher education institutions in the USA: (1) The reform over development of training, improving the standards, advancement of programs, recognition of the needs of ever-changing student population. (2) Decreased sources and increased costs in higher education. As a result, some quarters turn their attention to the business world in order to rebuild the higher education system (decreased costs, function and bureaucracy).

Colleges and universities in the US have also considered ways so as to lessen their costs, close some departments, programs or institutions, as well as measuring of performance the teaching staff, loading extra responsibilities onto them and privatization of various institutions. According to cites by Halimi, public judgment as a "*result of globalization*" in France have expanded as parallel to demands of central and local authorities (Tural, 2002). On the other hand, globalization offers a number of opportunities. According to Aktay (2002), universities students and academicians are now likely to reach global opportunities via internet access. According to Kellner (2002), changes just at the beginning of the 21st century have also opened up new technologies such as computerization, communication and multimedia. However, according to Scott (2002), globalization is the greatest challenge to against universities and has brought many threats together. According to him, the university is exposed to three major challenges caused by globalization: (1) The discordant relation between globalization and traditional role of the university in national culture (2) A more homogenized education system, which is caused by the effect of communication and informatics technologies and the culture of global research, has inevitably weakened the "differences" which are usually expressed as "*national cultures*". (3) The gradual deterioration in social function of the state with globalization has also weakened financial aspect of public universities, declining their income levels. According to Apple (2002) and Aktay (2002), globalization has invariably brought about "*a gap opportunity*" in secondary and higher education between ones from lower class and middle class. According to Lee (2002), another threat lies under the declined shares and funds in many countries. According to Kellner (2002), there has recently appeared a "*digital gap*" also known "*digital division*" between ones, including in higher education, which do have knowledge and technology and ones who do not. "*Digital gap" (digital divide)*" draws on absolute frontier between the universities which could offer technology and knowledge and the ones which could not. Therefore, this case should be regarded as a considerable obstacle.

2.2. Paradigms of changing state university

> "Actually, yesterday is invariably gone, my friend! There are a lot of new things to mention today."
>
> *Mevlana*

Changes which have speeded up since the last quarter of the twentieth century have directly affected and re-establish the paradigms related to state universities. Today changing state university paradigms with the effect of globalization could be categorized under seven headlines (Apple, 2002; Didou-Aupetit, 2002; Lee, 2002; McBurnie, 2002; Yang & Vidovich, 2002; Scott, 2002; Tural, 2002; Arslanoğlu, 2002; Yılmaz & Horzum, 2005; Rehber, 2007): (1) *Association of the affair between the state and universities with market economy*: Gradually increasing importance of market economy have naturally affected the mentality of public administration and applications. As a result, the state, which provides financial support to the university, has changed its point of view to the university. Thus, market mentality and certain market applications have irresistibly replaced the traditional point of view in public

administration. For instance, Baker who was the Education Secretary of Teacher's Government warned universities to care more about the training of individuals whom the state needed in terms of qualifications and quantities. (2) *That the university autonomy has gradually replaced the requirement for "judgment before the public"*: The society, which offers universities, many financial opportunities, is now able to use the right for inspection through public mind. Now, universities feel themselves obviously responsible to the all steps of the society which give universities vast financial sources. However, this mentality contradicts with the academic freedom in a way. (3) *Effective use of science and technology in researches, training & education service and cyber education*: Information technology have now been used highly efficiently in maintenance of formal, distance and virtual higher education programmes. As a result, the higher education service could be available to more students in different places in a more efficient way. (4) *More internationalist mentality in universities*: Today, universities in developed countries welcome in their bodies not only national learners and researches but also international ones. Moreover, they are in fierce competition to attract more students and researchers from all over the world. (5) *Regarding universities as a society of knowledge, a financial source, and a complex body rather than just a society of teachers and students*: While training qualified individuals who are needed by the society, they do not take the employment rates into consideration to a large extent. In this respect, it is certain that they usually focus on fields coherent with the market itself. According to Currie (1998) the mentality of "*the market trends know the best of all*" has inevitably affected the university itself, as well (cited from Kwiek, 2002) (6) *Tendency to a pragmatic university*: In pragmatic university suggested by Valimaa (1999), being on academician should mean multi-dimensioned effort because in changing conditions, academicians feel obliged to market their speciality at the markets in and out the university. Such a case, according to him, puts of marketing and consultancy role on them as well as their traditional role on education and research. (7) *Competition among the state universities and multiplying of them*: They are private national institutions, private foreign institutions, certificate centers with national and foreign partners, national and foreign cyber education serves, and ones which offer mixed education services. It is also clear that the number of such competitors have increased day by day.

In addition, concerning the effect of latest changes in the world on higher education, we could also conclude the following realities (Erdem, 2006): (1) *Commercialization of universities*: Universities have gradually become customer centered companies which are driven more bureaucratic way and this case has urged public universities to become more competitive. (2) *Considering knowledge as a bought-sold material within market mentality*: Undoubtedly, this case has already led to a university mentality focusing on market-centered ideas and opinions.

3. Turning of non-profit state universities to open & distance education

"Firstly, we shape our own characteristics, and then our characteristics do us."

W. Churchill

From the last quarter of the 20th century on, the world has inevitably got trough a period of information society and information economy. Undoubtedly, in this period, information society has stimulated different economic and social paradigmas from onsw in the Industrial Revulation Age. In information society, training indvidals who are sensitive to modern sciences and point of view is of great importance. In this respect, the steam boiler refers to man power and the industrial society while means such as the computer and brain power represent the information society. Therefore, in the information society, highly qualified human sources in intellectual respect are supposed to effectively contribute to economy as well as its gradual participation in productivity. As a result, a new global trend called information economy has inevitably evolved in which economic ability of individuals, intellectual levels of them as well as competition power of countries and human and social backgounds could be measured. During the establishement of information and economy society, here are the increasing expectations of different groups from universities: (1) Being ale to address to more studentsa and a larger age group (*massification*), (2) Enlarged programmes including whole of newly obtained knowledge and fields of knowledge (*academic expansion*), (3) Concentration on job opportunities for graduates in education and orientation to practise in search as well as knowledge (*relevance*), (4) Being able to make considerable contribution to regional and national development by building up rigorous affairs with society, (5) Being able to develop new transparent model in administration which feel responsible themselves to society (*accountability*), (6) Being able to to handle all there expectations with respectively lessening financial public sources (YÖK, 2007; Şentürk, 2008).

Today, higher education has largely been considered so far to be a public service whose expenditures are met thoroughly by public sources, apart from a handful of countries including the US. However, due to the gradually increasing demand in higher education in recent and following years, the maintenance of higher education service only through public sources have been seriously argued. In that way, new attempts have been almost inevitable (1) to meet expenses of higher education service through other sources as well as public sources, (2) to vary income sources of higher education institutions, (3) more efficient and even distribution and use of public sources. Meanwhile, we could see a variety of reforms such as freedom and privatization, mainly based on maintenance and financing of higher education. As a consequence, students' financial support in education expenses and industrial support for research expenses have been initial agenda (collaboration between the university and industry) and budgets for education and research have gradually separated from each other. Therefore, education expenses which accounts for the most important rate (70-80 %) of higher education budgets due to additional fees for individuals who gets this service and considerable social income of such a service, the society has gradually held the opnion that education expenses which accounts for the most important rate (70-80 %) of higher education budgets should be financed by the state's support which all the society is supposed to pay. As in education field, universities have been gradually exposed to get financial sources out of public ones. In other words, instead of obtaining knowledge for public benefit with public support, they are supposed to conduct search and development projects with private institutions' support heavily for these institutions. For instance, of 32

state universities of the US, the funds allocated for such projects more than doubled between 1990 and 2001 (YÖK, 2007; Odabaşı & Fırat & İzmirli & Çankaya & Mısırlı, 2010).

Today, education system in general sense and higher education system in private is exposed to considerable pressure from frequent criticism due to its disability in meeting the requirements of economies based on pure knowledge. In this process, demands of the market economy have changed at a remarkable rate along with the institutions established to meet regional and national demands. As a result, students who are afraid of being unemployed prefer to graduate from vocational schools or departments which will make obtaining job easier and so such departments have been exposed to gradually increasing pressure of capacity. Moreover, economic difficulties and students' additional fee which universities charge along with the stress of having to live another city and high cost of metropolitan life are likely to mean extra burden on students' budgets. Meanwhile, crowded classrooms, inefficient and routine courses, gradually increasing costs and insufficient number of education staff have forced authorities to find out new alternatives so as to meet the ever-increasing demand. Throughout history, universities in different countries have always tried new alternatives, some of which are open training, distant training (by letters), distant education, e-learning, online learning, learning on web database, distributed learning, simultaneous learning, tele-learning and flexible learning. However, in recent years, new tendencies in higher education have dragged universities to make use of electronic facilities and this makes almost inevitable to offer their students in-line services. In this course, thanks to interactive conditions and the availability for reaching limitless knowledge, a new unprecedented age has begun notably for universities. Therefore, while drawing their roles in the 21st century, felt themselves obliged to establish virtual campuses in addition to their traditional campuses (Güven, 2002; Balyer & Gündüz, 2010; Bayram & İbili & Hakkari, Kantar & Doğan, 20.11.2011; Ersoy & Acartürk, 12.01.2012).

As examples to the universities offering open and distand education service are Illinois virtual campus in America (IVC), Canadian Virtual University (CVU), UK Open University, Finnish Virtual University, The Italian Distance University (NETTUNO), Open Education Faculty of Anadolu University in Turkey, The National Institute of Information Technology in India (NIIT), University Tun Abdul Razak in Malaysia (UNITAR), African Kenyatta AVU Virtual University, Chinese Open University, Japanese Open University, Avustralian USQOnline.

3.1. Applications in open & distance education process at state universities

"No one could be as much blinder as one who doesn't wish to see."

İbn-i Sina

When thought in its general respect, the term "*open education*" refers to an educational approach aiming to serve education in any required level to human societies which traditional education institutions do not regard as "priority". Among major reasons for why individuals who open education are "*to be employed as well as studying, to be older than*

university age, to be in the army for compulsory service, to be physically disabled or to be imprisoned", all of which prevent them from attending normal universities. Apart from them, housewives who wish to complete university education and ones who have their own occupations but wish to study at a second field as well as ones living abroad. As ones who study at open education are usually deprived of the change to attend formal education, the most commonly preferred education way "*distant teaching*" which makes use of technology in maintenance of interaction and material transmission of different student and teaching staff profiles within different geographical conditions. In a system whose origin date back to centuries ago based on such teachings applications as letter or newspaper training, we could see some other novel technologies such as phone, radio or even cinema. Admittedly, open education has caught up its popularity thanks to TV training. Benefitting from experiments of Brisitsh Open University which was introduced in the 1960s, a great many of education institutions in different countries which offer TV-based education have unprecedentedly flourished in the 1980. In this respect, we could estimate that the major training materials are the coursebooks which are particularly designed consistent with distant education methods, for self-learning process. In addition to the course-books parallel TV programmes to the units of aim the courses aim at promoting and comprehending the self-learning activities and so the number these techniquies and technologies of distance condition has multiples over time. "*The open education*" which originaly evolved in the forms of letter –training has been practise for centuries in Canada, Avustralia, New Zeland, The USA, England and China has arousen more interest as a result of newly developing and expanding internet technologies. Further, newly evolving electronic facilities such as video-conference systems, computer and internet technologies offer considerable opportunities to instructors and learners. In the case of the US, as a counter way to ever increasing cost in universities, we could see a great many of open-education universities, the most important ones of of which are Pennsylvania ve South Carolina Universities. As for Europe, the European Council has conducted educational publishing in five different languages with the support of open education universities in Europe. Meanwhile "*Hagen University*" in Germany is another considerable example for open education service as well as "*Tubingen University*" which offer constant vocational training for teachers. In this course, England is the first country to have established the "*Open University*". On the other hand, Japan has also an important status due to establishing a university so as to offer open higher education service in which almost a half million Japanese study based on a system founded by modeling on "*British Open University*" system (Hakan, 1998; Ulukan & Baraz, 2001; Sağlık & Öztürk, 2001; Çukadar & Çelik, 2003; Çetin & Çakıroğlu & Bayılmış & Ekiz, 204; Mutlu & Öztürk & Özöğüt & Yılmaz & Çetinöz, 11.09.2006).

"Distance education" has proved to be a contemporary model of free of time and space which offers free and individual education service through leading communication technologies such as internet. Distance education program is a dimension of contemporary and new education technologies. Concepts and applications in this field are the results of a series of educational demands and developments in various communication and education technologies. Distance education applications have some conceptual bases. These are creating new education opportunities, realizing work-education unity, getting democratic in

education, lifelong education, tendency to individual matters, effective use of institutions, integration of technology and education, tendency to individual and social needs, taking three dimensional integration as the main principle (publishing, printed materials and face to face education), reaching maximum mass, individual and mass education integrity and education demand and financial matters balance. Actually, the origin of "*distance education*" dates back to the 1800s and by the end of the 19th century, certain institutions in both the USA and the UK had already established the infrastructure of the education service based on mutual correspondence. As for the hapining of the 20th century, many other universities all around Australia including Queensland University and New England University introduced the distance education service. When it came to the 1960s, with the onset of Brtisih Open University project, distance education rapidly flourished all around the world, on institutional scale, ranging from European countries and North America to Australia. Today, distance education service undoubtedly has made it available to individuals to benefit from formal education service in their own locations by attending the courses of formal education out of the borders of distance education. In this process, the spreading of internet for affordable costs and its enlarged capacity have made great contributions to the onset of "*Distance Education based on Internet*" by which internet technology has rapidly proved to be an ideal platform for "*Distance Education*" service. In 1985, the first application of "*Distance Education by Internet*" was initiated in Phoenix University and today it offers so varied opportunities to internet users as a remarkable base of distance education. We could consider, among these opportunities, the electronic mail, World Wide Web (www), new groups, discussion groups, ftp gopher, chatting programs, telnet, URL and search motors. In addition to such opportunities, we could also count electronic data bases, books, journals and papers, website applications and basic use of intermediate applications that make it available to students and educators to readily reach the classroom activities. Thanks to such encouraging applications, it is now assumed that internet, by its nature, has made considerable global contributions to distance education service. In that way, it could be considered that distance education applications through internet technologies could be classified in three groups as follows: (1) *Synchronised and nonsynchronised applications of distance education*. Non-synchronised applications refers to a process in which the student determines his/her own improvement pace by accessing learning activities in times he/she wishes and by initially drawing his/her own resolution for the problems he/she faces to and if no solutions, by letting his/her consultant for a rigorous resolution. However, the synchronized application, the student and the instructer take part in this process of learning while the latter plays the consultant role and the students' acts as an active participant in student-centered learning process. (2) *In-line and out-line applications in distance education process*. In educational respect, such an application could be thought to be directly relecent to discrimination and content in classification, varied activities and applications in addition to the maintenance of these steps on the Internet (in-line) or downloading then onto personal computers so as to attend them individually (out-line). (3) *Distance education applications based on the technologies involved and their specifications*. In fact, we could also divide this term into three groups: web-based education, internet-based education and e-learning. In their context, web-based education is related to transmission of varied learning materials in a

web-scanner including materials, CD-ROM or its additional package on other media tools. However, internet-based education is related to the content which is ready for access on a computer. As for e-learning, it is rather related to the computer and the net with synchronized action. Therefore, the computer doesn't need to be the center of the provision of learning and varied activities. However, it is supposed that the computer and nets should have overt relation with learning activities. On the other hand, it shouldn't notice that the Distance Education supported by Internet Technologies play active role; (1) In maintenance of consistent relations between the occupation and the education. (2) In offering education opportunities, all of which are supposed to apply to students' interests and expectations in different places and times. (3) In provision of individual and free opportunities for learning to students. (4) In offering education opportunities for larger masses. (5) In wiping out inequality in education. Seen in this respect, it is certain that distance education applications on internet have rapidly penetrated into higher education. That's way; many universities have turned today to distance education education service in order to meet ever-changing needs of students. In 2000's, various e-learning services such as e-Book, e-Practice, e-Television, e-Exam, e-Audio Book, e-Facilitation, e-Support and e-Course were designed and put into practice. It is anticipated that Distance Education will serve even greater numbers of students in the near future. In this service, the systems used for distance education on the internet is called "*Learning Management Systems*" while the users working through this system is called through different roles such as "*student, educator, lesson opener or system manager*" all od whom invariably benefit from courses' contents, home assigments, evaluation, alive view, chat rooms and message boards in order to achieve the interaction on the internet between student –material and teacher. On the other hand, distance education applications are the most developed forms of today's distance education applications. With the development of web technologies, lecture contents are diversified, flexible education independent of time and place is achieved. Perhaps, that's way; knowledge of students in internet-based distance education process mostly tends to be permanent. When considered that technologic innovations reign today at such a high pace, we would readily estimate that durther innovations are on the way in near future (Özer, 1990; Güven, 2002; Önder, 2003; Yılmaz & Horzum, 2005; Aslan, 2006; Önür, 20.11.2006; Karataş, 2006; Aydın & Biroğul, 2008; Işık & Işık & Güler, 2008; Erturgut, 2008; Karaağaçlı & Erden, 2008; Baturay & Bay, 2009; Demiray & Curabay, 2010; Akdemir, 2011).

3.2. Strategic results of the applications in open & distance education process at state universities

> "The most commonly seen point in the decisions taken by the management is focusing on achieving the right answers then right questions."
>
> *Peter Drucker*

We could define positive strategic results, in five points, resulting from open and distance education applications in state universities (Yılmaz & Horzum, 2005; Erdem, 2006; Elmas &

Doğan, Biroğul & Koç, 2008; Çınar, 2009; Balyer & Gündüz, 2010): (1) *Universities have gradually turned out to be virtual institutions*. Virtual universities, on one hand, benefit from a great many applications in higher education period. They, on the other hand, use varied new concepts such as blended education, unsynchronized distance education, in-line learning, whole–life learning, web–based distance education, mobil learning and virtual classrooms. Thanks to new concept known as "*Non-wall University*" in state universities, the major aim is now to establish a large net in global sense of potential students, teaching elements, employers and graduates. (2) *Distance education by using internet based technologies is available to large masses*. Therefore, distance education has gradually been run on new technologies based on internet. Considered in this respect, it could be assumed that the major aim in distance education is, by using different methods from traditional teaching methods, to meet the ever-increasing global demand for higher education. (3) *In-line training has now been available*. Students could now efficiently benefit from in-line training facilities by which e-learning and distance education service opportunities has inevitably resulted in globalization of education by using virtual universities without needing to leave a city or a country. (4) *The student profile has gradually been internationalized*. Today, thanks to great contributions of open and distance education applications, the student profile in state universities have also gradually been away from nationaland more and more srudent from different countries register their names on-line for training. (5) *Costs are gradually declining*. Because all the services for students are available faster, more efficient and at lower cost, distance education is the cheapest one of all other education systems on condition that there is enough number of students, apart from formal to support the financial investment.

On the other hand, there have undoubtedly several negative points in higher education resulting from state universities' turning to open and distance education (Güven, 2002; Erdem, 2006; Balyer & Gündüz, 2010): (1) *Universities are gradually likely to became a center for certificate*. Upon the increasing importance of university degree and certificates, a fierce competition has nearly become inevitable between universities and the institutions which deliver these certificates, and as a result certain institutions have nearly regarded such certificates of private bodies as sufficient to gain professional career, which has made these private agents considerable competitors of universities. In the meantime, seeking themselves as a commercial body, universities have also taken a counter-action by opening a number of programmes in order to obtain financial resource. Nevertheless, over time, such a trend is likely to create "*universities to be drained*". (2) *Universities could also turn into be instutions that merely deal with "education & training" process*. One of the considerable functions of universities is "education & training", yet they also have some other critical responsibilities such as "*research*" and "*social service*". (3) *The mentality of a university based on "client-market" could turn to be ermanent*. Sub-units of universities or faculties are awarded for their contributions thanks to projects and etc., and so universities are gradually turning into an attraction center as a "*profiting body*". However, they are supposed to be inevitably "*non-profit institutions*". In this respect, they are expected to work for new technologies and knowledge, making contribution to national and universal culture, as well as taking some respects and point of views into consideration such as leading in the society. (4) *Academic*

staff and students could be regarded as only a material in the process. Academic staff is today regarded as a commercial material to attract more students to the university while the students are considered to be an object that could access learening materials through user names or codes, without using interactive methods and social environment which are heavily based on. Considering today's universities exclusive function for society, it could be concluded that academic staff and students are both and element. (5) *Universities have steadily lost their autonomy given as a right*. The university could be observed closely and strictly in academic, financial and administrational terms, even including censor as a means of strict control.

4. Conclusion

> "Things will change over time. Then, you'll either be the one who changes them or someone will invariably change them for you."
>
> *Sergio Zyman*

Undoubtedly, we are experiencing a period of rapid changes, increased interaction, developing technologies and advanced scientific knowledge. In other words, the period we experience today is heavily composed of computer technologies, brain power and qualified man power all of which are inevitably related to global-based speed economy; also know as "*society of knowledge*". The developed society of today is identified as society of knowledge. Therefore, the key words of "*change*" has now turned out "*globalization*" that refers to some concepts such as the spread and development of economic, social and politic affairs among countries, increased activity of capital movement, as well as taking encouragigng steps against ideologic discrimination based on extreme ends, better awareness of different social, cultures, beliefs and expectations and more intensified affairs between countries. On the other hand, according to ones who are of positive opinions of it, globalization inevitably refers to increased cross-border trade, remarkable development in efforts for establishment of democracy and human rights as well as considerable contribution to enhancement of social affluence. However, ones who are opposed to globalization maintains that globalization is a global market in which cross-borders corporotions are closely kept under control and therefore globalization and developments in information technologies as an accelerator of globalization invariably affect almost any field of life and so as to closely observe and benefit from such developments, a form of qualified individual with new attitudes and values are needed. Globalization is the greatest challenge against universities. By this challenge, the developments that mostly affected universities can be said as the technological developments. To speak objectively, recent developments in information technologies also affect intensively a large number of traditional values in universities as in many other fields of education. In this respect, today's higher education institutions are experience a painstaking period of many changes including obting transmission and spread of knowledge. As aresult, universities have gradually become institutions that provide professional knowledge and documents to allow a number of occupation categories. The changes

occurred in last quarter caused change in the structure and function of higher education in the world. Neo-liberalism and international educational exchanges are some examples for these changes. Rapid developments in computational technology have created opportunities for new implementations in both face to face education and on-line learning as one from of distance education. For this purpose, developments in knowledge and communication technologies have increasingly gained ground in modern universities "*open*" and "*distane*" education service, both of which are based on the internet. "*Distance education applications*" through the internet make up for a new economic learning dynamic based on rigorous education & training by which it is available to students to benefit virtually from higher education programmes in any other country without needing to live abroad, which is called "*programme mobility*". However, it also seems likely that spreading technologies in universities to a large extend could also resultin neglecting their social functions and studies or regarding such social responsibilities as inferior anyway. Furthermore , due to market-inspired reforms, higher education service is not only offered by state universities, but it is also available in profit foundation universities or corporation universities (Güven, 2002; Balay, 2004; Yılmaz & Horzum, 2005; Aktan, 2007; Dağlı, 2007; Şentürk, 2008; Odabaşı & Fırat & İzmirli & Çankaya & Mısırlı, 2010; Çetiner & Türkmen & Bolat, 20.11.2011)

Undoubtedly, globalization has tended to turn state universities into customer-centered companies that are driven in a bureaucratic way whereby these universities are gradually forced to take more enterprising steps in any field. In other words, it seems now inevitable that state universities as higher education institutions should keep pace with the innovations in national and international educations as well as social, politic and technologic changes. Of all such innovations, universities are particularly supposed to manage and lead the innovation process in education & training, science and technology fields. In this sense, universities are required to drive "*open*" and "*distance*" education programmes, and more importantly, to be a "*pioneer*" in such applications. For state universities to drive changes in "*open*" and "*distance*" education programmes and to introduce the strides they are supposed to, universities must, by seeing the future from today, take precautions, make a number of realistic plans and then put them into practice in a short while. Otherwise, it seems inevitable that state universities will become an "*ordinary body*" in education service.

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5. References

Aktan, C. C. (2007) Chance in higher education: Global trends and new paradigms, *Higher education in change age, (*Editor: Coşkun C. Aktan), pp. 1-43, Yaşar University Publication, ISBN 978-975-6339-10-7, İzmir, Turkey

Akdemir, Ö. (2011) Distance education in Turkish Higher Education, *Journal of Higher Education and Science*, Vol.1, No.2, pp. 69-71, ISSN 2146-5959

Aktay, Y. (2002). Global possibilities in education-opportunity inequality and emancipatory opportunities in globalizing world, *Educational Sciences: Theory & Practice*, Vol.2, No.1, pp. 7–22, ISSN 1303-0485

Ansoff, H. I. & Declerck, R. P. & Hayes, R. L. (1976) *From strategic planning to strategic management*, A-Wiley –Interscience Publication, ISBN 0-471-02223-9, New York, United State America

Apple, M. W. (2002). Global dangers: Comparing neo-liberal projects and inequality in education, (Translation: M. Hilmi Baş), *Educational Sciences: Theory & Practice*, Vol.2, No.1, pp. 23–46, ISSN 1303-0485

Arap, S. K. (2010) Turkey meets its new universities: New universities in Turkey and the rationale behind the their foundation, *Ankara University Journal of SBF,* Vol.65, No.1, pp. 1-30, ISSN 1309-1034

Aslan, Ö. (2006) New way of learning: E-Learning, *Fırat University Journal of Social Science,* Vol. 16, No.2, pp. 121-131, ISBN 975-97447-0-8

Arslanoğlu, R. A. Globalization and university, *Uludağ University Journal of İİBF,* Vol.21, No.1, pp. 1-12, ISSN: 1301-3386

Aydeniz, N. (2002) Decision making in industrial corporations and the relation between the controls function and production costs, *Journal of Standart*, Vol. 41, No. 487, p. 74, ISSN 1300-8366

Aydın, C. Ç. & Biroğul, S. (2008) Open source learning management systems in e-learning and moodle, *International Journal of Informatics Technologies,* Vol.1, No.2, pp. 31-36, ISBN 978-1-62100-621-3

Balay, R. (2004) Globalization, information society and education, *Ankara University, Journal of Faculty of Educational Sciences,* Vol. 37, No. 2, pp. 61-82, ISBN 978-605-5885-95-3

Balkar, B. & Özgan, H. (2010) Teachers' opinions on the effects of globalization on the education process in primary education, *Mehmet Akif Ersoy University Journal of Education Faculty*, Vol.10, No.19, pp. 1-22, ISSN 1301-3386

Balyer, A. & Güzdüz, Y. (2010) Development, academic process and reality of virtual university in some countries and Turkey, *Abant İzzet Baysal University Journal of Education Faculty*, Vol.10, No.2, pp. 27-39, ISSN: 1303-0493

Baturay, M. & Bay, Ö. F. (2009) Demographic characteristics of the students that chose distance education, *Dicle University Journal of Ziya Gökalp Education Faculty,* Vol. 13, pp. 17-26, ISSN 1305-0060

Bayram, F. & İbili, E. & Hakkari, F. & Kantar, M. & Doğan, M. Use of Scorm-adjusted modular learning administration systems in higher education programmes, Academic Information'09, XI. Booklet of Academic Information Conference, 11-13 February 2009, Harran University, Şanlıurfa, 20.11.2011, Available from: ab.org.tr/ab09/kitap/ bayram_ibili_AB09.pdf

Bryson, J. M. (1995). *Strategic Planning for Public and Nonprofit Organizatıons (A Guide to Strengthening and Sustaining Organizational Achievement)*, Jossey –Bass Publishers, Revised Edition, ISBN 0-7879-0141-5, San Francisco, United State America

Bursalıoğlu, Z (1991) *Theory and practice in education management,* Pegem Publication, No.1, ISBN 975-8792-05-9, Ankara, Turkey

Ceyhan, E. M. & Summak, S. (1999). Boiled frog and change management, *Theory And Practice in Education Management,* Vol.5, No. 20, pp. 521-544, ISSN 1300-4832

Çalık, T. & Sezgin, F. (2005) Globalization, information society and education, *Kastamonu Education Journal,* Vol.13, No.1, pp. 55-66, ISSN 1300-8811

Çeken, H. & Ökten, Ş. & Ateşoğlu, Ş. (2008) Globalization and poverty as a process of deepening the inequality, *Cumhuriyet University Journal of Economics and Administrative Scıences*, Vol.9, No.2, pp. 79-95, ISSN 1303-1279

Çelebioğlu, F. (1988). *Organizational change in terms of behaviour***,** İstanbul University, Publishing No: 3008, ISBN 975-404-039-7, İstanbul

Çetin, Ö. & Çakıroğlu, M. & Bayılmış, C. & Ekiz, H. (2004) Vitality of education for technologic development and the meaning of the internet-supported training in education system, *The Turkish Online Journal of Educational Technology – TOJET*, Vol.3, No.3, pp. 144-147, ISSN 1303-6521

Çetiner, B. G. & Türkmen, N. & Borat, O. Paradigm shift in higher education, 20.11.2011, Available from: www.iticu.edu.tr/Hayat-Boyu-Egitim.../GCetNTurOBor(TR).pdf

Çınar, İ. (2009) Globalization, Education and Future, *Journal of Theoretical Educational Science*, Vol.2, No.1, pp. 14-30, ISSN: 1308-1659

Çoban, A. (2002) To be against globalization: Opportunities and limitations, *Journal of Praksis,* No.7, pp. 117-164, ISBN: 9771302861002

Çukadar, S. & Çelik, S. (2003) Web-based distance learning and university libraries, *Journal of Doğuş University*, Vol.4, No.1, pp. 31-42, ISSN 1308-6979

Dağlı, A. (2007) Globalization towards Turkish Education System, *Dicle University Journal of Ziya Gökalp Education Faculty*, No. 9, pp. 1-13, ISSN 1305-0060

Demiray, E. & Curabay, Ş. (2010) Organizational Commitment of Anadolu University Open Education Faculty Students', *Selçuk University Journal of Social Sciences Institute,* Vol.23, pp. 39-50, ISSN 1302-1796

Didou-Aupetit, S. (2002). Globalization, NAFTA and Higher Education System in Mexico: Issues, Challenges and Reforms, (Translations: Haşim Koç, Gülçin Tunalı-Koç), *Educational Sciences: Theory & Practice*, Vol.2, No.1, pp. 81–92, ISSN 1303-0485

DPT (1995) *Globalization in the world and regional integration (sub-commission report),* Publishing No: 2375, ISBN 975 – 19 – 0984 – 8, Ankara, Turkey

DPT (2000) *The eighth 5. year development plan the report by specialists commission*, Publishing No: 2544, ISBN 975 -19 -2574 – 6, Ankara, Turkey

Elmas, Ç. & Doğan, N. & Biroğul, S. & Koç, M. S. (2008) Distance Education Application of a Model Lesson with the Moodle Learning Management System, *Journal of Information Technology,* Vol.1, No.2, pp. 53-62, ISBN 978-1-62100-621-3

Erdem, A. R. (2002) The perceptions of important inside and outside shareholders (interest groups) towards current and future of Pamukkale University (unpublished doctoral thesis), Dokuz Eylül University, Institute of Educational Sciences, İzmir, Turkey

Erdem, A. R. (2006) Change of higher education in the world, *Selçuk University Journal of Social Sciences Institute,* No.15, pp. 299–314, ISSN 1302-1796

Eren, E. (2008) *Management and organization,* 8. Print, Beta Publication, ISBN: 9789752957602, İstanbul, Turkey

Erol, N. (2010) Re-thinking the organizations in the process of globalization, *Journal of Gazi Academic Overview,* Vol.4, No.7, pp. 79-89, ISSN 1307-9778

Ersoy, A. F. & Acartürk, C. International higher education and and Turkey's status: Advice of university ing-formation processes, 12.01.2012, Available from: ab.org.tr/ab06/bildiri/166.pdf

Erturgut, R. (2008) Organizational, social, pedagogic components of the internet basic distance education, *Journal of Information Technology,* Vol.1, No.2, pp. 79-85, ISBN 978-1-62100-621-3

Gates, B. (2000) *Performance at thinking speed with digital nerve system*, Translation: Ali Cevat Akkoyunlu, Doğan Publication A. Ş., ISBN: 975-6817-33-X, İstanbul, Turkey

Gibson, R. (1997) *Rethinking the Future: Business Management, Competition, Control, Leadership, Markets and the World,* Translation: Sinem Gül, Books of Sabah, ISBN 975-579-014-4, İstanbul, Turkey

Giddens, A. (1994) *The results of modernity,* Translation: Ersin Kuşdil, Ayrıntı Publication, ISBN 975-539-068-5, İstanbul, Turkey

Giddens, A. (2000) *The third way: the resurrection of Social democracy,* Translation: Mehmet Özay, Birey Publication, ISBN 975-8257-56-0, İstanbul, Turkey

Güler, A. (1994). *University reforms in Turkey,* Adım Publication, No: 34, Ankara, Turkey

Günay, D. (2007) Twenty-first century university, *Higher education in change age, (*Editor: Coşkun C. Aktan), pp. 77-88, Yaşar University Publication, ISBN 978-975-6339-10-7, İzmir, Turkey

Gündüz, M. (2002) The attack of "so-called" globalized world over social-state, *Eurasian Journal of Educational Research,* Vol.2, No.6, pp. 34–43, ISSN 1302-597X

Gürak, H. (2003) Where does globalization take us?, *Journal of Productivity*, No.2, ISSN 1013-1388, 02.03.2011, Available from: http://www.elelebizbize.com/e-kutuphane/hasangurak/Kuresellesme_Nereye.pdf

Gürüz, K. (Koordinatör) & Şuhubi, E. & Şengör, C. & Türker, K. & Yurtsever, E. (1994). *Higher education, science and technology in Turkey and the world,* Turkish Industrialists' and Businessmen's Association (TÜSİAD), İstanbul, Turkey

Gürüz, K. (2001) *Higher education in Turkey and the world,* ÖSYM Publication, No.4, Ankara, Turkey

Güven, İ. (2002) Structural transitions in higher education under the light of recent developments, Ankara University, Journal of Faculty of Education Sciences, Vol.35, No.1-2, pp.93-110, ISSN 1304-7639

Hakan, A. (1998) Open education in the solution of educational problems. *Innovations in education sciences,* Editor: Ayhan Hakan, pp, 57-69, Anadolu University Publication, No. 1016, 1. print, ISBN 975-492-765-0, Eskişehir, Turkey

Harvey, D. (1997) *Status of postmodernism,* Translation: Sungur Savran, Metis Publication, ISBN 9789753421621, İstanbul, Turkey

ILO, Globalization, 20.11.2006, Available from: http://www.itcilo.it/english/actrav/telearn/global/ilo/globe/new_page.htm

Işık, İ. & Işık, A. H. & Güler, İ. (2008) Using the 3D web technologies in distance education, *Journal of Information Technology,* Vol.1, No.2, pp. 75-78, ISBN 978-1-62100-621-3

Karaağaçlı, M. & Erden, O. (2008) The design of the nine-level learning situation in the distance education supported with ınternet Technologies, *Journal of Information Technology,* Vol.1, No.2, pp. 21-29, ISBN 978-1-62100-621-3

Karataş, S. (2006) Comparisons of ınternet-based and face-to-face learning systems based on "equivalency of experiences" according to students' academic achievements, *Joournal of Gazi Education Faculty,* Vol.26, No.3, pp. 113-132, ISSN-1301-9058

Karlsen, G. E. (2002) Educational governance, globalization and democracy, *Educational Sciences: Theory & Practice*, Vol.2, No.1, pp. 93–104, ISSN 1303-0485

Kellner, D. (2002). New technologies/new literacies: Reconstructing education for the new millennium, *(*Translation: Ayşe Taşkent), *Educational Sciences: Theory & Practice*, Vol.2, No.1, pp. 105–132, ISSN 1303-0485

Kızılçelik, S. (2002) Globalization as the diaspora of capitalism, *Eurasian Journal of Educational Research,* Vol.2, No.6, pp. 12–33, ISSN 1302-597X

Koçel, T. (1995), *Business manager*, Beta Printing A.S., ISBN 975-486-304-0 İstanbul, Turkey

Korkut, H. (2001). *Higher education under interrogation,* Nobel Publication, Publishing No: 237, ISBN 975-591-216-9, Ankara

Kwiek, M. (2002). Globalization as a new paradigm for rethinking higher education? Implications for the future, *(*Translation: Emrah Akbaş), *Educational Sciences: Theory & Practice,* Vol.2, No.1, pp. 132–154, ISSN 1303-0485

Lee, M. N. N. (2002). Global trends in education *(*Translation: M. Hilmi Baş), *Educational Sciences: Theory & Practice,* Vol.2, No.1, pp. 155–168, ISSN 1303-0485

Lucey, T. (1991) *Management Information System*, Guernsey Press Co. Ltd., ISBN 9781870941808 London, United Kingdom

McBurnie, G. (2002) Globalization, GATS and transnational education, (Translations: Haşim Koç, Gülçin Tunalı-Koç), *Educational Sciences: Theory & Practice*, Vol.2, No.1, pp. 169–190, ISSN 1303-0485

Milli, E. Globalization and education, 20.11.2006, Available from: http://egitisim.inonu.edu.tr/EMilli_kuresellesme.htm

Mintzberg, H. (1994) *The rise and fall of strategic planning*, The Free Press, ISBN 0-02-921605-2, New York, United State America

Mutlu, M. E. & Öztürk, M. C. & Özöğüt, Ö. & Yılmaz, R. & Çetinöz, R. E-Learning in open education, 2-5 September 2003, 20. National Informatics Congress, 11.09.2006, Available from: http://www.bilgi.aof.edu.tr/yayinlar/2003/Acikogretimde%20e-Ogrenme.pdf

Odabaşı, H. F. & Fırat, M. & İzmirli, S. & Çankaya, S. & Mısırlık, Z. A. (2010) Being academician in globalizing world, *Anadolu University Journal of Social Sciences,* Vol.10, No.3, pp. 127-142, ISBN 978-975-06-0446-1

Önder, H. (2003) The use of computer on distance education and expert systems, *The Turkish Online Journal of Educational Technology – TOJET*, Vol.2, No.3, pp. 142-146, ISSN: 1303-6521

Önür, N. Structural obstacles, in periof of being an information society, to distance education facilitates, Symposium Open and Distance Education, 23-25 May 2002,

Anadolu University, Eskişehir, 20.11.2006, Available from: http://aof20.anadolu.edu.tr/bildiriler/Nimet_Onur.doc

Özdemir, S. (1996). *Organizational innovation in education,* Pegem Publication, No: 27, ISBN 9789756802212, Ankara, Turkey

Özer, B. (1990). The universal nature of distance education system, *Journal of Kurgu,* No.8, pp. 569-594, ISSN 0971-2690

Rehber, E. (2007) Changing higher education and understanding of quality in the world, *Higher education in change age*, Editor: Can Aktan, pp. 211-243, Yaşar University Publication, 1. print, ISBN 978-975-6339-10-7, İzmir, Turkey

Robertson, R. (1999) *Globalization: Social theory and global culture,* Translation: Ümit Hüsrev Yolsal, Bilim ve Sanat Publication, ISBN 2114023754, Ankara, Turkey

Sağlam, M. (1979). *Organizational change*, TODAİE Publication, No: 185, Ankara, Turkey

Sağlık, M. & Öztürk, S. (2001) Television as an educational technology: Using television at open education faculty, Anadolu University, *Turkish Online Journal of Distance Education-TOJDE*, Vo.2, No.1, pp. 74-82, ISSN 1302-6488

Scott, P. (2002). Globalization and the university: Challenge for the twenty-first century (Translation: Seda Çiftçi), *Educational Sciences: Theory & Practice*, Vol.2, No.1, pp. 191–208, ISSN 1303-0485

Sönmez, V. (2002) Philosophical foundations of globalization, *Eurasian Journal of Educational Research,* Vol.2, No.6, pp. 1–11, ISSN 1302-597X

Steiner, G. G. (1997) *Strategic planning (What every manager must know),* Simon & Schuster Inc., ISBN 0-684-83245-3, New York, United State America

Şen, B. (2008) Globalization: Meanings and discourses, *Süleyman Demirel University Journal of Faculty of Arts &-Science Social Sciences,* No.18, pp. 135-150, ISSN 1300-9435

Şentürk, Ü. (2008) Place of education in information society, *Journal of Turkish Educational Sciences,* Vol.6, No.3, pp. 487-506, ISBN 978-1-62100-621-3

Şimşek, H. (1997). *War of paradigms at the very beginning of the 21st century,* Sistem Publication, Research and Review Books, No.129, ISBN 9753220405, İstanbul, Turkey

Tabancalı, E. (2000). Globalization change, *Contemporary approaches in Management (Applications and problems),* (Editors: Cevat Elma, Kamile Demir), pp. 313-342, Anı Publication, ISBN 975-6956-23-2, Ankara, Turkey

TDK (1992). *Turkish dictionary,* Vol.2, İstanbul, Turkey

Tural, N. K. (2002) Effects on globalization on university: Examples from different countries, *Eurasian Journal of Educational Research*, No.6, pp. 99–120, ISSN 1302-597X

Tural, N. K. (2004) *Globalization and universities,* Kök Publication, Ankara, Turkey, ISSN975-499-269-X

Yang, R. & Vidovich, L. (2002) Positioning universities in a context of globalisation (Translation: Murtaza Bedir), *Educational Sciences: Theory & Practice,* Vol.2, No.1, pp. 209–222, ISSN 1303-0485

Murtaza Bedir), *Educational Sciences: Theory & Practice*, Vol.2, No.1, pp. 209–222, ISSN 1303-0485

Yeniçeri, Ö. (2002). *Organizational change methods (Problems, methods, techniques, strategies and solutions),* Nobel Publication, Publishing No.337, ISBN 9789755913162, Ankara, Turkey

Yılmaz, K. & Horzum, B. (2005) Globalization, information technologies and university, *İnönü University Journal of Education Faculty*, Vol.6, No.10, pp. 103-121, ISSN 1300-2899

YÖK (2007) *Turkey's higher education strategy*, Board of Higher Education Publications, No.1, ISBN: 978-975-7912-32-3, Ankara, Turkey

Ulukan, C. & Baraz, B. (2001) Evaluation of universities that offer internet-based (online) education through the analysis of web-sites, *Afyon Kocatepe University Journal of Social Sciences*, Vol. 3, No.1, pp. 197-211, ISSN: 1302-1265

Zengingönül, O. (2005) What is globalization? Can we escape? Can we use?, *Journal of Siyasa*, Vol.1, No.1, pp. 85-106, ISSN 1306-0651

Chapter 2

Open and Distance Learning: Achievements and Challenges in a Developing Sub-Educational Sector in Africa

Idowu Biao

Additional information is available at the end of the chapter

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1. Introduction

Africa became independent during the first decade of the second half of the 20th century as most countries making it up established their own governments and opened diplomatic missions in foreign lands for the first time, in the 1960s. With independence arose fundamental preoccupations and primary concerns; these preoccupations and concerns were those addressing issues of the development of the newly independent nations and the search for appropriate instruments that were to be used in bringing about this development.

Aside the UNESCO generated series of workshops of the early 1960s, encouraging investment in education (Thompson, 1981), a number of pertinent literatures made public in the 1960s did much to reinforce the belief in the reliability and efficiency of education as potential instrument for the quick development of Africa; these literatures include the writings of Blaug (1966) and Anderson (1966) which threw up the acquisition of literacy as a process to be embarked on, by all that seek development and literacy skill as a veritable tool for social development and societal advancement; specifically, these literatures submitted that any human society that may attain at least 40% literacy rate, would have succeeded in raising the productivity of new literates living within the society; they also posited that, in addition to raising the productivity of new literates, this feat would have equally raised the productivity of those working in association with the new literates as a consequence of the spillover benefits of literacy; additionally, the acquisition of 40% literacy rate by a society has been said to be capable of bringing about the expediting of the flow of general knowledge (relating to best practices in health, nutrition and information seeking) among members of society.

As a result of these factors, the new nations of Africa opted to expand both the educational structures and personnel inherited from colonisation with the view to ushering in, development similar to that enjoyed by their respective metropoles. Consequently, between 1960 and 1983, the number of primary schools quadrupled and the number of primary school pupils quintupled; the number of secondary schools tripled and the number of secondary school teachers rose two folds; teacher training schools multiplied four folds and the number of teachers teaching in them rose three folds; the number of universities doubled itself and the number of lecturers equally rose significantly in Sub-Saharan Africa (World Bank, 1988:12).

In addition to these major and ground breaking preparations for development, additional initiatives aimed at increasing literacy, numeracy and livelihood activities in Africa were initiated throughout the continent during the 1960s through to the 1980s; for example, Tanzania embraced the concept of "Ujamaa" in 1961, the details of which were contained in a document released in 1967 that has come to be known as the "Arusha Declaration"; among other policies, the Ujamaa advanced the implementation of free and compulsory education, one objective of which was the raising of the national average of literacy rate; consequently, primary school enrolment was raised from 25% (with 16% females) in 1960 to 72% (with 85% females) in 1985; additionally, the adult literacy rose from 17% in 1960 to 63% by 1975 (Wikipedia, 2011).

In 1972, Benin introduced the concept of "Ecole Nouvelle" (New School) and in 1974, it established the "Direction de l'Alphabetisation du Benin" (Directorate of Literacy Education of Benin); one of the many objectives of these two institutions was the raising of literacy rate in both national and French languages; as a result of this policy, literacy rate in the country rose from about 50 per cent in 1960 to about 85 per cent in 2008 (Nardulli, Peyton and Bajjalieh, 2010; Biao, 1995; Direction Nationale de Statistique, 1992); all these efforts came to add to the fact that Benin has since 1960, been posting the highest yearly school enrolment in Francophone Africa (Hough, 1989) and to the fact that Benin has traditionally supplied Francophone Africa with not only teachers and lecturers, but also high caliber international functionaries (Biao, 1995).

Senegal also introduced in 1980 its own concept of "Ecole Nouvelle" whereby primary school education is linked to the needs of the community while at the same time, serving as instrument for the amelioration of literacy rate across the community (Adick, 1998) .

In 1974, the Government of Lesotho established the Lesotho Distance Teaching Centre (LDTC) with the view to equipping adults and youths with literacy, numeracy and income generation skills; by 2007, more than 200,000 learners have benefitted from the programmes offered by the centre (Garg and Lephoto, 2009). In addition, a free education scheme was introduced in the country by 2000 (Avenstrup, 2004); this scheme has now produced about a quarter of a million primary school graduates.

Kenya, Uganda and Malawi equally launched their Free Primary Education projects in 2003, 1997 and 1994 respectively with resounding success and with the view to increasing national literacy rate averages and reducing poverty (Avenstrup, 2004).

In addition to increasing the national literacy rate, Nigeria's Universal Primary Education that was launched in 1975 did much to reconcile two perceptions concerning literacy and development that prevailed prior to this period in the country; for many years, the view was held in Northern Nigeria that the promotion of adult education programmes with minimal promotion of formal youth schooling was adequate for any social development. On the other hand, much of Southern Nigeria expended much effort in advancing youth formal schooling to the detriment of adult education for a long time.

While the Federal Government of Nigeria deployed enormous human, material and financial resources towards the establishment of thousands of formal primary schools, recruitment of teachers and distribution of learning resources, it also encouraged its constituent parts (the States) to advance the cause of adult education within their areas of jurisdiction. This strategy culminated into the establishment of the first Agency for Mass Education in Kano State in 1985 and in the establishment of the National Commission for Literacy, Adult and Mass Education in 1991 (NMEC, 2004; FGN, 1974) . The pursuit of literacy education having been prosecuted from many fronts, impressive results were yielded as illiteracy was seriously dented after a while.

As it is to be expected, all these initiatives have produced over time, huge populations of literate and schooled persons; in the words of World Bank,

> *Primary school enrollments increased the most in absolute terms, growing from approximately 11.9 million pupils in 1960 to 51.3 million pupils in 1983. The gross primary school enrollment ratio rose from 36 per cent to 75 per cent over this period (World Bank, 1988:12).*

As mentioned earlier, teacher education enrolment equally grew exponentially and so did enrolment in secondary and tertiary levels of education (World Bank, 1988). However, an analysis of the rates of expansion across levels of education, suggests that the higher the level of education, the lower was the rate of expansion recorded during this period.

This chapter discusses the impact of a pattern of educational expansion such as this, on the development of open and distance learning in Sub-Saharan Africa. Additionally, the chapter discusses the findings relating to the performance of a novel and high profile open and distance learning programme currently running in Africa with the view to drawing valuable lessons for the future of ODL on the continent.

2. Review of the literature

In addition to the historical performance of formal education, a number of other social and economic factors account for the growth of open and distance learning in Africa. A clarification of the concept "Open and Distance Learning" shall here precede the discussion of those numerous factors that fuel the growth of this budding sub-educational system.

3. Conceptual issues in open and distance learning

Open and distance learning was first known as "Distance Learning" before it became "Open and Distance Learning"; indeed, the concept "Distance Learning" emerged from the idea of

"Distance Education" which came from "Correspondence Education" which itself arose from "Non-formal Education".

Tracing our steps back to the basics therefore, we recollect that the emergence of open and distance learning was motivated by inability of numerous qualified candidates to access tertiary education in regular or formal tertiary education institutions; the search for educational opportunities by those candidates locked out of formal education institutions was eventually met with a positive response within the non-formal education environment.

3.1. Non-formal education

Non-formal education is a planned educational activity that takes place outside the formal school system; while its outcome may lead to results and products similar to those produced by the formal school system, the environment within which it takes place and its processes are different from those obtained within the formal school system. It is a system of education within which the rigid safeguards (teacher or institution-controlled time-tabling, student discipline, teacher-controlled curriculum, etc.) of formal education are either made flexible or eliminated.

For example, learning meeting periods are jointly arrived at through discussions involving learners and facilitators; also the motivation techniques (giving of gifts, promises of future rewards, etc.) that would usually work among formal education students would not ordinarily be effective within non-formal education environment as each non-formal education learner is driven by his own peculiar intrinsic motivation.

Having reviewed the submissions of a number of authors, including Merriam and Caffarella (1999), Merriam and Brokett (1997), Watkins and Wright (1991) and Combs (1972), Gibson (2008) concludes that non-formal education is planned education that takes place outside the formal school and which may or may not lead to credit earning.

Although, not all non-formal education programmes, do qualify as distance learning programme, yet, it was within an environment such as the one afore described, that the first distance education programme was conceived; that first distance education programme was known as "Correspondence Education".

3.2. Correspondence education

The humble beginning of correspondence education must be traced back to 1840 when Isaac Pitman began to teach shorthand by post (Morris, 2011; Rowntree, 1992). This was the first ever recorded successful national attempt at providing education at a distance anywhere in the world; for many years, Pitman used the post to reach his many learners who equally got back to him through the same medium.

After this initial experience the practice of correspondence education spread like wild fire throughout the world and very soon, all kinds of subjects and topics were taught through correspondence education.

Correspondence education is a paper and written document based process of passing information between a facilitator and a learner or group of learners with the view to facilitating learning.

> *whereas correspondence education relies on paper and the written or print materials and it employs the post or surface transportation as its means of communication, distance education, its successor, employs in addition to print and surface transportation, many more diverse and modern means of communication (Morris 2011; Jeffries 2011).*

3.3. Distance education

Distance education is a process whereby an individual or institution packages information in a learnable way with the view to helping another individual or group of individuals to learn at a distance. In line with the general aim of education, distance education employs all available media, methods and techniques to enable learners access needed information at a distance; distance education equally assists the learner to apply whatever may have been learnt.

One major characteristic of distance education is that it employs a variety of media (print, electronic and virtual) in its quest to help the learner learn as much as possible.

Distance Education is "a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both" (Honeyman and Miller, 1993:68)

3.4. Distance learning

Distance learning on the other hand, is a process of education which emphasises learning; it is an educational enterprise during which, a facilitator of learning who is usually separated from the learner by spatial or mental distance, gathers, collates and presents information in a learnable form to one or a group of learners who have accepted the responsibility to learn.

While in distance education, the facilitator does the most that it could to help learners learn, distance learning assumes that the responsibility to learn is the learner's; and this responsibility includes the choice and decision to enroll on a programme, the choice of media through which to learn and most importantly what to learn and how to learn it.

While most psychologists would submit that learning means acquisition of information and knowledge that lead to change in behaviour (and this is the aim of education and the objective of distance education), distance learning leaves room for the learner to impute to the information and material presented, his own understanding that may be different from the understanding the facilitator had intended; additionally, the learner is at liberty to use his understanding and the information presented in any constructive way which suits his own will, circumstances and environment without recourse to the facilitator or institution that originated the learning material.

In this regard, distance learning operates within the strictest principles of distance education but with the largest tolerance for interpretations and application of learning outcomes; this is transformative learning; distance learning therefore more than distance education promotes transformative learning.

Arseneault in her 1998 study cited in Cranton (2000:190) suggests that an individual may embark on transformative learning through a process of "disorientation, self-examination, critical assessment, exploration of options, engaging in discourse and planning a course of action". In her own postulation, Gibson (2008:270) proposes "problem-posing education, critical reflection, dialogue, contextualisation and politicising of experiences and the taking of action" as the path to transformative learning. She then concludes that transformative learning may be stimulated at a distance through,

> *educational materials regardless of medium of delivery, be it print, radio, audiocassettes, videotapes or television, [that] embrace Holmberg's guided didactic conversation and through this "conversation" pose questions, guide critical reflection, in the true sense of the word. Furthermore, the learner can be also guided toward reflections on and in the context in which she/he lives and works--the context that may be oppressive, stifling individual and social growth (Gibson, 2008: 271).*

3.5. Open and distance learning

Distance learning needs not be open at all (Rowntree, 1992:30). This suggests that there exists a difference between "Open Learning" and "Distance Learning"; for many decades, the term "Distance Learning" has been used to describe learning organised, dispensed and acquired from a distance; the prefix "Open" became attached to Distance Learning towards the end of the 20th century as a result of three significant developments, namely, criticisms against the formal school system, GATT (General Agreement on Tariffs and Trade) and Globalisation.

A number of criticisms have been leveled against the formal school system; first it is remarked that, apart from being costly to erect and maintain, the formal school system is not elastic and pliant enough to accommodate as many as would need education; additionally, it records a lot of wastage through a high percentage of failure of its products at private and public examinations (Garg and Lepotho, 2009; Biao, 1992; Combs, 1985); second, although the General Agreement on Tariffs and Trade (GATT) was established in 1947, to regulate international interaction as it concerns specific issues and items, it was in 1994 that it was agreed that education should become an international saleable commodity; this agreement had profound positive effect on the development of Open and Distance Learning (Preece and Biao, 2011); third, the phenomenon of globalisation which suddenly turned the world into a global village, did much to encourage educational interaction among societies that hitherto would not have dreamt of educational collaboration as a result of the great geographical distance separating them.

As a result of these major social developments therefore, learning opportunities opened up to many inhabitants of the earth like it never did before and irrespective of their

geographical location. The concept of open learning then entered the educational diction and the prefix "Open" was added to "Distance Learning" to signify that apart from being learning managed from a distance, it is equally "Open Learning" wherein "Open Learning" is understood to be,

> *..arrangements to enable people to learn at the time, place and space which satisfy their circumstances and requirements. The emphasis is on opening up opportunities by overcoming barriers that result from geographical isolation, personal work commitments or conventional course structures which have often prevented people from gaining access to the training they need (Rowntree, 1992).*

And to be:

> *..a wide range of learning opportunities that both aim to assist learners in gaining access to knowledge and skills they would otherwise be denied and to give learners the optimum degree of control over their own learning (Dixon, 1987)*

3.6. Hiccups in the development of formal education and the growth of Open and Distance Learning in Africa

In historical terms, we must start off with the view that the concept and philosophy of distance education are not alien to the African. As suggested by Kabwasa and Kaunda (1973), the talking drum has always represented both the medium and African consciousness of distance education; through vast plains, across a great many rivers and lagoons and across many hills and mountains, the talking drum has been used to convey messages and information of both simple and immeasurable value; the literate in the language of the talking drum has usually learnt his or her lesson and has become wiser for it.

Kabwasa and Kaunda (1973) confirmed this submission when they asked their pointed question and answered same thus:

> *Is long-distance transmission of knowledge a new phenomenon in Africa? Certainly not. For long before radio or television were introduced in the continent during the colonial era, the 'homo Africanus' relied on his instrument par excellence-the drum- in order to communicate through distant space with his fellow man……. In a way, therefore, the 'talking drum' was a precursor of the modern correspondence education in so far as it linked the distant learner to his teacher or knowledge-holder (Kabwasa and Kaunda, 1973:3)*

However, if this introduction were accepted as an appropriate historical interjection, it is to be recollected at this juncture, that the focus of the current write-up is modern correspondence and distance education and not ancient concepts of distance education.

Consequently, the story of African open and distance learning must be discussed here, with two eras in mind, namely, the pre-independence era and the post-independence era. The pre-independence era refers to the colonial period and it is here situated between 1884, when Europe began its meetings that eventually culminated in the partitioning and sharing

of Africa (Robiquet, 1897; Halsall, 1998) as a cake would have been shared, and 1960, the beginning of massive decolonisation of Africa.

Two landmarks were recorded during the pre-independence era and these include the establishment on African soil of clearing houses for European Correspondence Colleges and the establishment of the University of South Africa (UNISA) as the first African Distance Education institution in 1946. The post-independence era, after recording a major achievement soon after independence, produced rather later, towards the end of the 20th century, a number of weak ODL structures which nevertheless are gradually strengthening their roots.

3.6.1. Open and Distance Learning during the pre-independence era

During the colonial period, a few Africans enrolled as learners with overseas correspondence colleges; through most of the colonial period these learners received their course packages and returned assignments and correspondences overseas, through the post office. However, at the approach of independence, a number of these overseas correspondence colleges began to establish clearing houses in African countries with the view to both reducing the cost of postal correspondence to learners and accessing a larger market of correspondence education clients at independence.

Alongside this humble beginning of open and distance learning in Africa, came in 1946, the establishment of the University of South Africa (UNISA) as the first and foremost Open and Distance Learning institution in Africa (Wikipedia, 2011). Initially, UNISA combined the promotion of its own courses with those of some overseas correspondence colleges (Wikipedia, 2011); in other words, while it was possible to enroll for and obtain UNISA degrees and diplomas, opportunities were equally given to candidates to obtain degrees and diplomas of a few overseas correspondence colleges through UNISA.

This phenomenon carries both a historical connotation and practical significance; UNISA itself started in 1873, not only as mother institution to most other South African universities but as a clearing house for overseas universities such as Oxford and Cambridge universities (Wikipedia, 2011).

> *Founded in 1873 as the University of the Cape of Good Hope, the University of South Africa spent most of its early history as an examining agency for Oxford and Cambridge universities and as an incubator from which most other universities in South Africa are descended. In 1946, it was given a new role as a distance education university and today it offers certificate, diploma and degree courses up to doctoral level (Wikipedia, 2011).*

As time went on however, the new ODL institution grew in autonomy and it launched itself into the African open and distance learning orbit with all the sophistication and resilience it could muster to claim the first position in a developing sub-educational sector of Africa.

Today, UNISA caters for about 300,000 learners spread throughout the world with a personnel strength of 4,000 academic and administrative staff. The certificates delivered by

the university enjoy international recognition and the university runs an open learning programme in addition to distance education as students who do not possess a university entrance matric can register for the University of South Africa's access programme. By July 2011, University of South Africa was ranked 9th out of 100 African universities and 1221st out of 10,000 universities in the world (Wikipedia, 2011; Webometrics, 2011).

Clearly, the University of South Africa rules over the African open and distance learning space. However, while South Africa remains to date the unequalled leader in the field of open and distance learning in Africa, the regions in the east, west and centre of Sub-Saharan Africa also have their own pale ODL stories of success to tell.

3.6.2. Open and Distance Learning during the post-independence era

A stroke of economic meltdown hit the world in the 1980s which scuttled at least temporarily, the ambitious project of developing enviable formal school systems in various African countries (World Bank, 1988). As a result of the slowing down in impetus of formal education growth, a system of adult remedial education began to develop in major cities of African nations at about the same time (Mpofu and Amin, 2004; Biao, 1992); this system of education is made up of learning meetings organised in the evenings and weekends that aim at helping learners acquire knowledge, skills, certificates and diplomas which they were not able to obtain through the formal school system; apart from being cheaper to maintain than formal schools, the services of these remedial education centres came at relatively low cost to learners. Most of the adult remedial education classes ran high school (secondary school) level learning programmes and are by that token institutions that prepared numerous candidates for university or tertiary education.

Over the years, the products of these adult remedial education centres, joined the regular high school graduates to queue for admission into African universities; these universities have consistently not been able to provide space for most of the qualified candidates as a result of the availability of only limited placements within their premises. Tilak (2009) submits that only between 6 and 7% of those qualified to obtain tertiary education do get placement in African universities.

As a result of this shortage of places in African universities, many qualified candidates turned their search for tertiary educational opportunities towards other educational structures including open and distance learning institutions. This then, marked the beginning of the demand for distance education in post-independence Africa.

One most significant early achievement recorded in the realm of open and distance learning after independence, was the establishment in 1962 of the "Centre d'Enseignement Superieur" in Brazzaville, Congo. This was a Correspondence College with its peculiarities. First, it was a college designed to serve a French speaking audience; secondly, the qualifications it granted were specifically tailored towards up-grading basic skills and preparing recipients for job; thirdly, in addition to serving candidates in search of tertiary institution qualifications, its main target audience is made up of rural populace and

extension workers--subsistence farmers, village women and development leaders-- (Dodds, 1973).

However, beginning from the end of the 20th century, this college has begun to take on English-speaking populations of Africa; for example, it is currently operating in Kenya, Ghana and among English-speaking people of Cameroun.

After this significant early achievement, a number of open and distance learning institutions have come on stream among which only a few are major players within the ODL field; the institutions discussed here are those that are headed by an ODL specialist and/or staffed by an ODL-trained personnel to the tune of at least 15%; through sheer hard work and promotion of innovation, one or two ODL outfits have made it unto the list of the ODL institutions discussed here.

In East Africa, we may speak of only the ODL project, located at the University of Tanzania and that situated within Makerere University, Uganda; in Central Africa, no credible ODL project exists; in West Africa, Nigeria established in April 2001 an institution known as the National Open University of Nigeria (NOUN); in Southern Africa, UNISA braises the trail; but the Botswana's, Lesotho's, Swaziland's, Namibia's and Zimbabwe's open and distance learning outfits, are other credible ODL projects that must be mentioned in that part of the continent.

More than a century ago, the geo-political entity known today as Tanzania had had to be governed by Germans, the French and the British at different periods in history; by the time Tanzania attained political independence in the 1960s, it had a chequered history indeed; the mainland having had a different colonial experience from the off-shore Zanzibar. Yet, at independence, national leaders decided to pool the two bits of the country together and marched with determination to make a success of the union (Mmari, 1999). Education was identified as an instrument for national development and integration; it was therefore vigorously promoted both at the community development level and at the formal school system level; while community development was promoted at the grassroots level, the formal schools, made up of primary, secondary and tertiary institutions, trained the low, middle and high level manpower that was to see to the development of the country.

The University of Tanzania which was the only university during the first years of independence to serve the country had capacity to admit only 30% of qualified candidates; this wastage was quickly noticed by the authorities and by 1988 the country set into motion the process of establishing an Open University whose objective was to provide increased access to educational opportunities to Tanzanians; by 1994, the Open University of Tanzania admitted 766 students as its first batch of open learning students. Between 1994 and 1998 the advent of the Open University increased access to higher education in the country by about 25% (Mmari, 1999).

During the second decade of the 21st century the university has been coping as well as it could with the global recession while at the same time fine tuning its strategies for better performance as soon as the difficult times were over.

The Institute of Adult Education and Distance Learning of Makerere University, Uganda was established by Act of Parliament no. 12 of 1975 (www.iae.ac.tz/profile). As an organ with the mission of promoting adult education, the institute has been technically in existence since 1960, first as an extra-mural studies arm of the Makerere University College and secondly as Department of Adult Education attached to the University of Dar-es-salaam between 1963 and 1974 (www.iae.ac.tz/profile).

Upon becoming Institute of Adult Education and Distance Learning (IAEDL) in 1975, this ODL outfit has toed the path of all other developing African ODL outfits by providing teacher education, literacy education and some amount of technical education; in this sense, it was not a significant enough open and distance learning outfit to be highlighted but for one event that occurred between 2005 and 2011.

A staff of Makerere University, Paul Birevu Muyinda began a Doctor of Philosophy (Ph.D.) study programme in 2005 during which an e-learning system that aims to increase interaction between facilitators and their distance learning students was developed; the initial testing of the invention christened Mobile Learning Model (M0LODUM) confirmed it as a groundbreaking innovation (Kisambira, 2008) and this event brought that one ODL outfit on the continent to limelight and to a status of importance.

The advent of M0LODUM is important to both IAEDL and African ODL family because the invention has the potentials to increase the population of Open and Distance Learning clients on the continent and the quality of learning offered by the ODL route. Confirming the potential advantages of this invention, Kisambira submitted as follows:

> *The Department of Distance Learning at Makerere University has deployed an amazing mobile-telephone-based application to aid research supervision by students who learn and study long distance. Not only have they addressed a teething issue of limited collaboration between the distance learner and the supervisor; the department is also taking learning to a place it has never been before (Kisambira, 2008).*

Nigeria is the most populous black nation on earth; it equally posts one of the highest annual population growth rate in the world (National Population Commission, 2006); as a result of the combination of these factors with other socio-economic and environmental factors, the population of the country grew exponentially and all social amenities, including educational facilities, were stretched to a breaking point within the first two decades of independence.

For example, while at the close of the 1970s and the beginning of the 1980s, about 25% success was regularly registered at the West African School Certificate Examinations, Nigerian universities showed a glaring lack of capacity to absorb even such a low number of qualified candidates (Biao, 1992; Okebukola, 2004); by the close of the 20th century, Nigeria could absorb only 15 per cent of the about 1.5 million youths that regularly qualify to benefit from tertiary education (Ambe-Uva, 2007).

From the 1970s therefore, the need to seek other routes to higher education acquisition had become an issue in Nigeria; an aborted attempt was made to provide Nigeria with an Open

University in 1983; the plan eventually materialised only in 2001 with the establishment of 4 centres in Lagos, Adamawa, Borno and Kano States. Fifty learning programmes were rolled out and 32,400 pioneer learners were registered (National Open University of Nigeria, 2009). The National Open University of Nigeria is "Nigeria's leading-and only specialist-provider of open and distance learning at tertiary level" (National Open University of Nigeria, 2009).

The Distance Education Association of Southern Africa (DEASA) comprises Botswana, Lesotho, Swaziland and Namibia; other DEASA countries include Malawi, Mozambique, Zambia, Angola, Tanzania, Zimbabwe, Mauritius, the Seychelles, Madagascar, the Democratic Republic of Congo and South Africa (DEASA, 2010).

Botswana, Lesotho, Swaziland and Namibia shared the common destiny of resisting apartheid; consequently, they naturally found themselves collaborating on many other fronts for the sake of collective survival in the face of the monster that apartheid was; one of the fronts where they collaborated was education. Dodds (1973) submits that initially, Botswana, Lesotho and Swaziland ran a common university known as the University of Botswana, Lesotho and Swaziland (UBLS) between 1964 and 1975. University of Namibia was originally modelled after the Afrikaner tradition with little contact with the outside world. While Botswana, Lesotho and Swaziland ran a joint institution, the Distance Learning developed through the joint institution was committed to promoting community development.

When the joint institution got dissolved and each country set up its own university, higher education distance learning was developed in each of the countries. Botswana launched its Diploma in Theology in 1979 but could not make a success of it; it launched its distance education Certificate in Adult Education in 1982 and was able to run it till the end of the 1990s with about 27 students usually on the programme (Dodds et al, 1999). Beyond the 1990s, the Certificate in Adult Education has been upgraded to the Diploma in Adult Education by distance education and this Diploma programme is going on up to date, understandably with its problems of low enrolment, greatly reduced government support and low patronage by non-governmental organizations. However, within the first decade of the 21st century, Botswana has managed to equip about 9,000 primary school teachers with a Diploma in Primary Education through distance learning (Kamau, 2009).

The National University of Lesotho (NUL) currently runs Diploma and Bachelor programmes in Adult Education and Education by distance learning mode; these programmes were put up a few years ago and the Diploma in Adult Education and Bachelor in Education programmes have particularly attracted impressive patronage. Swaziland established its Institute of Distance Education (IDE) in the last decade of the 20th century to offer courses in Diploma in Law, in Commerce and B. A. in Humanities and B.Ed in Adult Education. The population on the various courses range between 30 and 100 learners. With courses in Law attracting the highest number of enrolees (Dodds et al, 1999).

Namibia went into independence with one university which was already equipped with a Department of Distance Education; this university's department, in addition to three other public institutions offer tertiary level distance education; many courses such as in-service

teacher education, Bachelors in Education, Commerce, Law and the Sciences are taught and plans are at foot to introduce courses in Bachelor of Technology; the centres offering in-service training for teachers attract the highest number of learners that range between 1,000 and 2,000 (Dodds et al, 1999).

Zimbabwe Open University had its hey days between 1993 and 1999. Its humble beginning is to be traced to the establishment of the Centre for Distance Education within the University of Zimbabwe in 1993; it then became University of Zimbabwe College for Distance Education in 1997 before becoming the Zimbabwe Open University through a 1998 Act of Parliament (Nyaruwata, 2011).

Between 1993 and 1999, the Zimbabwe Open University (ZOU) made giant steps within the realm of open and distance learning as it not only attracted good heads in ODL around Africa, but also attracted international funding which enabled it develop materials, strategies and technologies that portrayed it as a truly promising African ODL outfit; to its credit, the solid ODL network established throughout all the provinces of the country must be highlighted. During its hey days, every aspiring learner residing in any part of Zimbabwe felt the presence and the intensity of the activities of ZOU through its provincial coordinates. However, it must be acknowledged that beginning from the year 2000, the political and economic reforms in that country have come to nearly completely erase the beautiful work accomplished during the initial years of ZOU.

For example, less than 8 per cent of the staff in Zimbabwe's conventional universities currently hold a Doctorate degree, a situation that temporarily led to the suspension of classes at the University of Zimbabwe during the first decade of the 21st century (Wikipedia, 2011; Nyaruwata, 2011); the few ODL specialists that served as backbone to the initial impressive achievements recorded in ZOU have been forced to relocate away from Zimbabwe and the gradual development of the soft ODL infrastructure (regular supply of electrical energy, availability of ever improving Information Communication Technologies, etc..) that held out such a great promise had equally been terminated; so have the development-oriented learning programmes introduced by the university diminished in quality and quantity. Yet, there are high hopes that, from the ashes of the initial toils and achievements of this promising ODL University, will rise again a great African ODL outfit at the end of the reforms.

Current observation suggests that the demand for open and distance learning will keep augmenting in Africa. What then are those other factors that continue to fuel ODL demand on the continent? Apart from the inability of conventional institutions to cater for the educational needs of teeming populations desirous to acquire education, a whole set of other factors account and will continue to account for the development of ODL in Africa.

For example, during the periods of struggle for independence in Africa, it was discovered by the elites that elementary and secondary education levels were not enough to effectively challenge colonial administration; a first university degree at least built greater confidence and elicited greater respect from the colonisers; consequently, a number of Africans who were not able to travel overseas for higher education, seized the opportunities offered by

ODL institutions to read for Bachelor and higher degrees while continuing their liberation movement activities.

During this same periods too, many Africans got incarcerated for their political views and actions as a strategy for breaking their resolve to fight for liberation; while in prisons across the continent, many of these confined liberation fighters conceived of learning and improvement in educational attainment as a continuation of the struggle and a preparation for a more sustained struggle after their eventual release; consequently, with the consent and help of prison authorities, they, too, learnt and acquired degrees and diplomas through ODL institutions that existed mainly outside the shores of Africa.

During the post-independence era, the fear of job loss, personal ambition, search for skilled manpower for the implementation of complex regional developmental agendas and globalisation are some of the factors that have fuelled expansion of the ODL sector.

By the 1980s, as a result of the economic recession at the time, Africa had started experiencing both significant unemployment problem and job losses; one strategy used by employers during that period to reduce work force was to set aside a time lag during which the work force in sections of enterprises or government organisations was directed to obtain higher relevant qualifications or be laid off; many found ODL institutions helpful in warding off the threat of job loss not only in the ability of these institutions to enable them acquire relevant qualifications that ultimately kept them on their jobs but in helping them keep their jobs while studying.

A number of individuals have always existed who have had the personal ambition of acquiring particular types of knowledge, skills and/or attitude; a number of reasons may account for such an ambition; the desire to learn may be for the purpose of practising a hobby or for preparing for a change of job at a later date; indeed, the learning may be for the purpose of upgrading skills on the current job for the purpose of retaining it. In other words, the reasons for learning could be both intrinsic and externally and socially driven.

Additionally, since becoming independent, African countries have sought to fast track their development through putting up gigantic developmental plans whose implementation can be facilitated by only the availability of not only a high population of literate citizens but by the availability within their borders of an appreciable population of citizens holding tertiary education qualifications (Biao, 2010).

For example, the Southern African Development Community (SADC), the Economic Community of West African States (ECOWAS), the East African and the Central African Organisation, all have developed visions aimed at actualising major development plans within the first three decades of the 21st century.

SADC aims to improve agriculture and agro-processing activities through substantial investment in irrigation infrastructure, through the development of innovative market linkages and through the development of preferential procurement mechanisms; it plans to reduce unemployment within the borders of member states to between 10 and 6% by 2030; SADC equally plans to embark on the development of light industries and to link all member state capitals by highway, rail road and waterway (SADC, 2011).

The East African Community (EAC) has bought into SADC's Vision 2030; therefore in addition to developing agriculture through the Strengthening of Trade in Agricultural Inputs in Africa (STAR) Project and through Integrated Regional Emergency Preparedness and Response Plan on Trans-boundary Human and Animal Diseases, and to poverty alleviation programmes run within member states, it is collaborating with SADC on many fronts (EAC, 2011).

Central Africa has equally bought into SADC's Vision 2030 and many countries in that bloc are involved in collaborative activities with SADC. ECOWAS rolled out in 2009, a five-point development plan it intends to attain by 2020; issues focused upon, include governance, the infrastructure, the private sector, women, children and youths and the utilization of the environment; in the main, the community wishes to run an ever-increasingly accountable government, an infrastructure able to support a 21st century economy and regional development; ECOWAS Vision equally seeks to operate a viable private sector, empower women, children and youths and encourage a sustainable use of the environment (ECOWAS 2009).

These various vision statments are of course consistent with the expectations of African populations; however, for their actualisation, almost all African nations' populations need to be literate and about 40% of those populations need to acquire higher education; the literacisation of the populations would enable as many people as possible understand the contents of the Vision documents while the high level manpower is needed for the successful implementation of the Visions; since no true development may take place without the participation of the people for whom the said development is designed, it is suspected that all current vision statements in Africa, which are so inspired by modern style of living, may remain dead letters without appreciable improvement in people's education.

At present, only about 6% of the relevant Sub-Saharan African population has access to higher education as stated earlier; therefore, in order to increase the chance of success of the various vision statements on the continent, work is to be done to increase both literacy rate and access to higher education in Africa.

Without our realising it, open and distance learning institutions, have been supplementing the conventional supply of higher education with the view to increasing the high level manpower that will eventually contribute to the actualisation of the continental vision statements. However, as could be seen a great effort is still needed to raise tertiary school enrolment from 6 to 40%.

Globalisation is another factor fuelling demand for open and distance learning on the continent. While Shiva (1997) in Arku and Arku (2011) advances three historical sources (European colonialism, the imposition of western development models and free trade) of globalisation, Saul (2004) also in Arku and Arku (2011) suggests that the true harbinger of globalisation is the economic crisis of the 1980s that forced industrialised countries' companies to look for cheap labour elsewhere as a result of the unfavourable restrictions brought on them at home.

Be it as it may, globalisation is a process that creates a borderless environment within which vigorous human interaction is promoted on all fronts including the realms of economy, trade, leisure, culture and education. Such a social interaction tends to introduce people into new habits, knowledge systems and attitudes that they may wish to try out.

Open and distance learning was one such practice that was fuelled by globalisation; the colossal advancement that has been recorded in the domain of ICT-supported open and distance learning during the first decade of the 21st century, is clearly to be attributed to the phenomenon of globalisation. Not only have many international brain storming sessions (conferences, workshops, roundtable discussions, etc.) been profited by, to improve the technological foundation and content of the African ODL space, numerous pieces of information garnered through the Internet and the world wide web have equally had a positive and globalising effect on African Open and Distance Learning practice.

4. Achievements in open and distance learning space in Africa

Eager to accelerate the pace of educational development within their borders and anxious to fulfill the aims and meet the targets of various international agreements on education, many African nations started to employ open and distance learning strategies as tool for the massification of education beginning from the late 1970s; this process of massification was first directed towards the training of teachers before it was pointed towards other areas of education.

For example, Nigeria, Kenya, Malawi, and Botswana in 1976, 1986, 1992 and 1994 set up ODL programmes to train massive and staggering numbers of teachers to enable them prosecute their respective universal primary education programmes (Kamau, 2009; Rumajogee, Jeeroburkhan, Mohadeb and Mooneesamy, 2003). In one year alone (2004), Nigeria produced through its ODL programme, 10,629 trained teachers where 30,000 trained teachers were produced in 2003 from all the existing government and private teacher colleges in the country. Within three years of the commencement of its teacher training programme by ODL, Malawi produced 18,000 trained teachers; it would have taken all Malawi teacher training colleges, 12 years to produce this number of teachers through the conventional method of teaching. Also Botswana and Kenya produced huge numbers of trained teachers within a short time which colleges of education in those countries would have rolled out not only at prohibitive cost but also after many years of teaching and training (Kamau, 2009; Rumajogee, Jeeroburkhan, Mohadeb and Mooneesamy, 2003).

Apart from advancing teacher education and education massification in general, open and distance learning equally has been used in promoting technical, vocational education and community development; additionally, the cost of providing education got reduced considerably wherever ODL was employed, since distance education is characteristically more cost-effective than conventional education (Bates, 2007; Rumajogee, Jeeroburkhan, Mohadeb and Mooneesamy 2003).

One other advantage of involvement in ODL that is not quite advertised is that some conventional institutions that are currently involved in the provision of distance education are obtaining surplus financial resources from the distance education project with which they supplement shortfalls in government subventions meant for the running of their institutions.

5. Challenges within open and distance learning space in Africa

The first and major challenge to orderly growth of the domain of ODL in Africa is absence of national ODL policies; while many ODL outfits spring up and while governments authorise and do license conventional and non-conventional tertiary institutions to dispense ODL programmes and courses, there are no national policies clearly delineating a path for ODL to run on. Where government directives (policy incubation) have been issued for either conventional or non-conventional institutions to run ODL courses, the very operationalisation of those programmes end up being muffled and contrived by the unenlightened actions of the of regulatory agencies.

For example, Barasa (2010) submits:

> *Most open universities……are open universities trapped in residential national education policy environments. National regulatory agencies prescribe the minimum entry academic qualifications that learners must possess in order to be admitted into degree programmes…..This closes the window on openness as to admission and undermines the very philosophy upon which ODL is predicated. For..dual mode universities, institutional policies for staff recruitment, training and promotion are often modeled on and similar to those in residential face-to-face universities. The result is that emphasis is on research with little on evidence for effective teaching and learner support as criteria for promotion(Barasa, 2010).*

The second challenge is that of social acceptance of ODL products. There is abundant skepticism as to the quality of graduates produced through the ODL route. In the words of Pityana (2004),

> *....in many countries except possibly South Africa which has been practising distance education at tertiary level since 1946, there is no universal appeal for distance education among would be learners and suspicions remain about the quality of qualifications acquired through distance education (Pityana, 2004:12).*

Additionally, the dearth of ODL quality assurance frameworks (Barasa, 2010) is another of the challenges that the African ODL environment is expected to attend to if the growth of this sub-educational sector is to be sustained.

Clearly, the way out of the policy aridity and the quagmire of social skepticism and under-rated quality of ODL programmes is the conduct of more research with the view to encouraging the birth of viable policies and with the view to unearthing strategies for improving the quality of this developing sub-educational sector in Africa.

The third challenge is that of relevance of ODL programmes. One has always been of the view that ODL institutions need not replicate the programmes of conventional universities.

Similar suggestions emerged from the findings of the Lesotho Pan-African Tele-Education centre study whose report appears further within this chapter. It is therefore to believe that only a proactive, innovative and future probing Open and Distance Learning project will be seen as relevant and worthwhile in the 21st century.

The fourth challenge concerns dearth of trained personnel in the philosophy, principles and methods of Open and Distance Learning. While a large personnel is currently involved in running African ODL institutions, only a negligible portion of this personnel ever received formal training in the philosophy and principles of ODL. The Open University of Tanzania has just begun to give training leading to diplomas in ODL. It is expected that this area of the growing field of ODL will be taken quite seriously, very shortly by relevant institutions.

The fifth challenge concerns the low level of utilisation of Information Communication Technologies (ICT) within the area of ODL in Africa. The main issue that needs to be addressed before a high utilisation of ICT-based strategy may be experienced in Africa is the steady supply of electric power.

Unfortunately, no African country, including South Africa, is currently self-sufficient in electric supply; yet, one may not meaningfully run an ICT-based ODL project without adequate supply of electricity. All African ODL projects (except that of the African Virtual University that I did not discuss because it reaches a negligible population of African ODL clients) currently run solely on printed materials and minimal face-to-face meetings in order to circumvent unavailability of electricity; while, such a resourcefulness is commended, it should be stated that a combination of such a practice with some ICT-based strategies has a greater chance of impacting more positively on Open and Distance Learning projects.

The sixth challenge relates to the ease and credulity with which all ODL modes of delivery are embraced without discrimination or screening by open and distance learning institutions within the continent. While there may be value in employing some amount of multi-mode of delivery within the African ODL enterprise, it is certainly not conceivable that just any mode of delivery that may be invented anywhere on the planet will be suitable for the African ODL audience. Consequently, good practices dictate that careful trials of delivery modes or systematic researches be conducted to ascertain in the course of a limited time, the suitability or otherwise of any mode of delivery that may arrive on the African soil.

The main ODL modes in use in Africa at present are the correspondence education mode, long vacation courses mode, the weekend classes mode, Open University mode, non-interactive virtual classes modes and interactive virtual classes modes. Correspondence education mode is the oldest of all the ODL modes employed on the continent. However, the latest modes being employed on the continent are the interactive virtual classes modes which include the video conferencing mode and the Tele-Education mode; of these two modes, the Tele-Education mode is the newer. Currently, the newest and most famous of all open and distance learning programmes run through the Tele-Education mode in Africa, is the Pan-African e-Network.

> *The Pan-African e-Network Project is a joint initiative of the Government of India and African Union and is funded by the Government of India at an estimated cost of US$116 Million. It aims at imparting education to 10000 students of African countries participating in the project, using modern information communication technologies, from some of the topnotch universities of India. The eligible students enrolled in various programmes will be required to attend the classes in the learning centre set up in each member country as part of the project (Pan-African e-Network project, 2010).*

All existing 53 African nations (before the birth of South Sudan in September, 2011) hooked on to the Pan-African e-Network project in 2010. The project actually comprises two main components, namely, the Tele-Education and the Tele-Medicine components.

The Tele-Medicine programme seeks to link selected African medical practitioners (500 doctors and 1000 nurses) to the technological infrastructures, techniques and know-how developed by India or available in the field of medical practice in India; it is not a medical education programme that may lead to award of degrees in medicine; it is rather a medical empowering process that seeks to bring medical practitioners in Africa to collaborate with their colleagues in India in the diagnosis and treatment of illnesses, using the Tele-Medicine facilities and expertise available in India. On the other hand, the Tele-Education programme is an educational programme whose aim is to impart education with the view to awarding Diploma, Bachelor and Masters degrees in Management (Business and Finance), Technology (Computer Science and Information Technology) and International Languages (English, French, German and Arabic). Indira Gandhi National Open University, (IGNOU) New Delhi, Amity University, Noida, Birla Institute of Technology and Science (BITS, Pilani) University of Delhi, New Delhi and University of Madras, Chennai are the Indian universities partnering with selected institutions in Africa to implement the Pan-African e-Network project (Pan-African e-Network project, 2010).

On-line admission process, dedicated IP based network, live, interactive virtual classes, Off-line access (through the Internet) to archived lecture contents for review learning, digital library and dedicated Tele-Education portal for knowledge management are some of the special features of the Tele-Education programme (Pan-African e-Network project, 2010).

Lesotho signed up to the Pan-African e-Network agreement during the second half of 2010 and classes effectively began at the Lesotho learning centre, by April, 2011. The Institute of Extra-Mural Studies of the National University of Lesotho hosts the Lesotho Learning centre of the Pan-African e-Network. The current contributor was a one-time Deputy Director of the National University of Lesotho's Institute of Extra-Mural Studies. Through a study whose findings are reported below he sought to learn, among other things, the extent to which this new mode (the Tele-Education), holds potentials for bringing its contribution to the furthering of the ODL edifice that the African social, economic and educational experiences have begun to build so earnestly.

6. The study

The study sought to identify the characteristics of the clients that were the first to patronise the Tele-Education mode of delivering open and distance learning in Lesotho

and in Africa and to obtain these clients' views on the services offered them through this mode of learning. The study was conducted about one year after the programme had commenced.

6.1. The design

The study employed a descriptive survey design through which description and itemisation of basic characteristics and expressed views of the sample may be carried out.

6.2. Population and sample

A total of 217 learners were on the roll of the Lesotho learning centre at the time of this study. The intention was to turn the whole population of learners into the sample for the study by reason of the relative small number of learners at the centre. However, only 203 learners returned duly completed the data collection instrument handed to them. Eventually the completed copies of the instrument of 200 learners were finally considered for final analysis for ease of computation. Consequently while the population of the study was 217 learners, the sample was made up of 200 learners.

6.3. Instrumentation

A 6-item inventory was designed which sought to elicit information on the demography of learners, learners' preference for meeting periods, comfort at the learning centre, learner support services and learners' psychological experiences. The validity of the inventory was ensured through the selection and inclusion on the instrument of such items that are strictly relevant to the aspects of ODL studied.

6.4. Findings

The findings are here summarized in seven tables which are each followed by a detailed explanation of the data contained in them.

Table 1 shows that about two thirds (65%) of the learners in the Lesotho Tele-Education centre were female.

More than half of all the learners (53%) were aged between 26 and 35 years; specifically, 32% of the learners were aged between 26 and 30 years while 21% were aged between 31 and 35 years; only 1% and 2% of all the learners, were aged between 41 and 45 years and between 46 and 50 years respectively; interestingly, 13% of all the learners were found to fall within the age brackets of 16 and 20 years.

About half the learners (51%) were married while a large percentage (45%) of them were single. About two thirds (67%) of all learners were civil servants while 20% of the learners were working in some companies; six per cent of them were self-employed while 7% of them were not working.

S/N									Total
1.	**Gender**	Male	Female						
		70 **(35%)**	130 **(65%)**						200
2.	**Age**	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
		26 **(13%)**	20 **(10%)**	64 **(32%)**	42 **(21%)**	42 **(21%)**	2 **(1%)**	4 **(2%)**	200
3.	**Marital status**	Married	Single	Divorced	Widow(er)				
		102 (**51%)**	90 **(45%)**	2 **(1%)**	6 **(3%)**				200
4.	**Work status**	Not working	Self-employed	Civil servant	Company worker				
		15 **(7%)**	12 **(6%)**	133 **(67%)**	40 **(20%)**				200
5.	**Courses**	Business & Finance Management	Technology	International Languages					
		166 **(83%)**	34 **(17%)**	0 **(0%)**					200
6.	**Course duration**	6 months	1 year	1year 6mths	2yrs	2years 6 months	3years		
		16 **(8%)**	60 **(30%)**	26 **(13%)**	64 **(32%)**	0 **(0%)**	34 **(17%)**		200
7.	**Desire for foreign degrees**	Very High	high	medium	Low	Very low			
		30 **(15%)**	156 **(78%)**	14 **(7%)**	0 **(0%)**	0 **(0%)**			200
8.	**Other motivations for participation**	Obtain higher degrees. 40	Change job 21	Compete for higher position of responsibility 36	Convenience of reading while keeping one's job. 103				
		189 **(95%)**	40 **(20%)**	96 **(48%)**	200 **(100%)**				

Table 1. General Information on the learners of Lesotho Centre of Pan-African Tele-Education programme

Eighty-three per cent of the learners were reading Business and Finance courses; only 17% of the learners read Technology courses; none of the learners read International Languages.

Three quarters (75%) of the learners were enrolled on courses that lasted between 1 and 2 years; about the same number of learners (30% and 32% respectively) enrolled on a 1-year and 2-year study programmes; only 17% of the learners were undergoing a 3-year program me as at the time of this study.

As for one of the motivating factors for participating in the Pan-African Tele-Education programme, 93% of the learners indicated that the desire to obtain a foreign tertiary education qualification counted as one main reason.

All respondents were unanimous about the fact that the convenience of reading while retaining one's job was one main reason for enrolling into the Pan-African Tele-Education programme as 100% of the learners agreed to this inventory item; in addition, this last item of the first section of the inventory that allowed for multiple and ranked responses, revealed

that the motivation to obtain a higher degree for the sake of it, spurred 95% of learners to register for the Tele-Education programme; forty-eight per cent of learners enrolled on the programme as a means for eventually competing for higher positions of responsibility within either the civil service or companies on completion of their studies; on the other hand, 20% of learners registered with the Pan-African Tele-Education programme with the hope of changing job on completion of study.

S/N		Yes	Perhaps	No	Total
1.	**weekends**				
		181 **(91%)**	7 **(3%)**	12 **(6%)**	200
2.	**After work hours**				
		176 **(88%)**	19 **(10%)**	5 **(2%)**	200
3.	**During work hours**				
		10 **(5%)**	2 **(1%)**	188 **(94%)**	200
4.	**During lunch break periods**				
		74 **(37%)**	7 **(3%)**	119 **(60%)**	200
5.	**Night classes**				
		44 **(22%)**	8 **(4%)**	148 **(74%)**	**200**
6.	**Pre-work hour classes**				
		6 **(3%)**	2 **(1%)**	192 **(96%)**	**200**

Table 2. Preferences for meeting period among Lesotho Centre Tele-Education learners

S/N		Comfortable	Averagely comfortable	Not comfortable	Total
1.	**Chair**				
			178 **(89%)**	22 **(11%)**	**200**
2.	**Writing desk**				
			81**(40%)**	119 **(60%)**	200
3.	**Weather**				
			169 **(85%)**	31 **(15%)**	200
4.	**Lighting**				
			193 **(97%)**	7 **(3%)**	200
5.	**Noise control**				
			186 **(93%)**	14 **(7%)**	200
6.	**Cleanliness**				
			183 **(92%)**	17 **(8%)**	200

Table 3. Comfort at the learning centre

Table 2 shows the summary of learners' responses regarding the time of the day they would prefer to have their classes. Learners were encouraged to post multiple responses against this second section of the inventory and to rank order those responses. Table 2 reveals that 91% of learners would like to have their classes during weekends; another group made up of 88% of learners indicated that they could have their classes after work hours; only 37% and 22% of learners indicated that lunch break periods and night classes were acceptable.

Other suggestions such as pre-work hours classes (6-8am) and during work hours classes attracted only 3% and 5% positive answers respectively.

Effectively, the summary of the data in table 2 is that two choices (weekend classes and after work hour classes) were made by respondents.

Table 3 reveals that between 85% and 97% of learners agreed that the chairs used at the centre were averagely comfortable and that the lighting, cleanliness, weather and noise control were of average quality. However, 60% of learners submitted that the writing desks at the centre were of poor quality and were not comfortable.

On the whole, the comfort at the centre has been adjudged to be of average quality.

		excellent	**Very Good**	**Good**	**Fair**	**Poor**	**Total**
1.	**Services of Tele-education attendant**						
		2 **(1%)**	6 **(3%)**	185 **(93%)**	7 **(3%)**	0 **(0%)**	200
2.	**Provision of Additional learning resources**						
		0 **(0%)**	0 **(0%)**	16 **(8%)**	178 **(89%)**	6 **(3%)**	200
3,	**Availability of study space**						
		0 **(0%)**	0 **(0%)**	132 **(66%)**	61 **(31%)**	7 **(3%)**	200
4,	**Provision for tutorials**						
		0 **(0%)**	0 **(0%)**	0 **(0%)**	3 **(2%)**	197 **(98%)**	200
5,	**Provision for Internet Café**						
		0 **(0%)**	0 **(0%)**	0 **(0%)**	1 **(1%)**	199 **(99%)**	200
6.	**Provision for Business centre**						
		0 **(0%)**	0 **(0%)**	0 **(0%)**	4 **(2%)**	196 **(98%)**	200
7.	**Provision for restaurant services**						
		0 **(0%)**	0 **(0%)**	0 **(0%)**	1 **(1%)**	199 **(99%)**	200

Table 4. Learner support services

Table 4 shows that between 98% and 99% of learners submitted that the provision made by the centre for tutorials, internet café, business centre and restaurant services was poor. In actual fact none of these services was provided by the centre. However, the services of the Tele-Education attendant were adjudged to be good by 93% of respondents.

S/N		Excellent	Very Good	Good	Fair	Poor	Total
1.	**Ease in understanding the Lecturers (Lecturers' pronunciation)**						
				125 **(63%)**		75 **(37%)**	200
2.	**Facilitator-learner interaction**						
				75 **(37%)**		125 **(63%)**	200
3.	**Clarity of images**						
			33 **(16%)**	92 **(47%)**		75 **(37%)**	200
4.	**How well does Tele-Education facilitation resemble face-to-face teaching-learning technique**			25 **(12%)**	66 **(33%)**	109 **(55%)**	200
				25 **(12%)**	66 **(33%)**	109 **(54%)**	200
5.	**What is your assessment of female lecturers?**						
			167 **(84%)**			33 **(16%)**	200
6.	**What is your assessment of male lecturers?**						
			200 **(100%)**			0 **(0%)**	200
7.	**Performance of the interaction gadgets (speakers, microphones, headphones, etc..)**						
				83 **(41%)**	117 **(59%)**		200

Table 5. Instructional processes

Table 5 shows that after about one year of instruction, 63% of learners indicated that they never had any real problem following and understanding the pronunciation and way of speaking of their Indian lecturers; however, 37% of learners still reported some difficulties in following their lecturers as a result of their way of speaking English language which is different from the way Southern Africans speak English.

When the inventory sought to know the extent to which Tele-Education mode resembles face-to-face teaching, more than half (55%) of learners submitted that there existed no similarity between the two modes of facilitating learning; thirty-three per cent of the learners responded that there existed a minimum amount of similarity between the two modes of instruction while about 12% of learners submitted that there existed a large amount of similarity between the two modes of instruction. Additionally, 63% and 37% submitted that, through the use of Tele-Education mode, facilitator-learner interaction was low and high respectively.

When the respondents were requested to assess the performances of both female and male lecturers, they rated male lecturers as being over and above female lecturers; this is because 84% of the learners found female lecturers to be good lecturers, but 16% of them found them to be poor in lecturing skills; on the other hand, 100% of learners submitted that male lecturers possessed good lecturing skills.

Sixty-three percent of learners, found the images coming through the screen good and clear; but 37% of learners submitted that the images were poor in quality. The interaction gadgets (microphones, speakers, etc..) were found to be of good quality by 41% of learners while 59% of learners submitted that they were only of fair quality.

		Very High	High	Average	Low	Total
1.	**Ability to summarise oral presentations**					
			103 **(52%)**		97 **(48%)**	200
2.	**Speed in note taking**					
			91 **(45%)**		109 **(55%)**	200
3.	**Possibility to study 3-4 hours a day**					
			66 **(33%)**		134 **(67%)**	200
4.	**Have a high or low probability of missing 30% of each semester classes.**					
			137 **(31%)**		63 **(69%)**	200
5.	**Academic self-concept**					
			125 **(63%)**		75 **(37%)**	**200**

Table 6. Probability of success in learning

Table 6 shows the manner in which learners fared academically through their responses to issues that are critical to success in learning. These issues include, ability to summarise oral presentations that may have been listened to, demonstration of speed in note taking, ability to study for at least 3 hours a day, demonstration of high academic self-concept and regularity of attendance at learning meetings.

Fifty-two per cent of learners indicated a high ability to summarise oral presentations; but 48% of learners indicated that a low ability to summarise oral presentations that they may have listened to.

While 45% of learners indicated that they possess a high enough speed to take all the major notes on a lecture, fifty-five per cent of learners indicated that they are not able to capture all major notes of a lecture.

Only 33% of the learners indicated that they are able to study for a minimum period of 3 hours a day. All remaining 67% of learners submitted that they are not able to study for about 3 hours a day.

Thirty-one per cent of learners indicated that it is highly probable that they miss 30% of the classes while 69% of learners indicated that the chances are low that they miss up to 30% of the classes.

Sixty-three per cent of learners posted high academic performance; while 37% of respondents posted low academic self-concept.

S/No.	Issues	Percentage
1.	The use of calculators is forbidden during examinations	200 **(100%)**
2.	Examination questions reflect Indian realities more than African realities	122 **(61%)**
3.	Time is always in short supply to carry through the activities of Pan-African ODL	108 **(54%)**
4.	ODL Learners do not enjoy government financial support	74 **(37%)**

Table 7. Free comments

Table 7 reflects the summary of learners' other comments that were freely offered after the main concerns of the study inventory had been attended to by them.

All (or 100%) of the learners expressed surprise and perhaps disappointment that the use of calculators was forbidden in the first examinations they sat for at the Pan-African ODL programme; when, in further casual interaction with the researcher, they were asked to assess the extent to which such a regulation affected their performance in the examinations concerned, they almost all submitted that there was no real adverse effect to their examinations; they submitted that they were rattled by the directive because they did not expect it.

Sixty-one per cent of the learners, submitted that both examination and study materials reflected more Indian realities than African realities. When asked again about the collateral damages that a situation such as this may have had on their study, most of the learners responded that there were no real damages as they were studying disciplines that had international outlook in their theories.

Fifty-four percent of the learners indicated that availability of time for the purpose of carrying out and completing the activities required by Pan-African Open and Distance Learning was a challenge to them. On the other hand, 37% of the learners expressed their frustration at the fact that only very few ODL learners received financial support from Lesotho government.

Although the 7 tables laid out here, contain data collected only from Lesotho, a keen observer of the African Open and Distance Learning scene would note that the near totality of the data displayed by those tables reflect the African situation; apart from being a country desirous to employ all forms of education to improve the lots of its people, Lesotho is also symbolic of African countries with a high population of youths that are jostling in all directions with the view to ultimately making a decent living through education and skills acquired either through formal or non-formal education. In other words, using the same instrument, if this same research were conducted among Pan-African ODL learners in other African countries, the findings will not be significant different from the current ones.

Therefore the discussion of the findings of this study is based upon the assumption that Lesotho is representative of all African nations in this context; consequently, in the lines that follow, the findings are generalised to the whole of Sub-Saharan Africa and their discussion is carried on as though they were derived from an African wide survey.

7. Discussion of findings

A number of issues have been thrown up by this study which reveals current peculiarities of African open and distance learning. These issues include the age brackets occupied by African ODL learners, the types of courses opted for in open and distance learning, request for tutorials in open and distance learning programmes and the issue of language of instruction as it concerns the facilitator; other issues include the socio-psychological determinants of success in open and distance learning, friendliness or learning conduciveness of ODL centres and relevance of learning materials to African realities.

7.1. Age of learners

This study revealed that 23% or about a quarter of all learners fell within the age brackets 16-25 years; it was equally revealed that 32% or about a third of all the learners fell within the age brackets 26-30 years while 55% or more than half of all the learners fell within the age brackets 16-30 years. A total of 76% of all learners have been found to fall within the age brackets 16 to 35 years.

Ages 16 to 35 years constitute an acknowledged age grouping for the youths of any society; in Africa, these are the same age brackets within which about 90% of regular or formal tertiary institutions students fall into; therefore, if more than three quarters of the ODL learners fell within this age grouping, it should be deduced that open and distance learning is already serving the youths of Africa as an alternative tertiary education sector. It is also an indication that if African nations were willing to offer tertiary education to their teeming youths, they will have to more than double the number of their existing tertiary institutions.

One other curious finding was the fact that 13% of all learners were found to be aged between 16 and 20 years; these are age brackets within which high school or secondary school students are usually found; persons who are able to complete high school education before or by the ages 16-20 years are considered brilliant students and should normally have got placement in formal tertiary institutions.

The researcher could engage only a few of the learners within these age brackets in post-study interviews that turned out to be quite revealing; these learners actually made very good grades at their respective end of high school examinations; it could not have been otherwise since the Pan-African Tele-Education project did not lower entry qualifications for the purpose of admission into the various open and distance learning programmes. However, a number of other reasons informed the choice of open and distance learning mode over the formal tertiary education mode; learners within this age brackets declared that they were engaged in income generating activities as shop keepers, security guards, petit traders and even street vendors; apart from the fact that they did not have the required amount of money to register full time in tertiary institutions, they found open and distance learning mode offering them the double opportunity of earning a living for themselves and their families and of acquiring skills; these were not the only attractions offered by the Pan-African open and distance learning project; these youths equally submitted that the financial

courses they were reading were dear to their heart as they saw in them an opportunity to break the vicious cycle of poverty that kept them in their present situation.

7.2. Preferred courses

Eighty-three per cent and 17% of learners were reading business and technology courses respectively; courses such as these, offered greater opportunities of employment (both self and paid employment) to learners on the African labour market than International Languages that not a single learner registered for. Modern strategies of carrying on business and Information Communication Technologies are new domains of economic and professional activities in Africa; as such these domains that still boast of a great room for expansion are gradually growing, offering employment opportunities to persons with the right kind of skills.

Therefore, with greater needs-generated course offerings, open and distance learning institutions may end up being viewed as more beneficial to learners than formal tertiary institutions which Babalola (2007) described as being obsolete in their course offerings and as being institutions that equip their clients with knowledge and skills which the African labour market does not need.

Specifically, Babalola (2007) reports that:

> *In 2006, the Federal Ministry of Education (FME) conducted a large survey involving more than 10,000 online participants, to track the "products" of Nigeria's educational sector. One of the objectives is to determine who the products are, their backgrounds, capabilities and needs to inform a long-term strategic planning process for the education sector. The survey targeted the beneficiaries of Nigeria's secondary, tertiary, technical or vocational institutions and the individuals who graduated or discontinued their education from these institutions between 1995 and 2005. The survey clearly showed a disturbing trend that over 60% of participants were unemployed or under employed.*

Babalola (2007) then concluded that the 2006 findings confirmed the 2002 World Bank findings concerning mismatch between tertiary education teaching and labour market requirements. He further pointed out that tertiary graduate unemployment is further fuelled by i)lack of consultation with the private sector, ii)deficiency of practical skills at the level of graduates, iii)lack of qualified personnel to teach vocational skills and iv)high demand for skilled workers by the private sector.

7.3. Preferred learning meeting periods

Ninety-one per cent and 88% of the learners indicated weekends and post-work hours respectively as the preferred learning meeting periods. Throughout Africa, the Pan-African Tele-Education classes currently hold during work hours.

A few months after the take-off of the Pan-African Tele-Education, the organisers in India were notified of concerns expressed by learners across many centres on the continent

regarding learning meeting periods; as a result of consultation over the matter, an arrangement now exists whereby all live lectures are recorded and posted on the Pan-African e-Network platform so that learners who may have missed lectures may still catch up on these lectures and even enjoy them, albeit through secondary source.

The selection of convenient meeting periods for the purpose of participating in learning remains a serious challenge in open and distance learning; while self-study mode seems to be a solution to this challenge, the challenge of maintaining motivation to learn at a constantly high level at all time has been found to be another problem that constantly faces those learning alone; this motivational problem is usually resolved and overcome through group learning as the presence and prompting of peers and mates usually result in a generation of an internal energy that goads and motivates.

However, arrangement for out-of-work time meeting periods need to be arrived at soonest in a consultation that should involve learners and organizers of the Pan-African Tele-Education, if we must avoid the loss of a high number of learners.

7.4. Comfort at the centres

Naturally, the comfort that may be found at the learning centres is a function of the level of resources that are available to the country and institution hosting the centre.

Learners found the Pan-African Tele-Education centre at Lesotho averagely comfortable; if Lesotho with a GDP per capita of $1605 and Human Development Index ranking of 141 out of 169 countries (UNDP, 2010), could provide a centre adjudged to be averagely comfortable, most Pan-African Tele-Education centres in Africa can be judged to be comfortable.

7.5. Learner support services

Of all the identified learner support services, the running of tutorials and the provision of internet café, business centre and restaurant services were declared as being poor by 99% of the learners; in fact these services did not exist at the Lesotho Centre.

Although in many centres across Africa, internet café, business centres and restaurant services may exist because of the availability of means and resources to provide these things, observation has shown that open and distance learning institutions on the continent usually play down on the need to provide tutorials to their learners; the general notion is that distance education learners are mature and independent enough to run and guide their own learning. Yet, the fact is that these learners initially were schooled in our formal educational institutions where no particular instruction was given to them in the area of learning how to learn; while through previous efforts at resolving and surmounting difficult learning experiences and while the ever sharpening process of introspection acquired through inner maturation would have availed these learners of some techniques of learning adapted to their various situations, these learners cannot be said to be equipped with a good enough range of learning techniques and habits that have been tested and proven reliable

through studies and observation. True, a few useful study skills and habits will remain personal and unique to learners, but the vast majority of good study skills need to be consciously learnt.

In addition, it is realistic to believe that some aspects of the subject matter being taught could prove stubborn to understand and penetrate even in a highly interactive setting as the one offered by the Pan-African Tele-Education; group discussions and tutorials are usually the tools with which these difficulties in understanding are overcome.

7.6. Instructional processes

The manner of speaking English language by Indian lecturers, similarity between face-to-face teaching and Tele-Education and gender differences in lecture delivery were the three main issues that were highlighted in regards to instructional processes.

Although initial difficulties are usually faced in communication when two or more persons drawn from different linguistic backgrounds begin to use a common language, these difficulties are known to vanish under the process of habituation; habituation is a process whereby a constant and continued use or exposure to a language or a phenomenon ends up creating a harmonious condition between the phenomenon and the person exposed to it (Bello, 1988); in the case of language use and listening, the hearing organ and the brain have the ability to adjust within a short time to new types of sounds with the view to deciphering and comprehending them; as such, while 37% of learners submitted that they still experience comprehension difficulties one year after beginning to listen to Indian lecturers speak English, these learners nevertheless admitted that they have made a lot of acoustic progress and adjustment since only the understanding of very few words escaped them a year after the beginning of their classes as compared to the large number of words they could not understand a year earlier; this implies that the manner in which the language of instruction is spoken for purposes of promoting open and distance learning is not an issue as both facilitators and learners ultimately reach a level playing field in this matter.

More than half of the learners did not detect any similarity between Tele-Education and face-to-face modes while a third of the learners only spotted a slim similarity; yet, the Tele-Education mode is a highly interactive teaching-learning mode; is it that nothing can replace the human teacher? This lack of similarity however, did not have any repercussion on their learning.

The other interesting finding was that the learners who were made up of 35% male and 65% female, found overwhelmingly, male facilitators to be better facilitators than female facilitators. Although the difference in performance between male and female facilitators was not significant (84% of learners submitted that female facilitators were good but 100% of learners stated that male lecturers were good), this finding merits some attention. Is there any element of gender attraction in this finding whereby a group of predominantly female learners would prefer to be taught by male facilitators? No attempt was made to answer this question during this investigation.

7.7. Success in learning

High academic self-concept (Reasoner, 2010), speed in note-taking, 3-4 hours study a day and ability to summarise accurately a piece of writing that was read or a talk that was listened to (Lammers, Onweugbuzie and Slate, 2001; Kleijn, Ploeg and Topman, 1994) have all been identified as factors promoting success in learning.

Although, 63% of learners had a high academic self-concept, only 33% are able to read for 3 hours a day and only 45% were fast in note-taking and only 52% of them can adequately summarise an oral presentation; the percentages concerning daily period for reading, note taking ability and capacity to summarise are too low to allow the prediction of success in learning; therefore, while learners showed a fairly high academic self-concept, the deficiencies in these other abilities indicate anything but probability of a significant success in learning.

Indeed, inability to reinforce the confidence and study skills of learners has begun to impact negatively a few African ODL outfits as Abiodun (2010) reports in the following lines:

> *Given the benefits of distance education, the recent sharp decline in enrolment of learners for distance education in Nigeria might suggest the existence of fundamental problems in the provision of distance education. This trend, if not addressed, would undermine the purposes of establishing distance education centres in the Nigerian education sector. Jaiyeola (2000) reported that students' enrolment rate for distance education programmes dropped from 75% in the year 2006 to 55% in the year 2008. Lewis (1994) suggests the reasons for relatively high rate of dropout include learners finding themselves in unfamiliar situations. In addition, many learners associate learning with being taught by a teacher who is physically present, while others who are unfamiliar with distance learning packages are finding learning more difficult since many of them lack capacity to learn this way (Abiodun, 2010:90).*

7.8. Free comments

Under "free comments", three comments need some discussion; the first touches on absence of the reflection of African realities in Pan-African Tele-Education lecture and examination contents; the second concerns the unavailability of government scholarship for open and distance learning clients and the third regards learners' expressed concern for lack of time to adequately attend to their studies.

Although all learners indicated that the fact that next to no African realities were contained in their lectures and examinations, had no adverse effect on their learning, there is need to remedy the situation; injecting and spicing learning contents with scenes and images familiar to learners has the potential of motivating them to learn beyond points imaginable by the facilitator; additionally, this sort of motivation usually translates into success results that would be better than the result learners would have obtained in a situation devoid of the realities of their milieu.

The findings of this study as they regard the current age brackets of ODL learners and the choice of courses the learners seek to read in ODL institutions point to the fact that open and distance learning institutions have become both a complement and in some respects, an alternative to formal tertiary institutions on the continent; the importance of an institution such as this can no more be underplayed.

Since independence in the 1960s, African governments have developed elaborate study scholarship systems for formal tertiary education students; up to date, these same governments have not thought of developing similar systems of scholarship award that would enable distance education learners enroll in ODL institutions within or outside the continent; the time has obviously now come to consider seriously a type of scholarship system such as this, since open and distance learning is gradually advertising its merits and has in fact established its strong hold in parts of the African continent.

Learners' expression of unavailability of time for their study is nothing new or odd since learning in adulthood is only one out of the numerous social, professional and civic tasks the adult citizen is expected to perform. However, that which is yet to be taken seriously within learning circles is the recognition of time management as a study skill issue; the acceptance of this fact will ultimately bring facilitators to deliberately tutor learners on how to share and use the daily, weekly and monthly periods of the time available to them in a way as to transmute this scarce resource from an obstacle into an asset.

7.9. Acceptability level of the Tele-Education mode

Judging from respondents' responses under "Instructional processes" and "Learner support services", the Tele-Education mode of delivery is a potential viable ODL mode of delivery where African ODL institutions are committed to resolving the challenges associated with the recruitment of well trained and equipped Tele-Education attendants and the acquisition and reinforcement of technologies that will bring in sharper images through the waves.

Although respondents' responses suggested that nothing seems to be able to replace the human teacher, it was clear that learners acquired learning without hindrance associated directly to the operation of the Tele-Education mode of delivery except that which may be connected with the supply of the right technologies. Additionally the human teacher is not indispensable within the field of open and distance learning where the learning environment is continuously improved to support learning without the human facilitator.

8. Recommendations

The following recommendations flow from the study:

- Weekend or post-work hours classes have been overwhelmingly selected by learners as most appropriate. It is recommended therefore that the management of the Pan-African Tele-Education project should adjust its current beaming hours to accommodate this wish of the learners.

- This study has revealed that learners of open and distance learning institutions tend to come with specific educational and training needs in mind (e.g. those with high prospects for employment); this phenomenon offers a unique opportunity to ODL institutions to design and offer alternative courses to those offered by conventional tertiary institutions that have proven too rigid, bureaucratic, conservative and sluggish in responding to the learning challenges of the 21st century. This opportunity would have been seized when ODL institutions begin to engage with their potential clients with the view to seeking their views on their educational preferences and the reasons for such preferences; the analysis of those views will ultimately guide these institutions toward designing relevant learning programmes but also toward attracting to their gates, enthusiastic crowds of new types of learners.
- Ignorance of the existence of useful study skills and techniques by both ODL facilitators and learners currently constitute a menace to what would have otherwise been a noble contribution of open and distance learning to the educational field of Africa and the world. For example, as a result of lack of ability to manage their time effectively, learners drop out of study programmes in massive numbers; a number of them too who have the intellectual potentials to succeed, have failed as a result of poor study skill or habit. This is why it is here recommended that study skills courses should henceforth be made a part of the curricula of open and distance learning institutions.
- Since injecting into and coating lecture contents and deliveries with African realities will ultimately motivate learners to learn much better than previously, it is recommended that facilitators and course designers should make a deliberate effort to learn about African realities with the view to enriching their teaching and course contents.
- Without doubt, open and distance learning has now proved itself as an educational option that can no more be ignored on the African scene; that which is therefore expected at this point in time is the support of African governments to this emerging useful educational institution and option; government support may come in the forms of policies recognizing the value of ODL institution, material and financial support and study scholarship awards to learners.
- As a follow-up to government's support to open and distance learning institutions on the continent, relevant and competent institutions should intensify the training of specialised personnel in this emerging educational sector.
- In direct relation to the adoption of the Tele-Education mode, the training of specialised personnel should focus on the provision of competent Tele-Education attendants. Also, ODL institutions through the numerous African ICT regional and national initiatives should attempt to secure the right technologies with the view to profitably employing the Tele-Education mode for the further development of Open and Distance Learning in Africa.

Although challenges remain to overcome, by way of testimony of the good omen that ODL is, and as a way of appeal to all stakeholders to support this developing educational option, it should be submitted that the achievements this far recorded within the realm of open and distance learning in Africa are encouraging and highly motivating.

9. Conclusion

While a few notable achievements have been realised in the field of open and distance learning in Africa, this space still remains almost a virgin when one conceives of the boundless areas for intervention and the vast section of the space yet to be explored. The 21st century offers a lot of internal and external opportunities through which African nations may use open and distance learning as a tool for development.

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10. References

Abiodun, A. O. (2010) "A survey of students' perception of distance learning support-Implications for qualitative planning of distance education in Nigeria". *International Journal of Open and Distance Learning*. 3: 89-107

Adick, C. (1998) "Formal and informal basic education in Africa-complementary or competitive" EDUCATION 58:50-64.

Ambe-Uva, T. N. (2007) "National Open University of Nigeria (NOUN): A historical perspective and challenges" *Turkish Online Journal of Distance Education* 8, 1: article 6.

Anderson, C. A. (1966) Literacy and schooling on the development threshold in Anderson, C. A, & Bowman, M. J. (eds) 1966. *Education and economic development*. Chicago: Longman.

Arku, C. & Arku, F. S. (2011) "Development constructs and gender relations: Assessing rural gender relations within the context of dependency theory and globalistion *Journal of Peace Gender and Devlopkjent Studies* 1,2:28-33

Avenstrup, R. with Liang, X. and Nellemann, S. (2004) Kenya, Lesotho, Malawi and Uganda: Universal Primary Education and poverty reduction. Shangai: World Bank

Barasa, F. S. (2010) Promoting Open and Distance Learning in Africa: A critical reflection on thetoric, real and ideal . A paper presented at the Conference of Rectors, Vice- Chancellors and Presidents of African Universities, May-June, 2011, Stellenbosch, South Africa.

Babalola, J. B. (2007) Reinventing Nigerian higher education for youth employment in a competitive global economy. http://www.gracembipomfoundation.org2007

Bates, T. (2010) Distance education for teacher training in Africa http//www.tonybates.ca2010/03/29/distance.ed

Bello, P. (1988) "Learning theories and implications for adult learning" in Oyedeji, L. (ed) (1988) Copying with learning in adult years. Lagos: Joja Educational Publishers

Biao, I. (2010) Promoting ECOWAS Vision 2020 through higher education USA: Lambert Academic Publishing

Biao, I. (1995) "A comparative study of adult literacy education practices in Francophone and Anglophone West Africa" *International Journal of University Adult Education XXXIV,2:44-55.*

Biao, I. (1992) The place of remedial education in the supply of education in Nigeria. *Australian Journal of Adult and Community Education 32,1:42-50 .*

Blaug, M. (1966) "Literacy and economic development" *The School Review 74, 4:393-418.*

Combs, P. H. (1985) The world crisis in education: The view for the '80s Oxford: Oxford University Press

Cranton, P. (2000) Individual differences and transformative leraning in Mezirow, J. & Associates (eds) Learning as transformation: Critical perspectives on a theory in progress San Francisco, C.A.: Jossey Bass Inc. Publishers

DEASA Member countries of the Distance Education Association of Southern Africa. International Journal of Open and Distance Learning. 3: cover page.

Direction Nationale de Statistique (1992) Recensement 1992. Cotonou: Imprimerie Nationale

Dixon, K. (1987) Implementing Open Learning in local authority institutions,Further education Unit, London.

Dodds, T. (1973) INADES—A case study in Kabwasa, A. & Kaunda, M. M. (eds) (1973) Correspondence education in Africa London: Routledge & Kegan Paul Ltd.

Dodds, T. Nonyongo, E. & Glennie, J. (1999) Cooperation compettui or dominance: a challenge in Southern Africa in Harry, K. (1999)(eds) Higher education through Open and Distance Learning. London: Routledge

EAC (2011) The other Vision 2030 diplomateastafrica.com/index.php

ECOWAS (2009) ECOWAS vision 2020. http//www.ecowasvision2020

Federal Government of Nigeria (1974) Universal Primary Education blueprint in Nigeria Lagos: FGN

Garg, S. & Lephoto, M. (2009) "Technology in transforming learning and training within and beyond the four walls: Prospects for the National University of Lesotho". *Staff and Educational Development International 13, 3: 149-160*.

Gibson, C. C. (2008) From Chautauqua to correspondence to computers: Non-formal education in transformation in Evans, T. Haughey, M. & Murphy, D. (eds.) International handbook of Distance Education UK: Emerald Group Publishing Ltd.

Halsall, P. (1998) Internet modern history sourcebook http://africanhistory.about.com

Honeyman, M. & Miller, G. (1993) "Agriculture distance education: A valid alternative for higher education?" Proceedings of the 20th Annual National Agricultural Education Research Meeting: 67-73.

Hough, J. R. (1989) "Inefficiency in education: the case of Mali" *Comparative Education 25, 1:77-86*

Jeffries, M. (2011) Research in Distance Education http://www.ipse.org

Kabwasa, A. & Kaunda, M. M. (eds) (1973) Correspondence education in Africa London: Routledge & Kegan Paul Ltd.

Kamau, J. W. (2009) Re-training primary school teachers against diminishing resources: Is distance education the answer? http//portal.unesco.org/education/es/files/52552/117

Kisambira, E. (2008) Distance learning at Makerere University goes cellular www.elearning-africa.com

Kleijn, W. C., Ploeg, H. M. & Topman, R. M. (1994) "Cognition, study habits, test anxiety and academic performance" *Psychological Reports 75: 1219-1226.*

Lammers, W. J., Onweugbuzie, A. J. & Slate, J. R. (2001) "Academic success as a function of gender, class, age, study habits and employment of college students" *Research in the schools 8,2:71-81*

Merriam, S. & Caffarella, R. (1999) Learning in adulthood: A comprehensive guide. San Francisco, CA: Jossey Bass Publishers Inc.

Merriam, S. & Brokett, R. (1997) The profession and practice of adult education: An Introduction. San Francisco, CA: Jossey Bass Publishers Inc.

Mmari, G. (1999) The Open University of Tanzania in Harry, K. (ed.) (1999) Higher education through Open and Distance Learning. London: Routledge

Morris, A. (2011) What is correspondence education? http//www.ehow.aboutcorrespondenceeducation

Mpofu, S. T. and Amin, M. (2004) A survey of perceptions, delivery systems and funding of adult learning in Namibia. Windhoek: Department of Adult and Basic Education, Ministry of Education, Sport and Culture.

Nardulli, P. Peyton, B. & Bajjalieh, J. (2010) Gauging cross-national differences in education attainment: A 60-year look at global educational trends. Urbana-Champaign: Cline Center for Democracy University of Illinois.

National Population C omission (2006) Nigeria 2006 census Abuja: NPC

National Open University of Nigeria (2009) Programmes and strategies of NOUN Lagos: NOUN

NMEC (2004) Non-Formal Education Blueprint in Nigeria. Abuja: NMEC

Nyaruwata, L. T. (2011) Open and distance learning strengthening the space of higher education: Zimbabwe's challenges and experiences

Okebukola P. A. O. (2004) The State of Universities in Nigeria, Ibadan: Heinemann

Pan-African e-Network (2010) The Pan-African e-Network Project India-Addis-Ababa: AU-India.

Pityana, N. B. (2004) Open distance learning in Africa: Access Quality and Success. A paper delivered at the occasion of the establishment of the African Council of Distance Education in Pretoria, 2004.

Preece, J. & Biao, I. "Community service as open learning: case of ITMUA (Implementing the Third Mission of Universities in Africa)" aau.org/papers/COREVIP'11/biao_idowu_Promoting_ODL.pdf

Reasoner, R. W. (2010) Review of self-esteem research http://www.self-esteem-international.org/content/5.research.htm

Robiquet, P. (1897) Discours et opinions de Jules Ferry Paris: Armand Colin & Cie

Rowntree, D. (1992) Exploring Open and Distance learning London: Kogan Page Ltd.

Rumajogee, R., Jeeroburkhan, F., Mohadeb, P. & Mooneesamy, V. (2003) Case study on distance education for teacher education in Mauritutius http//www.adea.biennialmeeting.doc4.2003

SADC (2011) Southern African Vision 2030 www.sadc.vision.2o3o

Tilak, J. B. G. (2009) Financing higher education in Sub-Saharan Africa http://www.gracembipomfoundation.org2009

Thompson, A. R. (1981) Education and development in Africa London: The Macmillan Press Ltd.

UNDP (2010) Human Development Index *http://hdr.undp.org/en/statistics*

Watkins, B. & Wright, S. (1991) The foundations of American Distance Education: A century of Collegiate Correspondence Study. Dubuque, Iowa:Kendal/Hunt Publishing Co.

Webometrics (2011) Ranking web of world universities www.webometrics.info/top100continent

Wikipedia (2011) University of Zimbabwe en.wikipedia.org/wiki/universityofzimbabwe

Wikipedia (2011). Ujamaa. en.wikipedia.org/wiki/Ujamaa

Wikipedia (2011) University of South Africa en.wikipedia.org/wiki/universityofsouthafrica

World Bank (1988) Education in Sub-Saharan Africa Washington DC.: WB

Chapter 3

Bridging the Distance: The Pedagogy of Mobile Learning in Supporting Distance Learners

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Additional information is available at the end of the chapter

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1. Introduction

The challenge of the University of South Africa (UNISA), as the largest distance education institution in Africa, is to come up with innovative ways of supporting students who are not only geographically isolated from their teachers as sources of information, but also separated from their peers as sources of support. The effects of such isolation on distance learners can inhibit any possibility for engagement with teachers, study material and peers[1]. In distance education, the educational process is usually reduced from a dialogue to a monologue where a teacher sends out study material to the students. The assumption is that distance learners, do not need mediation or support as they go through their study material. Thorpe[2] argued that "course materials prepared in advance of study, however learner-centred and interactive they may be, cannot respond to a known learner". One of the main barriers of learning in distance education is the absence of interaction with other human beings in a learning environment. For these students, learning is most successful when people interact with each other through interrogating and sharing their description of the world[3]. Mediated Interaction is central to any educational experience irrespective of whether the students are studying through distance or not[4]. The problem arises when interaction between a lecturer and a student is not as constant as that which exists in a conventional face-to-face situation. The incorporation of mobile technologies, such as cell phones, in education can address this need because they can enable interaction between a student and the lecturer, as well as between a student and her or his peers.

The key to the successful enactment of interaction in distance education, according to Evans and Nation[5] does not rest with the way the course is designed, delivered and assessed or on the media used, "but it rests on the philosophy of distance education which informs the decisions about techniques and technology" (p154) that supports and enhance interaction in distance education. The idea of using cell phones for education is premised on building on

informal learning that most students are familiar with to develop formal learning opportunities for distance education students. The potential for using cell-phones in bridging the distance is enormous in a country of limited access to electricity and telephone networks; poor roads and postal services; and fewer people who have expertise of using computers. These limitations have lead to the rapid growth of wireless technology. Over the last ten years, cell phone users in Africa have increased at an annual rate of 65% - twice the global average[6]. In South Africa alone, the cell phone penetration is estimated at 98 percent. More than 90 percent of UNISA students own or have access to a cell phone that can be used in education for collaboration, tutoring, research, reading and writing purposes.

Although many technologies have been used in the past to enhance interaction in distance education, Keegan[7] argues that "it is not technologies with inherent pedagogical qualities that are successful in distance education, but technologies that are generally available to citizens" p3. Throughout the history of distance education, researchers and theorists have been involved in finding ways to bridge the distance between the students, their lecturers and their peers. Using cell phones is much more suited in supporting distance learning because it can reach those students who do not have access to other technological devices. A recent survey found that 39% of urban South Africans and 27% of rural residents are now browsing the internet from their cell phones[8]. Cell phones are more accessible to most rural communities in terms of cost, geographic coverage and ease to use.

The aim of this paper is to investigate the pedagogic approach that best support effective use of cell phones in the distance education context. It will draw on the integration of the distance education theories to argue for the principles that guide pedagogy and practice in using cell phones for the purpose of supporting distance education students. In this paper, distance education pedagogies will be mapped according to Moore's student-student; student-content and student-student interaction principles. Interaction is meant to provide cognitive, affective and systematic support to students in an education environment[9]. The success of any distance education system is based on three principles: "excellent (learning) and teaching material, high quality student support services and efficient logistical systems"[10] p218. Out of these three areas, student support services are widely considered as critical in the success of distance education programmes. Studies have shown that proper provision of student support services may break learners' isolation and meet not only the academic demands of students in distance education but also their social needs [11,12,13].

2. Context of student support at UNISA

Central to student support is a mediated conversation between the students and the teacher through integrated and structured dialogue in the study material and in other interventions aimed at formative development of a student[14,15]. The issue of limited student support as problematic in distance education was highlighted in several South African policy documents[16,17]. The student support programmes that are in place at UNISA appear to support limited number of students who live in select urban areas, thereby neglecting the majority of the student body who live in rural areas. In most cases, the student services are

in the form of face-to-face tutorials that are optional and depends on the number of students who take the initiative to organise contact sessions.

The challenge of UNISA is to identify mechanisms and intervention strategies that can support its 280 000 students who are dispersed in different parts of the country, the continent and the world. Students, no matter how far they are from the institution, need to be involved as active partners in the learning process. By and large, distance education requires and assumes that autonomous students do not need help from their lecturers. Students will always need guidance about course choice, study skills, access to group learning in informal small groups or tutorials offered by their lecturers[18]. The concept of learner autonomy as espoused by Wedemeyer is incongruent with the type of learning that most students are familiar with. A majority of students who enrol in distance education programmes came into higher education with expectations of past schooling where learning was directed and controlled by the teacher. When they are thrown into distance learning, where they are expected to work alone, they feel lonely, insecure and alienated. This problem is further exacerbated by the fact that many distance education students do not study through the medium of their first language. Although a majority of them choose to study in English, they lack fluency in the chosen language to cope adequately with academic work.

To address these concerns, UNISA has a network of community learning centres that provide a place where people can meet, attend weekly classes, participate in discussion groups, study, pick up books and other materials for learning. Unfortunately, students, who live in remote rural areas to not have access to these services because most of the learning centres are located in urban areas. Where it is not possible to offer face-to-face tutoring, tele-tutoring video, and computer-conferencing with lecturers is also used as well to support a two-way communication between the teacher and the learner. UNISA is also using Learning Management System - MyUnisa, to provide interaction and technological resources that supports all areas of teaching and learning. The multimedia approach that UNISA uses is much more effective than using one method of delivery. Despite well-meaning efforts of distance education providers, a majority of students still find it extremely difficult to adjust to and succeed in distance education.

An effective student support service in distance education is characterised by responsiveness to students' needs, that is, it personalises the learning process; it encourages and facilitates interaction between students and stakeholders; it facilitates learning within courses and "it evolves continuously to accommodate new learner populations, educational developments, economic conditions, technological advances and findings from research and evaluations"[19]p45. The emphasis, according to Thorpe[20], is on the student needs not on the content of the study material. Simpson[21] describes student support in terms of its activities beyond the production and delivery of course material. He divides student support services between academic and non-academic support. The former is concerned with developing cognitive and learning skills whereas the latter deals with the affective and organisational aspects of students' studies. The purpose of student support in distance education is to meet the needs of all learners[22].

The distance education character of individual form of learning and the absence of communication is a challenge for both students who need help and lecturers who want to assist students in cognitive development. Thorpe[23] believes that the quality of the interactivity between a student and his peers, a student and his teacher, and a student and his or her counsellor may enhance and even influence reactions to study. Keegan[24] argues that the incorporation of mobile learning can afford new opportunities for teaching and supporting students in distance education. Cell phones can be used to facilitate both synchronous and asynchronous communication to support and facilitate the process of interaction between individuals and groups in distance education context.

3. Theories of interaction in distance education

Interaction, according to Anderson[25] is the core of the educational experience. Without interaction, teaching becomes simply "passing on content as if it were dogmatic truth"[26] p 29. The nature of distance education compels providers to use mediated forms of this interaction to support their students. This enables students to communicate with their lectures and talk with each other in an effort to understand the course content. Interaction, according to Anderson[27], occurs when objects, events and people mutually influence one another. Through interaction, people become involved in a community of practice which embodies certain beliefs and behaviours to be acquired[28]. Vygotsky[29] argues that social interactions are methodologies that turn experience into knowledge, with language as a medium for negotiation of teaching and learning. Therefore, students' development is determined by social interaction through problem-solving under the guidance of a teacher or in collaboration with capable peers Vygotsky[30].

To understand how cell phones can be used for pedagogic purposes, it is important to look at interaction on the efficacy of distance learning. The main focus of the learning process should be based on a particular theory or theories that help to explain the functioning of people and institutions. Each theory of learning leads to an adoption of specific teaching and learning process. It is this regard that theories of distance education will be looked at in terms of supporting distance students. Keegan[31] classified theories of distance education into three groups: theories of independence and autonomy, theories of industrialization of teaching, and theories of interaction and communication. This study will focus on those theorists that dealt specifically with the role of communication or interaction in supporting distance students.

The character of good distance education, according to Holmberg[32], "resembles that of a guided conversations aiming at learning and that presence of the typical traits of such conversation facilitates learning." He argues that the study material that is developed with good didactic conversation in it should be written in a personal style; easily accessible; offer explicit advice and suggestions and invite exchange of views. The idea is to establish a personal relationship with the students and course developer and "find ways to non-contiguously cater for something functioning in the way that dialogue does"[33]p17.Central to student support is a mediated conversation between the students and the teacher through

integrated and structured dialogue in the study material and in other interventions aimed at formative development of a student. Iinteraction between the tutor and the student was done through student sending a completed assignment to the teacher who marks it and sends it back with comments and feedback. This system assumes that students have the ability to work through the study material independently. However, studies have shown that students seem to value contact with other people even when they study at a distance[34;35;36].

Holmberg[37] argues that the conversation concept can be successfully translated for use by the media available to distance students. Although the simulated conversation brought about by the presentation of the study material, the real or two-way conversation could be done through the written, personal and telephone interaction between the students and the tutors and others belonging to the supporting organisation. Keegan[38] defined distance education as a system characterized by 1) the separation of instructor and student during most of the instructional process, 2) the influence of an educational organization, 3) provision of student assessment, 4) use of educational media to deliver course content, and 5) two-way communication between instructor and student.

Moore[39] defines this distance in terms of the responsiveness of an educational program to the student rather than in terms of the physical separation of the instructor and the student. He argues that distance education, not only a geographic separation between the teachers and the learners, is a pedagogic concept. This separation affects the patterns of teacher and student behaviour. In this separation there is a "psychological and communications space to be crossed, a space of potential misunderstandings" between instructors and students who are physically separated[40]p22. It is in this space, that Moore describes as transactional distance, where the structure of the educational program and the quality of the interaction between the teacher and the student determines academic performance.

In his theory of transactional distance, Moore[41], argued for the relationship between dialogue (the interaction that occurs when one gives instruction and the others respond), structure (teaching strategies and evaluation methods), and learner autonomy (the ability of the student to take responsibility of his or her learning). Transactional distance tends to be lessened in courses with high levels of dialogue and little predetermined structure because students receive ongoing guidance from instructors. But where there is a high structure and low dialogue, the responsibility of learning is on the students. Moore believed that interaction should be both unidirectional and bi-directional in distance education. It should serve a variety of purposes including encouraging interaction between student and content; student and student; and student and lecturer. "Deep and meaningful formal learning is supported as long as one of the three forms of interaction (student-teacher; student-student; student-content) is at a high level"[42].

Anderson and Garrison[43] took Moore's types of interaction a step further by including the teacher-teacher, teacher-content and content-content interaction. They argued that teaching and learning is not only about students, it also includes other forms interaction that takes place in distance education. This model presents a shift from focusing on the student to

looking at the entire distance education system[44]. While Moore looked at interaction from a students' point of view, Anderson focused on the educational phenomenon of interaction from the multiple-perspectives. In developing this framework, Anderson was seeking to clarify the costs between independent-oriented and interactive-oriented learning strategies and activities. "He stressed the importance of cost and sustainability as well as pedagogical value in choosing appropriate mixes of interaction"[45]. From Anderson model, it is clear that there are many types of actors (both human and inanimate) and a variety of interactions

Most of the interaction that takes place in the distance education environment is often mediated by technologies. In introducing the fourth type of interaction, learner-interface interaction, Hillman, Willis, and Gunawardena[46] argue that student should have the skills and the necessary competencies that will give confidence in operating the mechanisms of the delivery system before they can successfully interact with content, the lecturer and other students. "What is known lies in the interaction between individuals and artefacts, such as computers and other technological devices"[47]p30. The successful implementation of learner-interface interaction, according to Hillman et al.[48]requires the student "to operate from a paradigm that includes understanding not only the procedures of working with the interface, but also the reasons why these procedures obtain results"p34. It is therefore important that students understand why they are using cell phones in an educational environment in order to interact successfully with content, lecturers and peers.

The use of technology is an essential component of supporting two-way communication in the education transaction[49]. The mediating role of information and communication technologies such as cell phones places the student at the centre of learning. Garrison's concept of learner control is based on the students' "ability to influence and direct a course of events"[50]p27 within a distance education environment. He believes that a two-way communication can only be sustained if students are also in control of the educational transaction. In this context, according Garrison[51], a student assumes responsibility for constructing meaning is an interactive environment. Mobile learning, by nature tends to ascribe to the student-centred approach which aims to develop in each student a sense of responsibility for his or her own learning by focusing on individual student's experiences, perspectives, background, interests, capabilities and needs. Garrison's[52] concepts of dialogue, structure and control are central to his two-way communication framework.

These selected theorists were concerned with explaining the functioning of the concept of interaction in enhancing and supporting learning in distance education. This shows that the potential to use cell phones in facilitating interaction is enormous and can be used in a variety of ways. Cell phones can be used as a tool to provide both synchronous and asynchronous support to learning. Cell phone social networks such as MXit can be used to facilitate the process of real-time communications between individuals and groups[53;54]. These devices can also be used by the teacher to stimulate discussion amongst students by sending a question via SMS. The idea is to find an accessible and available technological tool that can be used to support South African distance education students.

Theoretical framework	Main characteristics	Pedagogical focus
Guided didactic conversation[55].	Conversation character of the written pre-produced course package Real and simulated conversation	Study material should be written in a personal style; easily accessible; offer explicit advice, suggestions and invite exchange of views. Mediated conversation facilitates the development of learning relationships between the lecturer and the student
Transactional distance [56;57;58].	Dialogue – two-way communication; interaction Structure - teaching strategies and evaluation methods Learner autonomy Learner-interface interaction	Learner – lecturer :The lecturer provides an organised curriculum to ensure that the student masters the content Learner – learner: Students form peer support groups Learner-content : Student reads a book, views or listens to DVDs and CDs and interacts with inanimate learning resources. Learner-interface: interaction between the student and the technologies used to deliver the instruction
Two-way communication [59].	Dialogue, Learner Control Two-way communication	The course is designed and developed using networks of diverse mobile applications to support two-way communication. Students are empowered to control process of learning
Equivalency Theorem [60].	Interaction from the multiple-perspectives including teacher-teacher, teacher-content and content-content interaction. Costs of interaction	Focus is on the entire distance education system that includes interaction within the content and among teachers, course developers, instructional designers, administrators etc.

Table 1. Pedagogical focus of theories of interaction

4. Implication for practice

All these theories that have been mentioned in this study were trying to provide direction and new approaches that can be used to bridge the distance associated with the correspondence nature of distance education. Distance education has always been challenged by the problem lack of communication in the education transaction. Therefore, the distance education theory "must reflect purposeful and spontaneous nature of an educational experience"[61]p2. Many theories which looked at the challenge of interaction in distance education agreed that students need to be supported both cognitively and affectively through mediated technologies and face to face intervention. An effective student

support services in distance education should address student needs as they first enquire about the courses to studying (independently or assisted) and finally to graduating. During this process student support resources should be geared towards supporting students':

- Cognitively – by developing study materials through mediation.
- Affectively – by providing an environment which supports students, that creates commitment and that enhances self-esteem.
- Systematically – by establishing administrative and information management systems that are effective, transparent and student friendly[62]p289.

In distance education, students are physically, emotionally and socially separated from the institution. To help us address this challenge, the analysis in this study will use Moore's concepts of student-content interaction; student-lecturer interaction; and student-student interaction as a guiding framework to suggest how cell phones can be used to support students cognitively, affectively and systematically. The aim is to find the best pedagogical principles, that is, strategies, techniques and styles used to assist distance education students to learn[63]. Anderson and Dron[64] describe the usage of technologies and pedagogy as the two being intertwined in a dance: "the technology sets the beat and creates the music, while the pedagogy defines the moves". This means, according to Anderson[65], technology can influence the type of pedagogy that fit into a specific model that a technology can support. The availability of technologies to support different models of learning strongly influences what kinds of models can be developed. The nature of mobile technology is such that it has the ability to support situated learning which a critical component of social interaction is[66]. Effective mobile learning provides a platform where students can access relevant information while studying collaboratively. The technology – the cell phones affordances encourages the development of pedagogies that support collaborative learning.

5. Student-content interaction

Studying through printed media will remain one of the main medium of instruction in most developing countries such as South Africa. The pre-produced self-contained study materials are developed with an explicit understanding that they facilitate access to learning. Holmberg[67] argues that the study material that is developed with good didactic conversation in it should be written in a personal style; easily accessible; offer explicit advice and suggestions and invite exchange of views. Traditionally, students go through pre-packaged and submit assignments and the lecturer provides feedback though tutorial letters and marked assignments. In recent times, different technologies have been used to enhance student-content interaction through automated testing, simulations and computer assisted instruction. These methods of independent study are meant to maximise student-content interaction.

In distance education, Holmberg[68] believed that course material should be developed in such a way that the conversation is internalised and the "student will be more motivated and more successful than if the course studies has an impersonal textbook character" The idea is to facilitate access to conversation which is meant to support motivation. To ensure

that students do not feel left out, study materials and assignments should be designed in such a way that students are encouraged to analyse, summarise and draw conclusions on the content of the study material[69]. He believes that self-check exercises as well as frequent submission of assignments and extensive feedback increase motivation.

5.1. Supporting student cognitively

Cell phones can also be used to enhance student-content interaction through weekly self-assessment quizzes. Through these quizzes students can test themselves on basic factual information. This will also encourage students to pace themselves as they go through their study material. Cell phone downloadable audio files can also be utilised to add a voice and provide a narrative to the content. The combination of printed study material, cell phone based self-assessment quizzes and audio can guide a student through the maze of learning while assisting them to pace themselves.

5.2. Supporting students affectively

Since cell phones offer support that is immediate, convenient and personal, most students tend to look forward to receiving messages from their lecturers and the university. In a study conducted by Nonyongo[70] and collegues, UNISA students remarked that receiving SMS feedback on the content of the material made them feel that someone cares and they belong to the institution. Traxler and Dearden[71] used SMSs to deliver content such as hints, tips, revision etc. as well as to remind Kenyan teacher education students about their assignments and assessments.

5.3. Supporting students systematically

The issue of the geographic distance was reported as problematic by most of UNISA's distance education students, especially those who live in rural remote parts of South Africa. Most of them felt that they are physically cut-off from the university's resources. They have problems contacting administrative staff, obtaining study materials and borrowing library books. To address this problem, the University of Pretoria in South Africa used cell phone asynchronous academic intervention systems such as Instant Voice Response (IVR) system through which "students can phone a Frequently Asked Question (FAQ) number and receive answers from a pre-programmes system" [72]p225. Through these systems, students' administrative questions were answered. The University of Pretoria also use a cell phone system that enables students to register[73].

6. Student – lecturer interaction

The role of the lecturer in any education transaction is to encourage students through asking questions, correcting misperceptions, offering assistance, stimulating discussion and utilising technology to communicate. In distance education, the student-lecturer interaction is generally low. The lack of contact and limited feedback from their lecturers is of great concern for

distance education students. Most of them do not have the confidence to learn independently and a result they have trouble in self-evaluation. To encourage two-way communication, a variety of technologies such as telephones, computers, electronic mails have been integrated into the delivery of the study material to provide the missing interactivity[74]. It was reported that the direct student and lecturer conversation through telephones and computers have been used successfully in most developed countries. However, the lack of access to technologies such as computers and telephones was attributed as the reason why these technologies are not adopted for teaching and learning purposes in most developing countries including South Africa. By so doing, they ignore thousands of mobile technological devices that are in the pockets and schoolbags of thousands of students.

Students need some kind of contact with their lecturers as they learn. The portable nature of mobile technologies enables students to learn anywhere, anytime and at any place thus enabling them to contact their lecturer anytime they feel the need for support[75]. Mobile technologies by nature ascribe to student centred approach which empowers students and enhances lecturer's ability to clarify and challenge students ever changing base of knowledge. In this approach, the lecturer's role shifts from the custodian of knowledge to the facilitator of information.

6.1. Supporting students cognitively

Cell phones can be used as a tool to facilitate dialogue through synchronous and asynchronous learning. The lecturer can send questions to students via different types of cell phone messaging systems, i.e. twitter, MXit, WhatsUp, SMS etc. Through the development of the concept of mobile audio Wikipedia, Ford and Leinonen[76] used SMS and text-to-speech technologies to enable access to information using voice. Students who participated in this study were able to capture information; take photos; compile slide presentation; record and store information. These tools allowed students to interact with their lectures using multiple formats that cell phones have to offer. These formats can enable students to work on activities within the study material and briefly send a message to the lecturer reporting on how he or she went about doing the assignment.

6.2. Supporting students affectively

The use of cell phones in education offer offers a more interactive education encouraging critical thinking, communications skills, and flexibility for both students and teachers. Students need lecturers to help them complete courses on time and support them when stress becomes a problem[77]. This problem can be mitigated through motivational SMS messages. In distance education, there is strong correlation between care and learner motivation. To keep students motivated, lecturer should send students feedback almost immediately because students rely on lecturers comments on their assignments.

Many students have doubts about their capabilities of knowing whether or not they are on the right track, feedback, especially the one they receive almost immediately motivates them and gives them strength to continue. Motivation is also affected by the comments made by

their lecturers. To address this challenge of feedback, comments can be sent to individual students through SMS texting. Students can also be encouraged to use different types of platforms to communicate with the lecturer. A lecturer can periodically post a topic for discussion and assist students as they go about with their learning. Distance education need to feel the presence of the lecturer. When the lecturer send information via personal and situated devices such as cell phones, students feel supported, they develop a positive relationship with their lecturers and the university and they find learning more pleasurable and this in turn supports their motivation.

6.3. Supporting students systematically

In distance education, lecturers are expected to provide an organised plan and curriculum and communicate with the students via tutorial letters, emails and telephonically throughout the process of learning. To ensure that students are engaged in this process, a lecturer can encourage students through assessment exercises which can be sent to the university and be automatically marked and the results could be sent back to students through cell phones. This immediate and personal feedback is possible through the use of cell phones. Lecturers, on the other hand, could go through the students' responses and identify the problem areas that may need more clarification. The university can also develop a variety of cell phone applications to enhance feedback to students.

7. Student-student interaction

To most students, learning is a social process whereby a student feels the need to interact with fellow learners. This is significant in the learning process because the student need to be active in learning interaction in collaboration with other people. To address the problem of isolation, most UNISA students reported that they belonged to informal study groups even though this is neither encouraged nor discouraged by the university. It is in these study groups that students adopt a communal approach to learning by sharing responsibility for reading and explaining course material[78]. Through these groups "students can feel immediate identification with others in their group and so lose feelings of isolation and over anxiety" [79]p84. In most African cultures, group interaction is a strong factor determining values and social interaction. It is in these study groups that students adopt a communal approach to learning by sharing responsibility for reading and explaining course material[80]. The notion of helping each other is based on the South African traditional concept of '*ubuntu*' meaning "humanity to others" which espouses collectivity and harmony. Learning in support groups is embedded in cultural beliefs and practices. That's why these students become extremely lonely when they are expected to learn independently.

7.1. Supporting students cognitively

To help the informal study groups to become self-sustaining, cell phone social networks such as MXit can be used. This instant messaging application was used successfully to facilitate the process of real-time text chat between students. Through this network students

were able to work together on projects and assisted each other[81]. The use of MXit is uniquely situated to support distance education students because they are already familiar with it. Lecturers can post a topic for discussion amongst students via SMS and students can get into MXit and work together on a problem or discussion.

7.2. Supporting students affectively

Through this network, students formed study groups where they were able get together, engage in joint activities and discussions, help each other share information about the course. Communities develop their practice through problem solving, requests for information, coordination and discussing developments, mapping knowledge and identifying gaps. People engage in the communities of practice to interact with each other and learn together [82]. It is through collaborative activities that students adopt a communal approach to learning by sharing responsibility for reading and explaining course material[83].Through peer support groups, students are more likely to be motivated to share their work with each other. When students are in control of their learning, they are able to link up with other students as illustrated above to form collaborative learning networks. Mobile learning facilitates this process through building communities of learners who are committed to work together to achieve a goal. By so doing, "students were able feel immediate identification with others in their group and so lose feelings of isolation and over anxiety"[84]p365.

7.3. Supporting students systematically

Universities may do well by facilitating the process of helping students form study groups through social networks that are developed by the university. They can also ask students to send in their profiles so that they can link them up with other students. The advantage of the social network, students do not have to be at the same location or in close proximity with each other.

8. Conclusion

Despite several studies that proved that mobile learning can be used to enhance learning, the use of these devices should not be seen as a panacea to support distance students. The success of using this technology should be based on its affordances, that is, its ability to enhance interaction in education. The multimedia functionality of cell phones and its simpler and user-friendly interface make cell phone easier to be used by people who may be uncomfortable with using other technologies such as computers. However, cell phones' limited ability to carry large chunks of information due to screen size can make it impossible to support certain types of pedagogies. Despite this limitation, young people are already inventing ways to use their phones to learn. It is this enthusiasm from young people that we need to exploit for the benefit of supporting distance education students. Therefore, cell phones should not be used on their own as a delivery tool for study material, they should be used to support printed study material, online learning and other forms of teaching

resources. Besides being affordable and accessible, the use of cell phones can provide opportunities for support in distance education context. The incorporation of cell phones in education can afford new opportunities for teaching and supporting students in distance education especially in developing countries such as South Africa. The biggest challenge of distance education institutions is to come up with ways in which teachers can be empowered with the necessary skills in order to fully utilise the affordances of mobile technologies to engage and support students in the learning processes.

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9. References

[1] Simpson O. (2002) Supporting student in online, open and distance learning. Kogan Page, London.

[2] Thorpe M. (2001). Rethinking Learner Support: the challenge of collaborative online learning, A paper presented at SCROLLA Symposium on Informing Practice in Networked Learning, Glasgow, 14 November 2001. Cited March 20, 2008. Available from http://www.scrolla.ac.uk/papers/s1/thorpe_paper.html

[3] Sharples M.(2002) Disruptive devices: mobile technology for conversational learning, International Journal of Continuing Engineering Education and Lifelong Learning, 12(5/6), 504-520

[4] Garrison R. (2000). Theoretical challenges for distance education in the 21st century: A shift from structural to transactional issues.International Review of Research in Open and Distance Leaming, 7(1). Cited March 20, 2008, Available from http://www.irrodl.org/content/v 1.1 /randy.html

[5] EvansT. D., Nation D. E. (1989). Critical reflections in distance education. In T. D. Evans & D. E. Nation (Eds.),Critical reflections on distance education (pp. 237–252). Brighton: Falmer Press.

[6] Rao M. (2011). Mobile Africa Report: Regional Hubs of Excellence and Innovation, Mobile Monday. [cited December 20, 2011] Available from http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf

[7] Keegan D. (2005). The incorporation of mobile learning into mainstream education and training, proceedings of the 4th World Conference on Mlearning, Cape Town, 25-28 October [cited 2January 25, 2008] Available from http://www.mlearn.org.za/CD/papers/keegan1.pdf,

[8] Rao, M. (2011). Mobile Africa Report: Regional Hubs of Excellence and Innovation, Mobile Monday. [cited December 20, 2011], Available from http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf

[9] Tait A. (2003). "Reflections on Student Support in Open & Distance Learning", International Review of Research in Open and Distance Learning, vol. 4, No1, p.2-8.

[10] Rumble, G. (2000). Student support in distance education in the 21st century: Learning from service management, Distance Education, 21(2), 216-235.
[11] Brindley J.E., Paul R. (2004). The role of learner support in institutional transformation - A case study in the making. In J. E. Brindley, C. Walti, & O. Zawacki-Richter (Eds.), *Learner support in open, distance and online learning environments,* Oldenburg: Bibliotheks- und Informationssystem der Universität Oldenburg: 39-50.
[12] Rumble G. (2000). Student support in distance education in the 21st century: Learning from service management, Distance Education, 21(2), 216-235.
[13] Tait A. (2003). "Reflections on Student Support in Open & Distance Learning", International Review of Research in Open and Distance Learning, vol. 4, No1, p.2-8.
[14] Holmberg B. (1983). Guided didactic conversation in distance education. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance Education: International Perspectives (p. 114-122). New York: St. Martin's Press.
[15] Thorpe M. (2001). Rethinking Learner Support: the challenge of collaborative online learning, A paper presented at SCROLLA Symposium on Informing Practice in Networked Learning, Glasgow, [cited 14 November 2001], Available from http://www.scrolla.ac.uk/papers/s1/thorpe_paper.html
[16] Department of Education (DoE) (1998) Criteria for quality distance education in South Africa: Policy statement, Pretoria, Centre for Educational technology and Distance education
[17] Council on Higher Education (CHE) (2004). Enhancing the contribution of distance higher education in South Africa, Pretoria, Council on Higher Education
[18] Thorpe, M. (2001). Rethinking Learner Support: the challenge of collaborative online learning, A paper presented at SCROLLA Symposium on Informing Practice in Networked Learning, Glasgow, [cited 14 November 2001], Available from http://www.scrolla.ac.uk/papers/s1/thorpe_paper.html
[19] Brindley J.E., Paul R. (2004). The role of learner support in institutional transformation - A case study in the making. In J. E. Brindley, C. Walti, & O. Zawacki-Richter (Eds.), *Learner support in open, distance and online learning environments,* Oldenburg: Bibliotheks- und Informationssystem der Universität Oldenburg: 39-50.
[20] Thorpe, M. 2001. Rethinking Learner Support: the challenge of collaborative online learning, A paper presented at SCROLLA Symposium on Informing Practice in Networked Learning, Glasgow, [cited 14 November 2001], Available from http://www.scrolla.ac.uk/papers/s1/thorpe_paper.html
[21] Simpson O. (2002) Supporting student in online, open and distance learning. Kogan Page, London.
[22] Thorpe, M. (2001). Rethinking Learner Support: the challenge of collaborative online learning, A paper presented at SCROLLA Symposium on Informing Practice in Networked Learning, Glasgow, [cited14 November 2001], Available from http://www.scrolla.ac.uk/papers/s1/thorpe_paper.html
[23] Thorpe, M. (2001). Rethinking Learner Support: the challenge of collaborative online learning, A paper presented at SCROLLA Symposium on Informing Practice in Networked Learning, Glasgow, [cited14 November 2001], Available from http://www.scrolla.ac.uk/papers/s1/thorpe_paper.html

[24] Keegan D. (2005). The incorporation of mobile learning into mainstream education and training, proceedings of the 4th World Conference on Mlearning, Cape Town, 25-28 October [cited 2January 25, 2008] Available from http://www.mlearn.org.za/CD/papers/keegan1.

[25] Anderson, T. (2010). Interactions Affording Distance Science Education. In D. Kennepohl & L. Shaw (Eds.), *Accessible Elements: Teaching Science Online and at a Distance* (pp. 1-18). Edmonton: Athabasca University Press. [cited March 2012] Available from http://www.aupress.ca/books/120162/ebook/01_Kennepohl_Shaw_2010-Accessible_Elements.pdf

[26] Garrison, D. R., Shale, D. (1990). Education at a Distance: From issues to practice. Melbourne, FL.: Krieger.

[27] Anderson, T. (2010). Interactions Affording Distance Science Education. In D. Kennepohl & L. Shaw (Eds.), *Accessible Elements: Teaching Science Online and at a Distance* (pp. 1-18). Edmonton: Athabasca University Press. [cited March 2012] Available from http://www.aupress.ca/books/120162/ebook/01_Kennepohl_Shaw_2010-accessible_Elements.pdf

[28] Lave, J.,Wenger, E. 1991. Situated Learning, Legitimate Peripheral Participation, Cambridge, Cambridge University Press

[29] Vygotsky L.S. (1930/1978). Mind in Society: The development of higher psychological *processes*. Cambridge, M.A. Havard University Press

[30] Vygotsky L.S. (1930/1978). Mind in Society: The development of higher *psychological processes*. Cambridge, M.A. Havard University Press

[31] Keegan, D. (1986) Interaction and communication, (Chapter 6, pp.89-107). In Keegan, D., Thefoundations of distance education. Kent,UK.: Croom Helm.

[32] Holmberg, B (1983). Guided didactic conversation in distance education. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance Education: International Perspectives (p. 114-122). New York: St. Martin's Press.

[33] Holmberg B (1983). Guided didactic conversation in distance education. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance Education: International Perspectives (p. 114-122). New York: St. Martin's Press.

[34] Rumble G. (2000). Student support in distance education in the 21st century: Learning from service management, Distance Education, 21(2), 216-235.

[35] Tait, A. 2000. Planning student support for open and distance learning, Open Learning, 287-298.

[36] Thorpe, M. (2001). Rethinking Learner Support: the challenge of collaborative online learning, A paper presented at SCROLLA Symposium on Informing Practice in Networked Learning, Glasgow, [cited 14 November 2001], Available from http://www.scrolla.ac.uk/papers/s1/thorpe_paper.html

[37] Holmberg, B. (1989). Theory and Practice of Distance Education. London: Routledge.

[38] Keegan, D.J. (1980). On defining distance education. Distance Education, 1(1): 13–36

[39] Moore, M.G. (1993). Theory of transactional distance, in D. Keegan (ed), *Theoretical* Principles of Distance Education, Routledge, London, 22-38.

[40] Moore, M.G. (1983). The individual adult learner. In . In Adult Learning and Education, ed. M. Tight, 153-168. London: Croom Helm.

[41] Moore, M.G. (1983). The individual adult learner. In . In Adult Learning and Education, ed. M. Tight, 153-168. London: Croom Helm

[42] Anderson, T. (2003). Getting the mix right: An updated and theoretical rationale for interaction. *International Review of Research in Open and Distance Learning, 4*(2) [cited April 10, 2008]. Available from http://www.irrodl.org/index.php/irrodl/article/view/149/708.

[43] Anderson, T.,Garrison, D.R. (1998). Learning in a networked world: New roles and responsibilities. In C. Gibson (Ed.), Distance Learners in Higher Education. (p. 97-112). Madison, WI.: Atwood Publishing.

[44] Anderson, T.,Garrison, D.R. (1998). Learning in a networked world: New roles and responsibilities. In C. Gibson (Ed.), Distance Learners in Higher Education. (p. 97-112). Madison, WI.: Atwood Publishing.

[45] Anderson, T. (2010). Interactions Affording Distance Science Education. In D. Kennepohl & L. Shaw (Eds.), *Accessible Elements: Teaching Science Online and at a Distance* (pp. 1-18). Edmonton: Athabasca University Press. [cited March 2012] Available from http://www.aupress.ca/books/120162/ebook/01_Kennepohl_Shaw_2010-Accessible_Elements.pdf

[46] Hillman, D.C. A.; Willis, D.J. and Gunawardena, C.N. (1994) Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners, American Journal of Distance Education 8(2) 3-15.

[47] Dabbagh N. (2005) Pedagogical models for e-learning: a theory based design framework. International Journal of Technology in Teaching and Learning, v.1, n.1, p.25-44.

[48] Hillman, D.C. A.; Willis, D.J. and Gunawardena, C.N. (1994) Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners, American Journal of Distance Education 8(2) 3-15.

[49] Garrison, D. R. (1989). Understanding distance education. New York: Routledge.

[50] Garrison, R. (2000). Theoretical challenges for distance education in the 21st century: A shift from structural to transactional issues. International Review of Research in Open and Distance Leaming, 7(1). Available from http://www.irrodl.org/content/v 1.1 /randy.html arrison, D. R. (1989). Understanding distance education. New York: Routledge.

[51] Garrison, D. R.,Shale, D. (1987). Mapping the boundaries of distance education: Problems in defining the field. *The American Journal of Distance Education, 1(3),* 7-13.

[52] Garrison, D. R. (1989). Understanding distance education. New York: Routledge.

[53] Butgereit, L. (2007). Math on MXit: Using MXit as a medium for mathematics education, [cited 4 March 2008} Available from http://researchspace.csir.co.za/dspace/bitstream/10204/1614/1/butgereit_2007

[54] Makoe M. E. (2010) Exploring the use of MXIT – a social network system to enhance learning for distance education, Open Learning Vol. 25, No. 3, November 2010, 251–257.

[55] Holmberg B. (1983). Guided didactic conversation in distance education. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance Education: International Perspectives (p. 114-122). New York: St. Martin's Press.

[56] Moore, M.G. (1993). Theory of transactional distance, in D. Keegan (ed), Theoretical Principles of Distance Education, Routledge, London, 22-38.
[57] Moore, M. G., Kearsley, G. (1996). *Distance education: A systems view*, Belmont, CA: Wadsworth.
[58] Hillman, D.C. A.; Willis, D.J. and Gunawardena, C.N. (1994) Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners, American Journal of Distance Education 8(2) 3-15.
[59] Garrison, D. R. (1989). Understanding distance education. New York: Routledge. arrison
[60] Anderson, T., and Garrison, D.R. (1998). Learning in a networked world: New roles and responsibilities. In C. Gibson (Ed.), *Distance Learners in Higher Education.* (p. 97-112). Madison, WI.: Atwood Publishing.
[61] Garrison, D. R. (2000). Theoretical challenges for distance education in the 21st century: A shift from structural to transactional issues. International Review of Research in Open and Distance Learning, 1(1) [accessed 5 May 2008] Available from http://www.irrodl.org/content/v1.1/randy.pdf
[62] Tait, A. 2000. Planning student support for open and distance learning, Open Learning, 287-298.
[63] Bronack, S., Sanders, R. Cheney, A. Riedl, R.Tashner, J. Matzen, N. (2008) Presence Pedagogy: Teaching and Learning in 3D virtual immersive world, International Journal of Teaching and Learning in Higher Education, 20(1) 59-69.
[64] Anderson, T.; Dron, J. (2011) Three generations of distance education pedagogy, International Review of Research in Open and Distance Learning, vol. 12 (3).
[65] Anderson, T. (2009). *The dance of technology and pedagogy in self-paced distance education.* Paper presented at the 17th ICDE World Congress, Maastricht. Retrieved from http://auspace.athabascau.ca:8080/dspace/bitstream/2149/2210/1/The%20Dance%20of%20technology%20and%20Pedagogy%20in%20Self%20Paced%20Instructions.docx.
[66] Kukulska –Hulme, A.; Traxler, J. (200)5. *Mobile learning: A handbook for educators and trainers*. London: Routledge
[67] Holmberg, B. (1989). Theory and Practice of Distance Education. London: Routledge.
[68] Holmberg, B. (1989). Theory and Practice of Distance Education. London: Routledge.
[69] Holmberg B (1983). Guided didactic conversation in distance education. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance Education: International Perspectives (p. 114-122). New York: St. Martin's Press.
[70] Nonyongo, E; Mabusela, K; Monene, V. (2005). Effectiveness of SMS Communication between university and students. Available from www.mlearn.org.za/CD/papers/Nonyongo&%20Mabusela.pdf,
[71] Traxler, J.; Dearden, P. (2005). The potential for using SMS to support learning in organisations in Sub-Saharan Africa, proceedings of the Development Studies Association Conference, Milton Keynes, September 2005, Available from www.wlv.ac.uk/PDF/cidt-article20.pdf, 25/01/2008.
[72] Gregson, J. Jordaan, D. (2009) Exploring challenges and opportunities of m-learning within an international distance education programme. Mobile Learning: Transforming

the Delivery of Education and Training, M. Ally (ed). Athabasca University: AU Press:195-214.

[73] Hendrikz, J. (2006) Mobile phone technology as an instrument for student support in Africa, a paper presented at the Fourth Pan-Commonwealth Forum on Open Learning, Jamaica, 30 October – 3 November.

[74] Galusha, J.M. (1997) Barriers to learning in distance education. Interpersonal Computing and Technology: An Electronic Journal for the 21st Century, 5(3/4): 6–14. Available at http://www.infrastruction.com/barriers.htm

[75] Sharples M.(2002) Disruptive devices: mobile technology for conversational learning, International Journal of Continuing Engineering Education and Lifelong Learning, 12(5/6), 504-520

[76] Ford, M.; Leinonen, T. (2009). MobilED – Mobile Tools and Services platform for formal and informal learning, *Mobile Learning: Transforming the Delivery of Education and Training,* M. Ally (ed). Athabasca University: AU Press:195-214.

[77] Galusha, J.M. (1997) Barriers to learning in distance education. Interpersonal Computing and Technology: An Electronic Journal for the 21st Century, 5(3/4): 6–14. Available at http://www.infrastruction.com/barriers.htm

[78] Lentell, H., O' Rourke, J. (2004). Tutoring large numbers: an unmet challenge, International Review of Research in Open and Distance Learning, 5(1) www.irrodol.org/index.php/irrodol/article/viewArticle/171/253 (accessed 21 September 2008).

[79] Thorpe, M. (1995). Bringing learner experience into distance education in Sewart, D (ed.) *One world, many voices: Quality in open distance learning*: Selected papers from the 17th World Conference of the International Council for Distance Education, International Council for Distance Education and the Open University, Milton Keynes: Open University, 364-367.

[80] Lentell, H., O' Rourke, J. 2004. Tutoring large numbers: an unmet challenge, International Review of Research in Open and Distance Learning, 5(1) www.irrodol.org/index.php/irrodol/article/viewArticle/171/253 (accessed 21 September 2008).

[81] Makoe M. E. (2010) Exploring the use of MXIT – a social network system to enhance learning for distance education, Open Learning 25, (3), 251–257.

[82] Lave, J. and Wenger, E. (1991). Situated Learning, Legitimate Peripheral Participation, Cambridge, Cambridge University Press

[83] Lentell, H., O' Rourke, J. (2004). Tutoring large numbers: an unmet challenge, International Review of Research in Open and Distance Learning, 5(1) www.irrodol.org/index.php/irrodol/article/viewArticle/171/253 (accessed 21 September 2008).

[84] Thorpe, M. (2001). Rethinking Learner Support: the challenge of collaborative online learning, A paper presented at SCROLLA Symposium on Informing Practice in Networked Learning, Glasgow, [cited 14 November 2001], Available from http://www.scrolla.ac.uk/papers/s1/thorpe_paper.html

Chapter 4

Virtual Reality Applied in Distance Education

Adriana Soares Pereira and Sandra Dutra Piovesan

Additional information is available at the end of the chapter

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1. Introduction

The constant evolution of technology is leading the education to new ways, which are more attractive to students, making possible to use new tools, leading to an evolution in the teaching and learning process. The Virtual Reality has an important place in this evolution.

There are many definitions about virtual reality, but in general, refers to an immersive and interactive 3D-based graphics generated in real time by computer, that is, a computer-generated a real world simulation or just imaginary.

Virtual Reality is present in many knowledge areas, allowing several benefits in its uses. Some examples:

- Entertainment: games and virtual tours.
- Health: virtual surgeries, treating patients in the ICU, rehabilitation.
- Business: virtual models, buildings, interiors.
- Training: flight simulators, motorcycles, vehicles quality test, etc.
- Education: educational software.

The virtual reality systems have three characteristics:

- Immersion: all sensorial devices are important for the immersion feeling. Regularly, they use objects such as viewing helmets and projections views rooms to help in the immersion.
- Interaction: this idea is related to the computer's ability to detect the user input and modify immediately the virtual world and the actions on it (reactive capacity).
- Involvement: is related to the motivation degree to a person engagement with a particular activity.

Education can be seen as a discovery, exploration and observation process, except the eternal knowledge construction. Thus, the Virtual Reality specific features can turn it into a

powerful instrument in the service of all who seek the evolution of education. Many things that until a short time were dreams nowadays, existing with technological advances, become a reality, a Virtual Reality.

With Virtual Reality working in education we can discover, explore and build knowledge about places and situations that we could never explore. The great potential of virtual reality is exactly these possibilities, not only through classes or physical objects, but also by manipulating virtual target to be explored, analyzed and studied.

It is understood by the Theory of Automata and Formal Languages the mathematical models study that enable the specification and recognition language (in the broad sense of the word), their classifications, structures, properties, characteristics and interrelationships [8].

The importance of this theory in computer science is twofold: it supports both other aspects of theoretical computer science, as also it underlies several computer applications such as language processing, pattern recognition and systems modeling.

The Educational Software is a technical resource teaching, with pre-established educational objectives for teaching and learning of their target. It is any software used with educational purpose integrated curricular activities with the possibility of a multidisciplinary tool available to students and teachers.

The educational software should be well structured, properly uses the technological resources, to have interaction in the curriculum and activities, has friendly interface, be easy to perform, and mostly have well-defined its target to achieve its goals.

The quality of an educational software depends on some criteria to be observed: clear and defined goals; vocabulary appropriate to the target; activities with writing correction (spelling), clarity and conciseness of the text; feedback; implementation easy and secure with the possibility of termination at any time, user-friendly interface, online help, the possibility for interactivity [10] [3].

The virtual reality has been available as a technology for learning, offering great potential for applications in many areas. RV is considered a new and advanced computer interface for 3D models, which presents a whole new world of possibilities for human-machine interaction. It provides an environment in which users are able to interact and view images from different viewing angles. Consequently, the Virtual Reality enables the user to develop a spatial relationship with the information he is interacting.

The virtual reality, when inserted into an educational context can provide many benefits to teaching and learning, promoting:

- motivation and multisensory stimulation to the learners;
- the student creativity;
- opportunities to communicate with students from other cultures;
- possibility of the learner performing an experiment at his own pace;

- active participation rather than passivity opening these opportunities for special education and distance education [6].

Nowadays, the Internet provides the possibility not only to seek information, but also to help the teacher in the distance education process, using new interaction methods with the student, such as participation in chat rooms, discussion boards, and videoconferencing.

For education, the Internet can be considered the learning tool most complete, comprehensive and complex which have been used so far. We can, through them, find sources of information that virtually enable us to study different areas of knowledge [4].

For the scientific community or researcher, we can say that the Internet is an indispensable tool. Through it, we have access to more advanced search features of the world. Thus, one can discuss research with colleagues who work with the same concerns and seeking to achieve equal results.

The educational software proposed aims to help students and teachers to have a more complete and interesting of Automata and changes in its minimization. It also aims to make the subject more interesting to students, making learning easier as well as making the students to become more participatory, so they have a more interactive learning.

2. Tools for software development using virtual reality

The application of Virtual Reality is an animated simulation that lets you define and display a 3D object, change its point of reference and field of view, manipulate and interact with objects, and make these objects affect each other. The Virtual Reality software allows to pervade objects with behaviors as well as programming them to activate some kind of visual feedback, auditory or tactile when a specific event happens, and manage the entire sequence of events.

The most systems of building virtual worlds share some basic concepts that characterize the development of Virtual Reality and allow developers to create a very realistic simulation.

According to Jacobson (1994), these basic concepts could be: the universe and its objects, presentation techniques and dynamic feedback. The Universe is the place where the experience of virtual reality that is the place to be modeled. This universe contains objects that are characterized by the geometry (shape of the object), appearance (size, color, composition, lighting and shading applied to the geometry of the object) and behavior (reactions to events ahead of the object). Any object is formed by a set of polygons and its presentation techniques involve concepts of computer graphics. Some of these concepts are: linear perspective (the object size decreases with increasing distance from the user), lighting (intensity of light striking an object), shading (shading caused by the position of another object between the light source and the object) and overlay (objects obscuring other objects or parts of them). In addition to sharing the concepts mentioned above, the software for creating Virtual Reality also usually offer resources for certain types of interaction devices, allowing programming them to activate some kind of visual feedback, auditory or tactile. In

this virtual world you can use a 3D modeling program to create virtual objects and scenarios and import them into the software that creates virtual reality. The modeling usually is based on primitives called polygons, and an object of the virtual world is composed by multiple polygons combined. Then, the 3D modeling programs will combine modeling (creation of objects), visual representation (application properties to objects, such as texture and lighting) and animation (movement of objects in the scene), making the presentation of scenes and objects as close to reality as possible.

Currently, there are several software programs for the Virtual Reality. Some allow only the creation of Virtual Reality exploratory where the participant may not modify or interact with the environment and its components, while others allow you to create sophisticated scenes with interaction capabilities across devices compatible. In this chapter we present the software used to create the system to Formal Languages.

2.1. Blender

Blender or Blender3D is a program for modeling three-dimensional (3D) that is evolving very quickly. The program is open source, and it is developed by the Blender Foundation [1].

Originally, the program was developed as an in-house application by Dutch animation studio NeoGeo (not to be confused with NeoGeo game console) and Not a Number Technologies (NaN), the lead author, Ton Roosendaal, founded in June 1998 to NaN to develop and distribute the program. Blender was initially distributed as freeware until NaN went bankrupt in 2002 [1].

The debtors agreed to release Blender as open source under the GNU terms General Public License, with a single payment of € 100,000. On July 18, 2002, a Blender funding campaign was started by Roosendaal in order to collect donations and September 7, 2002 it was announced that the fundraising was enough, and that the blender source code would be released.

The objective of the development team is able to reach the development of commercial software. There are many professionals who have already used this program as a primary or secondary in their work [1].

The Blender3D can be used in any area that is necessary for generation three-dimensional models. We can mention architecture, industrial design and engineering, among others [1].

Blender can be downloaded from the actual web page design: www.blender.org, and yet there are several pages about the program.

2.2. VRML

VRML (Virtual Reality Modeling Language) is a standard for virtual reality applications used on the Internet. Through this language, written in text mode, you can create three-

dimensional objects can set color, transparency, gloss, texture. The objects can be basic shapes such as spheres, cubes, ovoid, hexahedrons, cones, cylinders, or forms created by the programmer [12].

In addition to objects, it is possible to add interactivity to them by means of sensors, so you can move them in position, add light to produce a sound when the object is clicked or simply close it and open a file or Web page or yet another page in VRML, when the object is triggered.

It isn´t necessary a specific software for VRML files creation (although there are), since all objects can be created in text mode. Figure 26 shows an example of code in VRML 2.0 using Windows Notepad (txt extension) to be opened. VRML 2.0 is the version used to create the software to Formal Languages.

2.3. Plug-in Cortona

Plug-in Cortona is an interactive 3D display ideal for viewing virtual worlds on the web. It is compatible with many 3D technologies for VRML formats developing. Plug-ins are programs that allow the virtual worlds visualization developed in VRML [2].

In the web address: www.parallelgraphics.com/products/cortona/ is available to download and install free software. Plug-in makes the images with *.wrl* extension are automatically loaded into the browser.

There are different plug-ins for different operating systems, but the Cortona plug-in was chosen for the Formal Languages development software .

2.4. HTML

The acronym HTML derives from the English expression HyperText Markup Language. It is a markup language used to produce web pages. These codes can be interpreted by browsers to display pages on the World Wide Web [5].

Unlike other structured languages, HTML uses tags, markings that are known as tags, which consist of brief instructions with a start tag and the other end, by which to determine the text formatting, images and other elements that compose a HTML page.

2.4.1. Macromedia dreamweaver

Macromedia Dreamweaver is a development tool for web created by Macromedia (now Adobe Systems), which is currently in version 8. Early application versions served as simple WYSIWYG HTML editor ("What You See Is What You Get", or "What you see is what you get"), but newer versions have incorporated notable support for many other web technologies such as XHTML, CSS, JavaScript and several server scripts [9].

Since the late '90s, Dreamweaver has had increasing success and now dominates around 80% of the market for HTML editors. There are versions for both Mac OS and Windows, but

you can also run it on Unix platforms and through the use of emulation software like Wine. As a WYSIWYG editor, Dreamweaver can hide the HTML details user, making it possible for non-experts to easily create web pages and sites.

To develop the Formal Languages pages layout software was used Macromedia Dreamweaver MX.

2.5. PHP

PHP (a recursive acronym for "PHP: Hypertext Preprocessor") is a computer programming language interpreted, free and very used to generate dynamic content on the Web Despite being an easy language to learn and use for small scripts, simple dynamic PHP is a powerful object-oriented language [11].

The language appeared around 1994 as a Perl subset scripts created by Rasmus Lerdof. With Zeev Suraski and Andi Gutmans, two Israeli developers belonging to the Technion, the Israel Institute of Technology, who additions rewrote the parser, was launched in 1997 to PHP 3, the first stable version and like the current language. By rewriting the parser was created the Zend Engine, which is officially maintained by the company together with the Zend PHP community. In May 2000, came to public version 4, and in July 2004, version 5, where the main change was a new API for object orientation provided by the Zend Engine 2.

This is a highly modularized language, which makes it ideal for installation and use on web servers. Several modules are created in PECL repository extensions (PHP Extension Community Library) and some of these modules are introduced as standard on new language versions. It is very similar, data types, syntax and even functions, with C and C + +. Maybe, depending on server configuration, embedded in HTML. Moreover, there is the extreme ease with which PHP handles database servers such as MySQL, PostgreSQL, Microsoft SQL Server and Oracle.

There are PHP versions which are available for the following operating systems: Windows, Linux, Mac OS, OS / 2, AS/400, Novell Netware, RISC OS, IRIX and Solaris.

2.6. JavaScript

JavaScript is a programming language created by Netscape - in 1995, which at first was called LiveScript to meet mainly the following requirements:

- form validation on the client side (browser software);
- interaction with the page. Thus, it was done as a scripting language [7].

Javascript has syntax similar to Java, but is totally different in its concept and use:

- provides dynamic typing - variable types aren´t defined;
- is interpreted rather than compiled;
- has great tools for standard listings (such as scripting languages in general);

- provides good support for regular expressions (a feature also common scripting languages).

3. Modeling of virtual reality system for formal languages

In this chapter we will introduce how the Educational Software building was made for the Formal Languages subject.

The educational software developed, is based on Virtual Reality facing the Formal Languages subject, targeting the automata minimization study. For this software installation was used Blender 2.37a modeler for the automata images construction (Figure 1) that allows you to export your files to VRML 2.0.

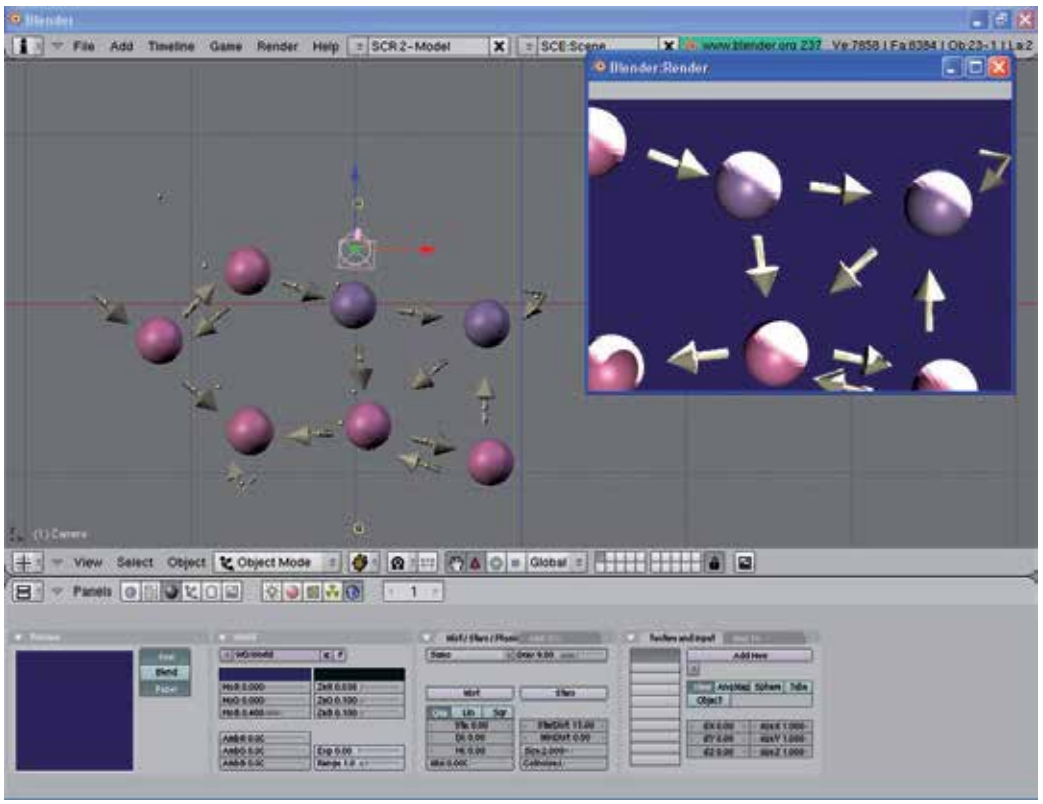

Figure 1. Construction of Automata using Modeler Blender

It is also necessary that Cortona plug-in is installed on your computer where the software will be used (Figure 2). Plug-in opens the Browser with controls that allow the user to view images from different angles.

The Maker Blender used to create images of Automata doesn´t allow that letters and numbers are exported, then it is necessary that the letters and numbers (q1, q2, a, b, 0) are placed in the images through the VRML Language.

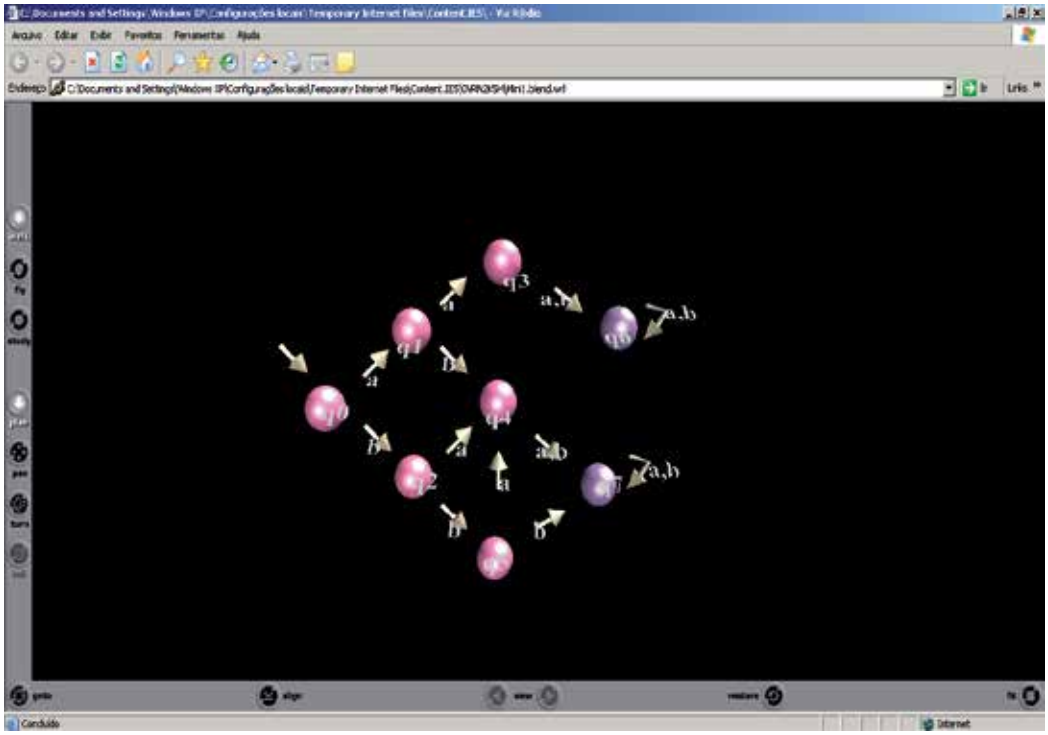

Figure 2. Cortona Plugin by opening an image generated by Blender

3.1. Use case diagram

The figure 3 shows a use case diagram that demonstrates the system use.

Initially the user will access the subject homepage. By entering the page, display the main menu that will give the student the possibility to choose the type of study he will perform. Through the menu, the user can:

- Access Plug-in Cortona;
- Access the Explanatory Material Formal Languages;
- Access Issues Objectives;
- Access the Menu Minimization;
- Access the Menu Regular Expression;
- Access Links Used.

If the user chooses to access the Plug-in Cortona, it must save and run, so he can view the Automata images.

If the user chooses to access the Explanatory Material on Formal Languages, he will have access to the reading material, with concepts and how to solve a minimization exercise.

If the user chooses to answer the objective questions, he will receive the answer if the options chosen were the right ones.

If he accesses the Minimization link, he goes in another menu that will give him the option to choose the exercise he wants to minimize doing or want before he visits the help page. If he chooses the exercise, the user will perform the exercise and should fill the spaces with equivalent states, so the user gets the correct answer or if the program will prompt re-run the exercise.

If the user accesses the regular expressions link, he can choose the exercise he wants to do. After choosing the exercise, he will answer what is the correct regular expression and gets the answer result.

The user can also access the links used in the workplace.

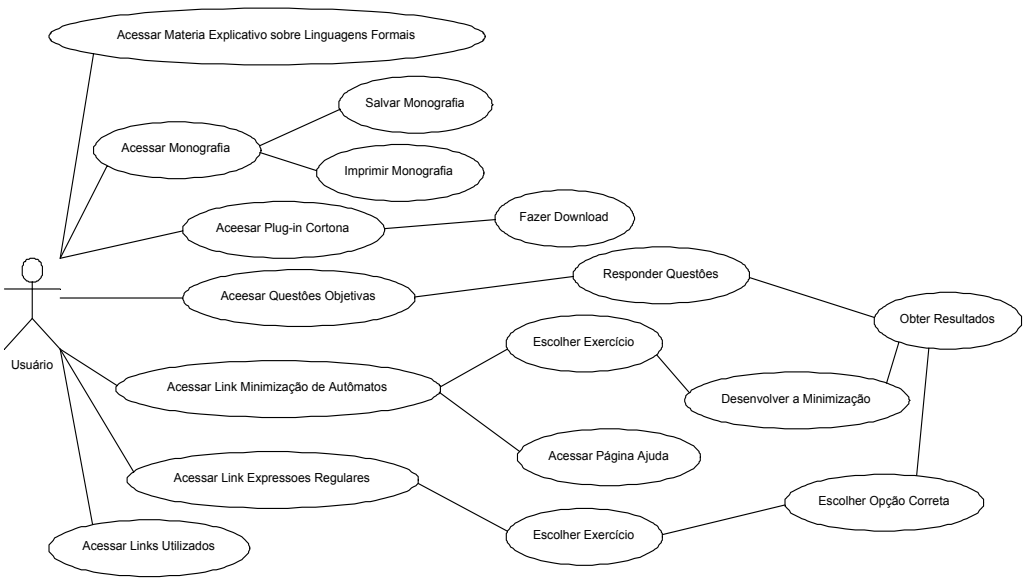

Figure 3. Use Case Diagram

3.2. Virtual reality system for formal languages with emphasis on regular expressions

The exercises will be available to students through the homepage (Figure 4). The pages layout was built using HTML through Dreamweaver MX software. From the home page users can access the page menu that shows the studying options it shows to the student the possibility to download the plug-in Cortona and also provides some links for reading (Figure 5).

The software will be available through pages built using the PHP programming language. The student can choose for answer questions about regular expressions before performing the Automata minimization. The figure 6 shows an exercise on regular expressions which is available through the Menu.

Figure 4. Home Screen

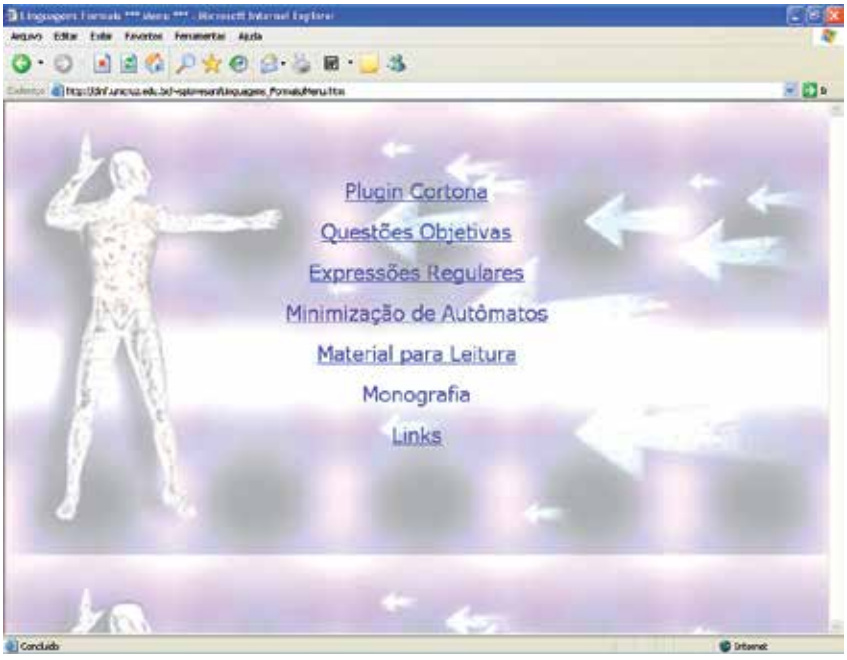

Figure 5. Menu

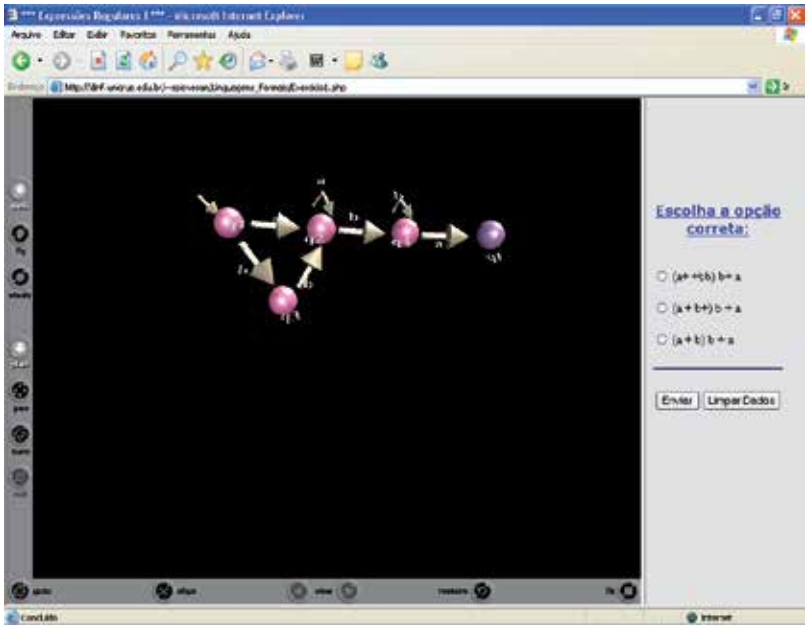

Figure 6. Exercises about Regular Expressions

The automata minimization is done on a screen where the user views the Automata drawings in 3D and must enter some state that is necessary and use the table and the lists to find the equivalent states that can be removed. When you find the equivalent states, he can view the 3D minimized automata. If the student doesn´t hit the equivalent states, the page warns him about the error and the student may retake the answers (Figure 7).

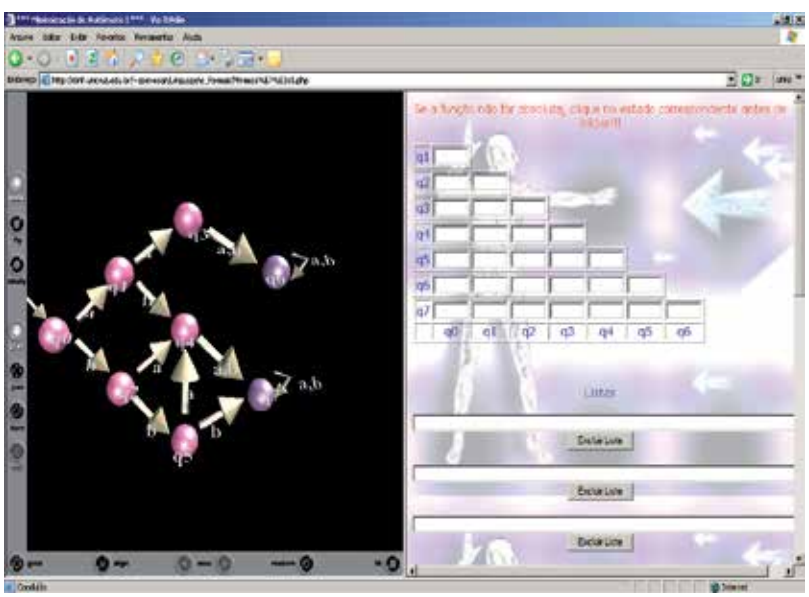

Figure 7. Home Exercise with Minimization

The page shows multiple choice exercises, where students will answer the questions and check whether the chosen answers were correct. (Figure 8) so students can test their theoretical knowledge. The page warns the student when the choices made in multiple-choice questions aren´t correct and the student will have the option to redo these wrong questions.

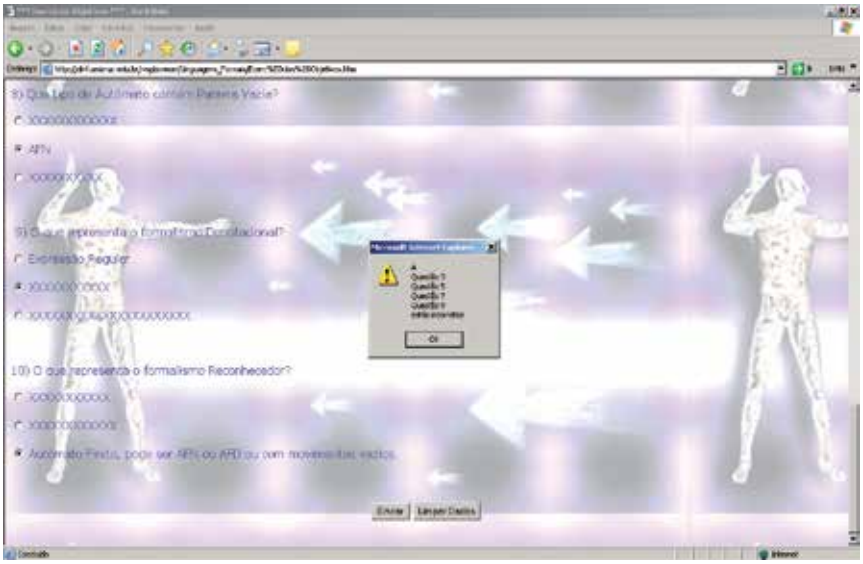

Figure 8. Exercises Multiple Choice

Figure 9. Materials for Reading

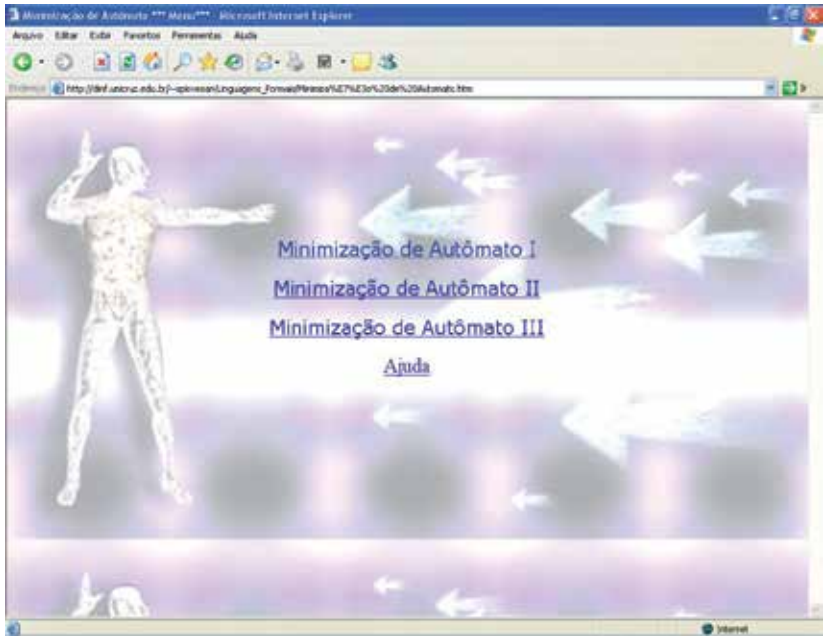

Figure 10. Menu Minimization

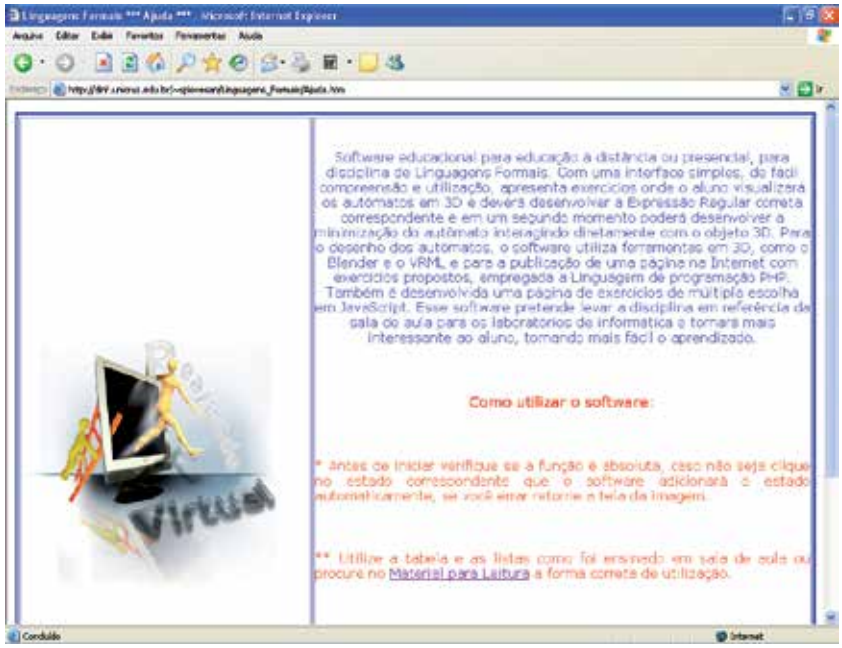

Figure 11. Material support

The page shows a Reading Material which is intended to answer doubts about Regular Expressions and Automata Minimization. This page can also be used by educators in their classroom or virtual class. The figure 9 shows the Theoretical Material page.

The page also has a help material, which explains how to use the pages with exercises Minimization. This help is available through the Menu Minimization that is shown in Figure 10.

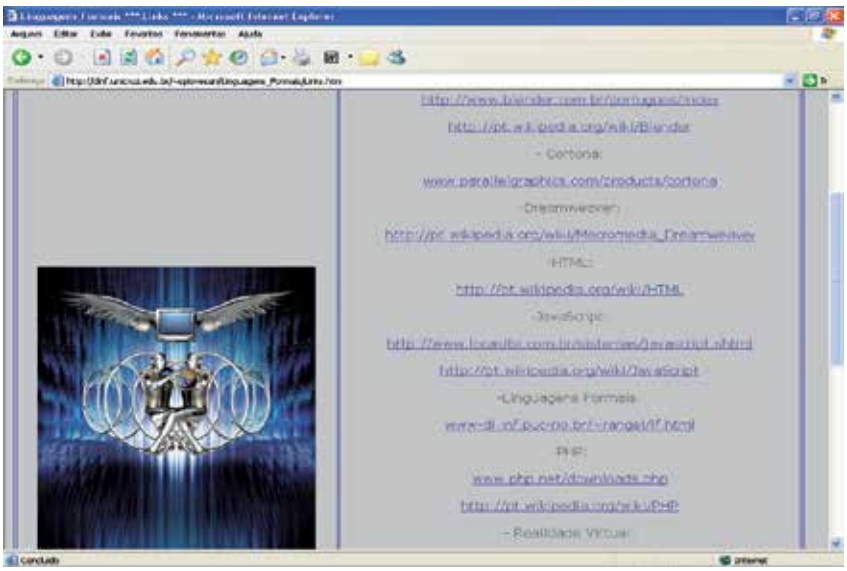

Figure 12. Links

Figure 13. Answers to Questions Minimization

The figure 11 shows the help page, where teachers and students can ask questions about the use of the Minimization exercises pages.

If the reading material doesn´t take all the doubts, is available through pages some links that were used in the workplace. The figure 12 shows the page that contains the web address links for reference.

Also are available on the discipline page, the answers for the minimization questions, which can be accessed through the help page. This page aims to help teachers and students if problems occur in these exercises solution. The figure 13 shows the page with the minimization exercises solution.

The educational software was used to take the Formal Languages subject from the classrooms to the computer labs, making the study more interesting to students.

The research made about the tools used for this research development can help in future research about Virtual Reality and Educational Software.

3.3. Assessment tool for the formal languages department

Using the system above together a distribution package apache server that has PHP phpMyAdmin tool (Figure 14) was created a database to store the students' login and

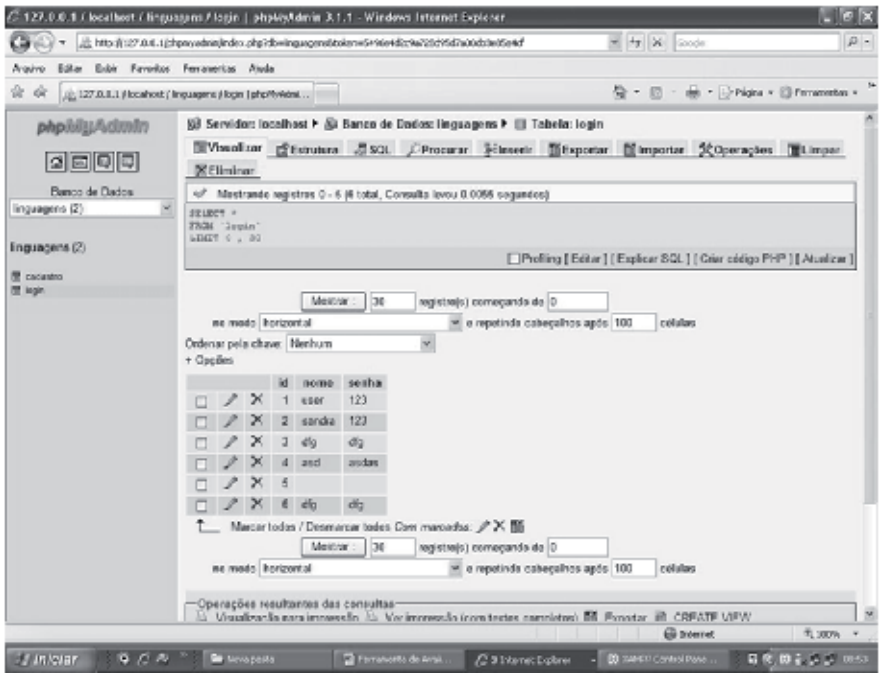

Figure 14. PhpMyAdmin tool which is created the database to store the login

password to perform the evaluation. The student´s login must be the email that he wants to receive his assessment, and the teacher will receive an email that is already defined in the program. To facilitate the database use will be exported and must be imported by the teacher who wishes to use the system.

```
$texto.='</br></br>Minimization:  </br>';
if (isset($_COOKIE['tb1']))
{$tb1 = $_COOKIE['tb1'];
$texto.="</br>M1:  $tb1";
}else{$texto.="</br> Exercise has not been resolved!";}
```

After the scan is done if the answers are correct as the code below:

```
<?php
include('conexao_mysql.php');
if (isset($_COOKIE['nota']))
{$nota = $_COOKIE['nota'];}
$q[0] = $_POST['quest1'];
$q[1] = $_POST['quest2'];
$q[2] = $_POST['quest3'];
$q[3] = $_POST['quest4'];
$q[4] = $_POST['quest5'];
$q[5] = $_POST['quest6'];
$q[6] = $_POST['quest7'];
$q[7] = $_POST['quest8'];
$q[8] = $_POST['quest9'];
$q[9] = $_POST['quest10'];

$certas_O[0] = 2;
$certas_O[1] = 1;
$certas_O[2] = 2;
$certas_O[3] = 3;
$certas_O[4] = 1;
$certas_O[5] = 2;
$certas_O[6] = 1;
$certas_O[7] = 2;
$certas_O[8] = 1;
$certas_O[9] = 3;

for($i=0;$i<10;$i++)
{if($certas_O[$i] != $q[$i])
{$valor = 'incorreta';}
else
{$valor = 'correta'; $nota = $nota + 0.2;}
```

```
setcookie("objs[$i]", $valor, time()+3600);}
$ver = true;
setcookie("objetivas", $ver, time()+3600);
setcookie("nota", $nota, time()+3600);
header("location:menu.php");
?>
```

After performing all the exercises the student will automatically send the results and note to the email address registered at the beginning as login and for the teacher´s email, so the evaluation made, according to the code below:

```
if (isset($_COOKIE['user']))

$user = $_COOKIE['user'];

}
$prof = 'sanpiovesan@hotmail.com';
$assunto = 'Resultado Avaliação';

mail($prof,$assunto,$texto);  // send email to the teacher, variable text containing all the answers

mail($user,$assunto,$texto);  // send e-mail to the student's login, variable text containing all the answers
```

4. Conclusion

In this work was shown an educational software for the Formal Languages subject, using virtual reality, with the goal carrying the subject from classroom to the computer labs, also making possible to use for distance education or as an extracurricular task.

The study was developed using the modeler Blender for the images creation, which were converted to VRML, to be used on the available Internet pages. We also used the PHP languages, to provide the proposed exercises, for the HTML layout pages and JavaScript for the multiple-choice exercises.

Virtual Reality is a relatively new area, where the student sees the possibility of exploring the environments through the objects manipulation scattered in the virtual environment, related to the content to be learned, making learning more interesting and easier for the students.

The ability to simulate real situations in a way that wouldn´t be possible, allow a breakthrough in several military and business sectors. In education, the use of Virtual Reality enables conducting experiments with the interactively knowledge, allowing the environments exploration, processes or objects, through the manipulation, interaction and virtual analysis from the own target in context.

Currently, with the increasing information spread through the Internet, the development of virtual environments that allow integration among students through the Internet can enable geographically dispersed students to learn without being present in the classroom.

Thus we can say that Virtual Reality is starting to change education. This is because, in spite of the technological barriers, the use of Virtual Reality can be associated with fantasy and imagination, revolutionizing the teaching and learning traditional concepts.

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5. References

[1] Blender Brasil, http://www.blender.com.br/portugues/index.php, (accessed May 06, 2011).
[2] Cortona VRML Client. www.parallelgraphics.com/products/cortona, (accessed Dec 12, 2010).DÁMICO, C. B. AMEA – Ambiente multiagente de ensino-aprendizagem na WEB. II Workshop de Informática na Educação – UFRGS.
[4] GARCIA, Paulo Sérgio. A Internet como nova mídia na educação. http://www.bibvirt.futuro.usp.br/textos/artigos/ novamidia.PDF, (accessed Jun 10, 2011).
[5] HTML, http://pt.wikipedia.org/wiki/HTML, (accessed Mar 19, 2011).
[6] HOFFMANN, Augusto Bohner. Micro Mundos Virtuais Interativos para Aplicações Educacionais. http://www.lsc.ufsc.br/microm/manual/Manual.html, (accessed Mar 27, 2011).
[7] JavaScript, http://pt.wikipedia.org/wiki/JavaScript, (accessed May 24, 2011).
[8] Linguagem Formal – Wikipedia, http://pt.wikipedia.org/wiki/Linguagens_formais_e_compiladores, (accessed May 24, 2011).
[9] Macromedia Dreamweaver, http://pt.wikipedia.org/wiki/Macromedia_Dreamweaver, (accessed Apr 24, 2011).
[10] PANQUEVA, A. H. Software educativo multimídia – Aspectos Críticos no seu ciclo de vida. http://www.univates.br/sicompi/wcompi2002/11-johansen-ramos.pdf, (accessed Dec 10, 2010).
[11] PHP, www.php.net/downloads.php, (accessed Mar 03, 2011).VRML – Wikipedia, http://pt.wikipedia.org/wiki/VRML, (accessed Dec 10, 2011).

Chapter 5

E-Learning in Chemical Education

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Additional information is available at the end of the chapter

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1. Introduction

Continuous efforts are devoted to fulfil locally the European and national policies in developing a higher education system supported by information and communications technology (ICT). In Romania, the development of infrastructure, communications, and information systems and services has been very rapid because it represents a crucial condition for general economic and social development (figures 1 and 2).

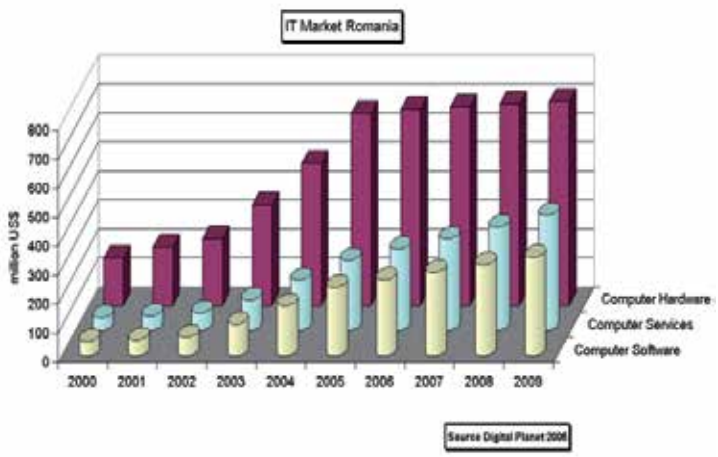


Figure 1. High rate of all IT sectors in Romania 2000-2009 [1]

It is known that Romania has had an impressive ICT experience, being the first Easter European country to build computers: CIFA-1957, MECIPT–1961, and DACICC-1962 [1]. Nowadays, ICT is not anymore a product or service for elites, and it is considered that "Information Society is for all".

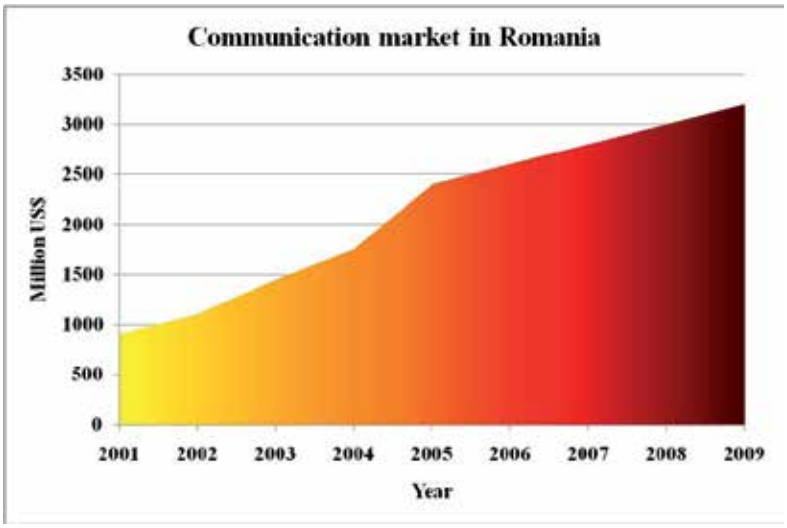


Figure 2. Development of the communication market in Romania 2000-2009 [1]

ICT revolution has a significant impact on all kinds of human activities. Educational and training activities are no exception. Rather, it could be said that the impact on them is larger, and the ICT-assisted education may become a personalized and adaptive experience.

Learning nowadays is a continuous and active process, performed with a specified goal and applied to real life situations. In the past, the main criteria in selecting a higher education institution were connected to its prestige and location. In Romania, characterised by a relatively low life standard, the location criterion was an important one for potential students. On the other hand, the prestige criterion brought many foreign students to Romanian universities. Globalisation tends to amplify both criteria. Thus, a true education market, governed by rules identical to any other services market, has been created. As a consequence, many high prestige academic institutions have found themselves in the situation of loosing some of their students in favour to other institutions, located at larger distances, but better anchored in the education market.

Higher education in Romania has been undergoing major changes, in order to achieve the highest possible compliance degree to the Bologna declaration and the 'communiqué' adopted by the Ministers of Higher Education of the Bologna Signatory States gathered in Bergen, in 2005. The challenges and priorities identified then have been associated to the link between higher education and research, social dimensions of higher level training, mobility, and attractiveness of European Higher Education Area. The legal framework has already been established in Romania in 2005. Since then, the educational path consists of a 3 / 4 years bachelor, a 2 years master, and hopefully a 3 years Ph. D degree. The Romanian academic education has been also enriched with post–doctoral fellowships.

Today students have a much wider view of the world than their parents, can juggle several cognitive tasks at the same time, are more relativistic and tolerant, and approach new situations and problems as a challenge. They also present a more fragmented sense of time,

reduced attention span, and considerable lack of faith in institutions and explanatory narratives, reduced sense of place, community, and history, and reduced vision for a personal or collective future. On the other hand, academics face particular challenges raised by the special Bologna requirements and the role played by the teacher in the ICT era [2-4].

The ICT-based education contributes to the development of a well established set of European approved skills using the 'learning by doing' approach, and it offers flexible lectures design and virtual practice lab, and simulation environments. ITC technology should become a productivity tool – "more, better, faster."

The new engineering curriculum, adapted to Bologna Convention requirements, implies a more student-oriented teaching system, with stepwise knowledge achievements for graduate and postgraduate degrees. A systematic attention should be directed towards the teaching and learning processes for engineering degrees. Even though a variety of innovative teaching techniques are available to engineering instructors, the education of engineers in many universities still follows the traditional lecture format [5]. On the other hand, the Romanian universities insist too much on the theoretical training and tend to produce super-skilled graduates [1].

Currently, there is a gap between the present education of engineers and the expectations of their roles in the engineering workforce. In our country, many engineering graduates have difficulties when moving from schooldays to employment. Using the ICT-based education, engineering education can more successfully bridge the gap between the lecture theatre and the engineering profession [5], and ensure a long life learning approach.

Because the higher education in chemical engineering assumes the difficult task of creating specialists with good knowledge in the area of chemical and biochemical processes, the academic community in the Faculty of Applied Chemistry and Materials Sciences in University „Politehnica" of Bucharest has been involved in several projects for developing e-learning applications for technical higher education, aiming to offer adequate tools for customized on-line and off-line training.

A theoretical framework for technology-pedagogy relationship in developing e-learning systems for chemical and chemical engineering education has been the basis for the system and content development. All considerations presented in the followings are based on the experience gained by the teaching staff of Faculty of Applied Chemistry and Materials Science, University "POLITEHNICA" of Bucharest in the activity carried out in 2002 – 2012 time interval, with special references towards two major projects. The first one has been aiming to develop and implement a nationwide e-learning community for chemistry teachers working with K12 students, aged from 13 to 19 (VIIth – XIIth grade), as well as to provide them with basic or advanced ICT training, and offer support for using the newly acquires skills and instruments in their day to day teaching (referred to as *project I*). The second project aims to develop an integrated e-learning portal for a university (referred to as *project II*). Major partners in these projects have been the University "Politehnica" of Bucharest and Siveco Romania S.A, an important software company in Romania.

2. Learning management system development

It has become increasingly common for universities and other educational institutions to support learning activities with e-learning platforms. The range of use extends from simple sharing to more complex forms of socializing. Apart from being a usable medium, an e-learning platform is also a basic communication means that, similar to websites, has to attract, engage, and hold users.

There is a broad spectrum of activities which constitute e-learning, from straightforward applications which enhance classroom activities to full distance, online and remote learning. If in the early days of e-learning, the systems were oriented towards solving well–defined problems (having an unique, determinate purpose) and their change and continuous adaptation meant a great deal of work and material resources, today's research has been oriented towards systems able to extend and adapt to any situations. Moreover, e-learning systems should provide support for students' collaboration, offering multiple ways of learning: solitary learning (documents accessible via the internet, downloadable from the Internet or on external media: CDs, video boxes), scheduled classes (direct interaction between the subject and object of learning), and group learning (online forums and chat-rooms).

The main factors, critical for operating any e-learning system are:

- *availability***:** the system should be robust enough to serve simultaneously the different needs of thousands of students, administrators, content developers, and instructors;
- *adaptability***:** infrastructure should allow further expansion under new requirements;
- *utility:* it must be intuitive and easy to use (to be as natural as Internet browsing) and should include many automatic features in order to minimize user's work;
- *interoperability:* the system should support content from different sources, in different formats, different solutions offered by various hardware / software vendors, it must be based on Open Source technologies, meet coding (XML, SOAP and AQ) and education (AICC, SCORM, IMS and IEEE) standards;
- *stability*: it must be operable at any time and should handle all situations for which it has been designed;
- *security:* the system must insure content safety by controlling access to resources.

Shortly, a good e-learning system is supposed to fulfil all of the following requirements:

- support education on a widely used Web-based platform, with a low cost,
- assemble and deliver learning material quickly, in several languages ,
- measure the effectiveness of educational activities,
- combine the concept "class of students" with the concept "education through the Internet / e-learning",
- centralize and automate administrative activities,
- be portable and implement standards such as AICC, IMS, SCORM.

These features have become a part of the first e-learning portal that has been developed and tested in the Faculty of Applied Chemistry and Material Science (FACMS) of University 'Politehnica' of Bucharest starting with 2004 (figure 3).

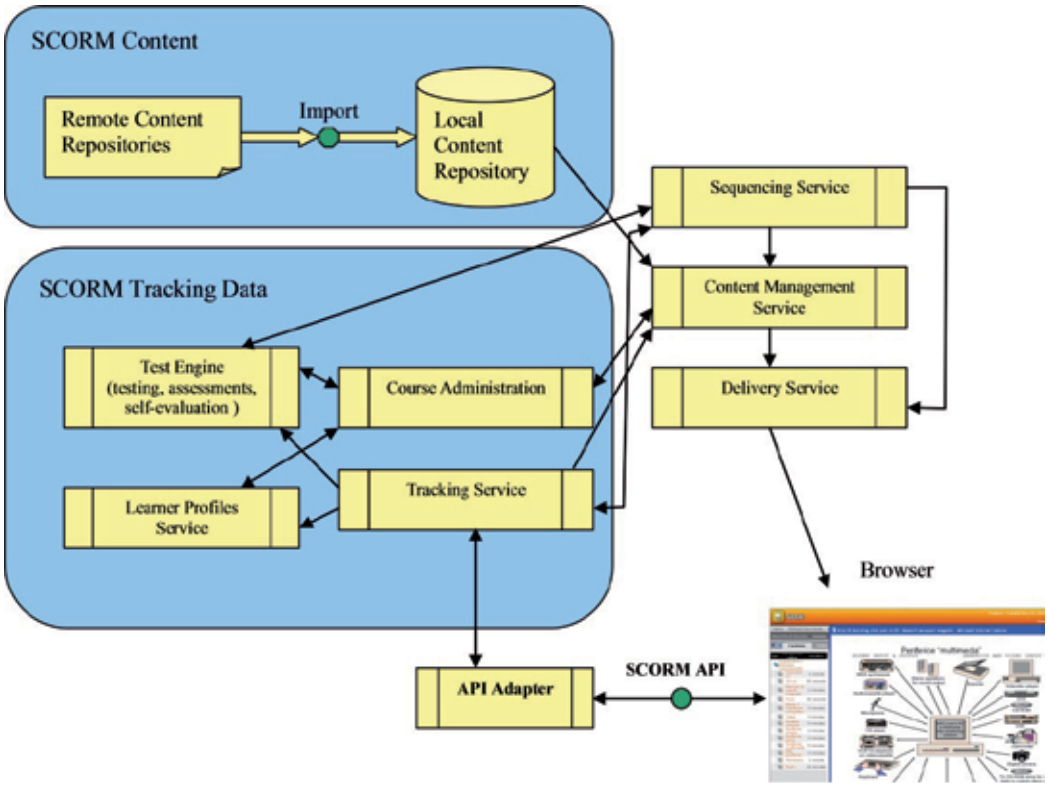


Figure 3. SeLFT – a Learning Management System developed in FACMS

As for the learning strategies, they should be selected as to motivate students, facilitate the deepening of information, promote an effective learning context, encourage interaction, provide feedback, and offer support during the learning process.

The system has supported the management of the students activities in the University by:

- realistic management of the teaching activity in the faculty;
- offering standardized educational content specific for technical faculties such as: process simulation, virtual experiments, virtual laboratories for chemical analysis, dedicated charts and graphs;
- integration of process simulation with modern analysis equipment and implementation of a remote control laboratory for monitoring environmental quality;
- development of students communication skills;
- integration with specialized software applications (IOLS, simulators, editors, video conferencing, CAD software, dedicated platforms, virtual dictionaries, and encyclopaedias);
- building a larger flexibility for individual study (online and offline courses in some defined periods of time, nonlinear scroll of the support material, adaptive testing, teacher assisted or unassisted learning / assessment).

The platform created by Siveco Romania S.A. and tested in the University 'Politehnica' of Bucharest attempted to fulfil all the requirements presented earlier. Besides offering basic information for the on–going subjects, AEL toped up by creating a virtual library suitable for all level students. The content of this library consisted of various documents: lectures, problems, project themes, project instructions, images, and videos, tests, created in–house by the academic staff and available to all authenticated users. Re-usage of e-lecture materials and the collaboration of all interested players, within the developed systems, provided a larger and better base for Process and Chemical Engineering education.

SeLFT, the e-learning platform implemented in 2004 in the Faculty of Applied Chemistry and Material Science of University 'Politehnica' of Bucharest was initially developed for synchronous study, offering larger access to the educational content in terms of location and time. For the first 4 years the access to the platform was limited to working stations on the faculty premises. Security reasons imposed this restricted access policy via Internet. An off–line study module was later designed and integrated in the updated platform AEL [6, 7], so that all interested users became exposed to synchronous and asynchronous instruction. In terms of communication the platform offered a special forum facility used by students to post any type of announcement, send messages and files.

The tested portal offered users (students and academics) five different spaces: personal homepage, teaching/learning, workspace, collaboration, and administration (figure 4). Common document, drawing board, agenda, meeting notes, instant messaging, private discussion, Web tour, slide presentation, audio and/or video conferencing represent the tools available in the workspace. The portal has been highly appreciated by those who have used it for training purposes in the chemical engineering undergraduate curricula. The next stage in the development of this portal has been a remote laboratory for environment quality monitoring.

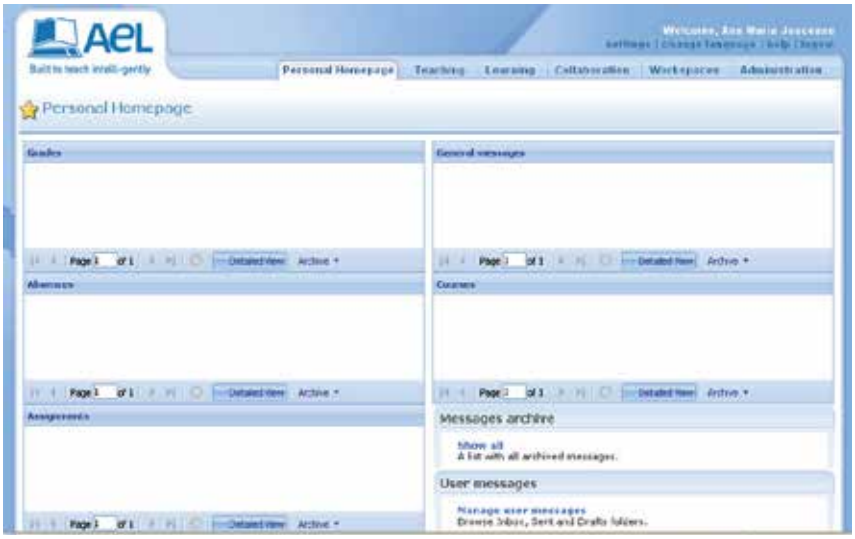


Figure 4. Modules in the e-Learning portal developed in project II

Thus engineering students have been offered a mixture of real and remote laboratory facilities. The remote control experiments allowed students to acquire good laboratory practice skills and experience related to real equipments in an intuitive and cost-effective way. Another attractive advantage was represented by the chance of free and flexible training in contrast to a fixed and regular class schedule. The design and delivery mechanism for the new module of the e-learning portal were tailored as recommended in the literature to: i) provide a constructivist pedagogical approach; ii) model a collaborative learning environment for group interaction; iii) match the characteristics of the delivery media to specific learning processes (media-synchronicity theory) including the provision of unambiguous feedback and guidance; iv) assign appropriate instructional roles, and v) determine desirable student competency outcomes, all in a remote learning context. A multi-tier role architecture consisting of faculty facilitators at both local, and remote sites, and students, has been used and adapted to maintain academic integrity and offer the same quality of interaction as the on-site laboratory activity. The interface between the user and the automatic machine is developed in Visual Studio .net and PHP. The automatic machine is split into an interface, firmware component developed in assembly language, and a hardware module, composed by microcontrollers from PIC family. The communication is established as Ethernet 10 MB and uses standard protocols like TCP and UDP.

2.1. Advanced communication and collaboration module

In terms of communication SeLFT in use at the Faculty of Applied Chemistry and Material Science offered a special forum facility used by students to post any type of announcement, send messages and files.

According to the feedback collected, an optimal e-learning platform should provide facilities to let team members (students, instructors, administrators, and technical staff in an e-learning model) access a series of shared content libraries and make use of a broad range of services that include:

- access to news and announcements, presented to members when they log in to the platform (also available in the form of alerts, which can be auto-generated and mailed to team members by request);
- mechanisms for submitting documents for comment, review, and approval, with the ability to track status, ownership, tasks, and assignments;
- shared lists for tasks, calendars, schedules, and other group/team activity-scheduling, and inquiry mechanisms;
- support for interactive discussions through message boards, instant messaging, and e-mail distribution lists;
- support for online meetings, either text-only or with voice and/or video capability, as well.

Obviously, technology in and of itself does not guarantee better learning. But when effectively used, technology can help focus attention while attracting and maintaining the learner's interest. Interests identified among engineering students were very much oriented towards collaborative activities. An off–line study module, with off–line communication

channels (forums, discussion boards, and file sending) does not support effectively their joint projects and real–time communication needs. A new version of the AEL Enterprise platform designed by Siveco Romania S.A. has offered the higher education user three different spaces: a learning space, a teaching space, and an integrated working space. The last is provided with both off– and on–line communication channels, and collaborative working tools. Requiring additional hardware, the newly deployed working space offers audio and videoconferencing, common document creation, web tours, drawing board, slides presentations, chat, private discussions and/or video conferencing. The platform has been thoroughly evaluated in the academic community, as to determine viability, versatility, and effects on the learning and teaching process. The news and announcements of general interest, as well as the personal messages among users are substantially augmented. The messages and announcements of general interest can be seen by all users, even if they are not authenticated. Personal messages are available only after authentication. The users are automatically notified by personal messages, which can be auto-generated and mailed to team members by request, when they are associated as students to a course or when synchronous sessions, which they must attend, are scheduled.

During collaborative sessions, participants are generally given similar rights, such as sending and receiving audio/video signal, web tour or using drawing board when the session is set up. There is a session host with additional duties, being the only role entitled to end a session, add or remove participants, and define their individual rights [8]. Before sending the invitation to join a collaborative session, the host may define a meeting agenda or load an existing one. The collaborative mode is the implicit one for videoconferencing (Figure 5).

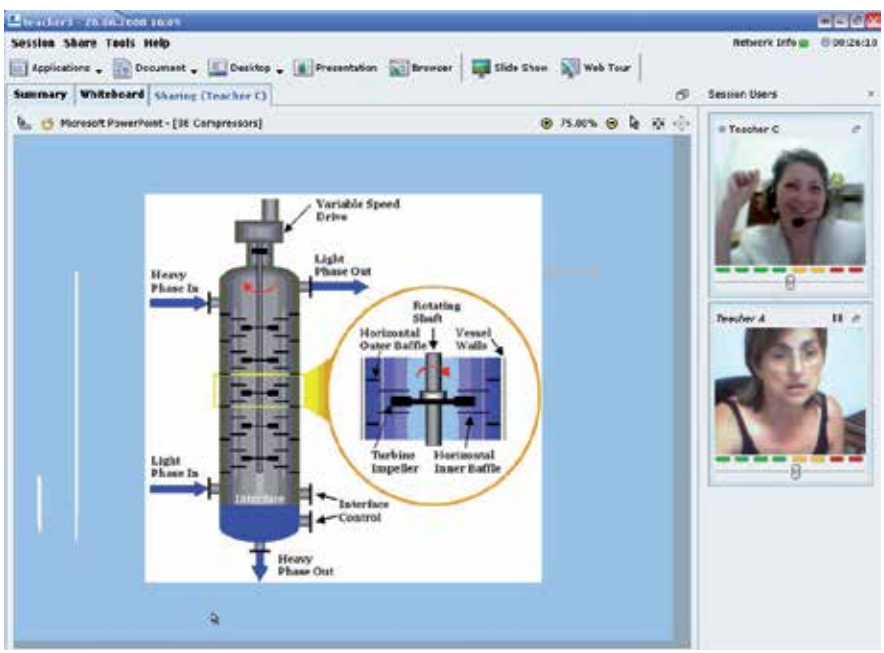


Figure 5. Videoconference session for a distillation column design

When working on projects, one of the students might be given session co–hosting duties. This may be the case when the academic in charge chooses not to attend the working session, and leaves the group to interact and collaborate in a more flexible and friendly environment.

The common workspace and applications facility give the participants the chance to contribute to Windows Word, Excel, PowerPoint, PDF and other specialized type files, provided that each participant has installed the corresponding application on his working station. Otherwise, only common visualization is possible, without editing. This facility offers the possibility to visualize and control an application running on another system, or the entire workspace of a computer. There is also the possibility to offer remote control of an application running on another computer when the keyboard and mouse are remote-controlled. Signal stability during medium length sessions (up to 45 minutes) proved to be satisfactory for the network transfer rate. Each user chooses to make use of all, one or none of these communication channels, according to physical availability and hardware performances. Best results were obtained when similar hardware was used by all participants in a session.

Nevertheless, the communication and group work facilities were ranked as rather insufficient by 75 % of the interviewed users, pointing out the need for further development if access and motivation, on–line socialization, information exchange, knowledge construction, and personal development remained the favoured pedagogical tasks.

2.2. Registrar function

In order to implement correctly and efficiently the legal stipulations regarding university studies (technical, economic, medical, judicial, and vocational), it is necessary that specialized entities in the universities (university or faculty registrar services) collect and process information regarding:

- students (personal data, contact, economic and social status),
- directions of specialization chosen after the first education cycle,
- credit accumulation along the education process,
- higher education mobility possibilities for Romanian and foreign students.

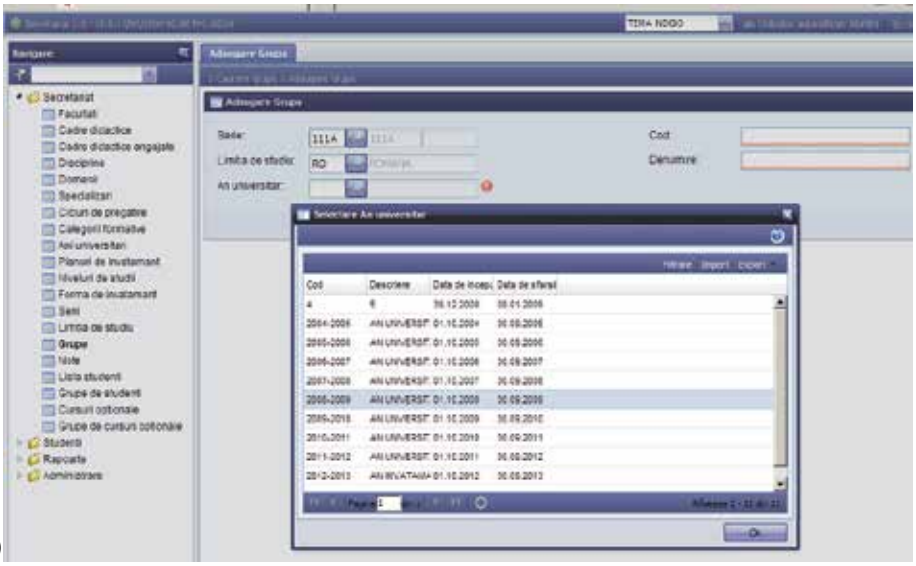
Besides bachelor studies, University 'Politehnica' of Bucharest organizes, according to the legal stipulations, master studies, doctoral, and post doctoral studies. All the possibilities stipulated by the law must reverberate in the management instruments of the university. They imply a complex activity for the administrative staff, in order to provide documents following individually the students, their retention and success rates, the professional route, and finally issue the graduating diplomas.

A registrar specialized module has been stipulated in the frame of the e-learning portal for universities (figure 6), in direct relation with the management of student academic activity. It has been designed to ensure:

- the management of faculties organizational structure in a university, with unique or various activity domains,

- implementation of recording, communication, and analysis procedures for the professional achievements of the students in correlation with the principles of quality assurances in university studies.
- the management of students achievements along their academic education, for any of the study degrees organized by a university,
- marking books administration,
- students information on their academic status and on the decisions they have to take in order to fulfil the requirements of the chosen curricula,
- generation of statistics regarding the students activities.

(a)



(b)

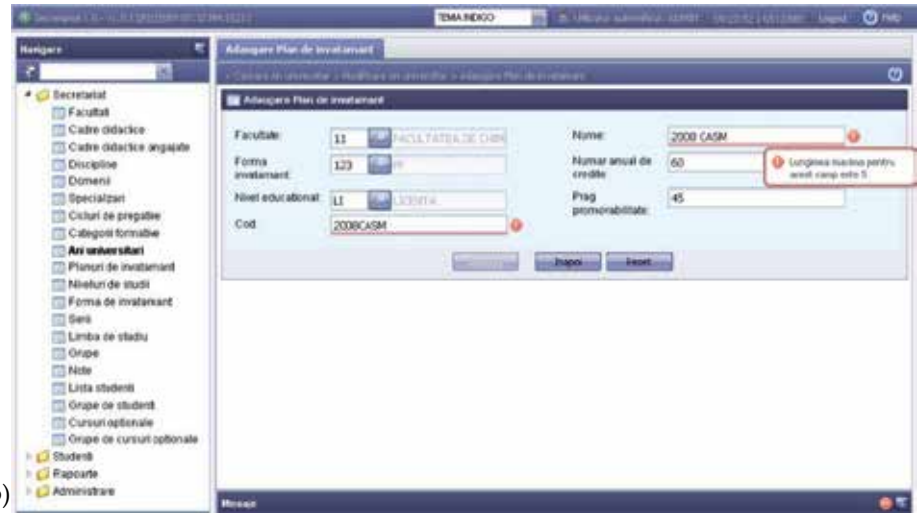


Figure 6. Secretarial application for an university with unique activity field

The basic administrative documents of any faculty, regardless its profile, importance or the university it belongs to, produced for any academic year are various and numerous (educational programs, catalogues, studies contracts, etc.). The informatics application centred on the management of the information and data flux from the university administration is integrated in the context of all other informatics applications implemented in the university. The development of these applications supports and improves the exchange of information and data within the organization.

According to the necessities of information, management, and analysis specific to the academic environment, the application was designed and developed to fulfil the following functional requirements:

1. include all educational forms legally stipulated: bachelor, master, doctoral studies, short term courses,
2. diversify the possibilities of assessing students activity, for any course, by introducing up to 6 components (laboratory, seminar, personal assignment, partial examination, other marks, final mark) with an editable weight,
3. implement academic staff evaluation by students through confidential surveys. The surveys are administered through the system, and results can be visualized only by the evaluated professor and by the faculty dean.
4. report generation in connection to the educational process evolution:
   - number of students enrolled in each education form (license, master, doctoral studies, post doctoral studies etc.)
   - student distribution as a function of age, gender, nationality, citizenship, last education form he/she graduated, etc.
   - rate of success, in all sorts of forms, such as:
     - reports at the end of each examination period, and of the university year,
     - reports per discipline and/or teacher,
     - reports concerning the number of credits obtained by each student,
     - reports concerning the number and names of the students who passed all the exams as a function of the domain, series and groups,
     - reports on the students as a function of the number of failed exams (N-1, N-2, ….etc.) and the correlation of the failed disciplines with the number of missing credits;
   - accountancy of the students who need re-examinations as a function of the disciplines and / or teacher.

The access in the system is controlled and secured by defining the users, user groups, and access rights for various functionalities and documents. For obtaining information from the system each user must authenticate itself when connected. After closing the session the system will not allow the access to the closed application (by using „Back" function of Web browsers).

Users are grouped on the ground of the functions they have in the university or the registrar office. A user can belong to one or several groups. Each user is able to access only the

documents and information for which he has an explicit permit. The administrator defines the access rights for each group of users, and each system function. The access rights are also specified at folder level.

3. Technology-pedagogy relationship in developing content for e-learning systems

Nowadays, the rapid evolution of information and communications technology creates new opportunities for multimedia instruction and education, ranging from ways of delivering content to ways of expressing this content, but similarly strong claims are being made for the potential of multimedia learning environments. In this context, natural questions arise: how can be avoided a trail of broken promises concerning the educational benefits of new educational technologies such as multimedia learning environments, and how to use these new opportunities for delivery and expression of educational content in order to maximize learning? A reasonable solution is to use instructional technology in ways that are grounded in research-based theory. There is a (natural) developing tendency for multimedia instruction and systems, from instructor-centred environments to learner-centred environments. In such circumstances, concerns about the efficiency of such systems are even more justified. Unfortunately, there still is a lack of standardization in what concerns the development principles of multimedia instruction and education systems; there is a tendency of content developers to create environments with spectacular components rather than educational ones that ultimately proves to be a counterproductive practice. The efficient use of technology-pedagogy relationship in developing multimedia instruction and education systems is, ultimately, a matter of usability. Usability concerns the measure of a product potential to accomplish the goals of the user. There are different levels of usability focus in developing multimedia systems, spanning from navigation to the use of colours, text, and graphics. Usability, and particularly learner friendliness is one of the most neglected areas in e-learning design and implementation. Too much focus on developing the application and not enough focus on the implementation is also a major problem. The main problem is that developers think the job is done when the application is developed. So, even if the applications have a high quality, the usability can be low. Increasing the quality of both content and functionality of the application can represent increased value for users of an e-learning product. Addressing usability issues guarantees that the learning environment doesn't become a barrier to learning. Consequently, learners are able to work through a course, with minimal distraction or frustration.

Besides considering technological issues, usability principles must rely on an *educational theory*, somehow driving the designer in developing suitable applications. Currently, the constructivist theory is almost universally adopted. This theory stresses that learning is a personal process, characterized by individual's developing knowledge and understanding, by forming and refining concepts. This leads to the view that learners should be assisted in some way to construct and refine concepts in personally meaningful ways. From a constructivist perspective, learners need to be encouraged to take responsibility for their learning, while generating a sense of ownership of learning experiences.

First of all, in e-learning, usability is defined by the ability of a multimedia object to support or enable a particular concrete cognitive goal. Concepts, such as working memory, cognitive load, production system theories of knowledge and learning, self-explaining behaviours, all become important considerations for the instructional designer who must learn to use technology effectively and intelligently, rather than simply because it is available and seems flashy or exciting. The human mind is limited in the amount of information it can process. Because computer-based training can quickly overwhelm these limited capacities, it becomes important for the instructional designer to understand the principles of cognitive science and how they apply to effective instructional design for multimedia instruction and education. Cognitive Load Theory (CLT) states that the working memory is limited in its capacity to selectively attend to and process incoming sensory data. Working memory is a concept that grew out of the older model of short term memory, which was seen more as a structure for temporarily storing information before it passed to long-term memory. The model for working memory is a system with subcomponents that not only held temporary information, but processes it so that several pieces of verbal or visual information could be stored and integrated. CLT is concerned with the way in which a learner's cognitive resources are focused and used during learning, suggesting that for instruction to be effective, care must be taken to design instruction in a way as to not overload the mind's capacity for processing information. The implication for multimedia and education is that if we only have a very limited amount of information processing capacity in the working memory at any single moment, then instructional designers should not be seduced into filling up this limited capacity with unimportant, but flashy content in a multimedia instructional unit. An example of what this means for multimedia instructional design is that the layout should be visually appealing and intuitive, and that activities should remain focused on the concepts to be learned, rather than trying too much to entertain. Content knowledge is organized into schemas found in the long-term memory, and these schemas control how new information is handled as it enters the working memory. Schemas organize simpler elements and can then act as elements in higher order schemas. In other words, as learning occurs, increasingly sophisticated schemas are developed and learned procedures are transferred from controlled to automatic processing. Automation frees capacity in the working memory for other functions. CLT suggests that instructional techniques that require students to engage in activities that aren't directed towards schema acquisition and automation can quickly exceed the limited capacity of the working memory and hinder the learning objectives. In simple terms, this means that you shouldn't create unnecessary activities in connection with a lesson that requires excessive attention or concentration that may overload the working memory and prevent one from acquiring the essential information that is to be learned. This is an important rule in any form of instruction and education, but it is an essential rule in multimedia instruction and education, because of the ease with which distractions can be incorporated.

A model of knowledge transmission in the classical (non-virtual) educational process is based on presenting information, followed by the proposal of problem items which students should solve based on the information presented. Unfortunately, this model, which has been also incorporated in multimedia instruction and education, skips an important step between

the presentation of information and problems proposals, namely the presentation of worked-out examples, as well as the algorithms and techniques recommended to work out these problems. If we consider that multimedia technology is extremely generous in terms of expression modes, when it comes to presenting a theoretical concept, then definitely it is even more suitable, by the multitude of technical possibilities of expression, when it is used to present the problems solving methods. Providing learners with worked-out examples can be very useful. This means that if a multimedia instructional unit was appealing enough to hold the learner's attention and cause the learner to really study the process of a worked-out problem in detail, then it could likely be just as much or more effective than having them work the problem out themselves.

In developing interactive media, the design of the user interface, system architecture, and navigation tools are often left to chance. It is well known that with emergence and development of interactive media, and especially of the World Wide Web, promoted the philosophy of nonlinear content scrolling, which was one of the strengths which has imposed new ways of presenting information in relation to the traditional ones (printed materials, television, radio, etc.). Here are some usability best practices in this respect:

- The system should always keep users informed about the application's status, through appropriate feedback within reasonable time. This can be done by visible indication so that the user is notified about the place he/she is in the application, as well as how this place is related to other components available in the application. Thus, it can be specified the current page number, number of pages viewed, current page address in the application architecture, the current chapter name, etc. There is also useful general information about applications, such as status updates.
- Navigation elements must ensure any time fast user access to any segment of the application. The existence of multi-level menus is welcome, given that they reflect the application architecture.
- Links must be identified as to express clearly if they represent access to other instruments than usual content segments.
- Excessive linear navigation must be avoided. For instance, the user should not go through substantial amounts of content to reach a certain place in the application. It is a good idea to include an index and search function for extensive multimedia applications.
- The system should keep users informed about progress tracking.
- Users must be provided with printer friendly alternative content.

Some of these principles, applied to the interface of the interactive educational system developed in the framework of project I are illustrated in Figure 7.

But it is also highly important that the principles of non-linear navigation are designed keeping in mind the way working memory works, and not least its capacity. One of the problems we face in this context is split-attention. Split-attention occurs when learners are presented with multiple sources of information that have to be integrated before they are understood. The instruction should not be designed in a way that forces the learner to divide his attention between several tasks.

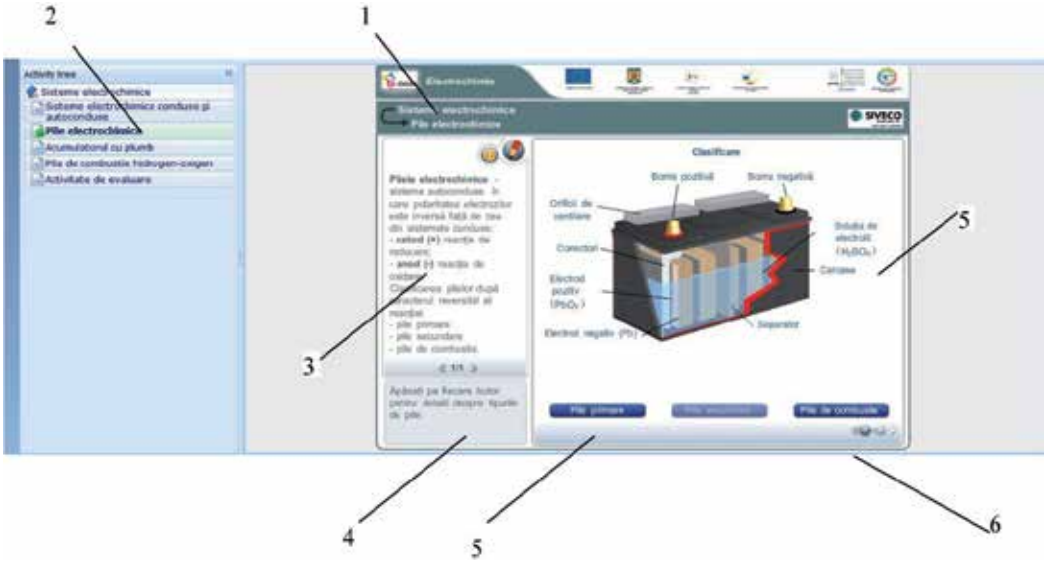


Figure 7. Principles of usability applied to the navigational system of a multimedia instruction system – the architecture of the system interface: 1 – Indications about the place in system; 2 – Table of contents; 3 – Information broadcasted through text channel; 4 – Instructions for using the multimedia application; 5 – Elements for navigation within the multimedia application; 6 - Elements for navigation within the chapter; 7 – Multimedia application.

For instance, in laboratories, both classical and virtual, it is required that the student follows specific steps: acquiring information regarding the laboratory objective, theoretical concepts, constructive and functional presentation of the equipment, mode of operation, data processing and interpretation.

Often there is no clear boundary between these thematic modules, and the learner's attention should be split in several tasks, with negative consequences on the process of knowledge understanding and integration.

Solutions must be found for organizing the information, based on existing multimedia technologies that avoid split-attention. We present here an example where we used simple Web technologies to organize educational material that represents a virtual laboratory (project I). Figure 8 presents a screenshot of this application. As it can be seen, by using frames in HTML technology, the content is divided into three main areas: the area of general data, the table of contents, and the content area. This splitting allows the student to have always availability over the general data and over the content structure, as he/she browses it. The content area is, in turn, split in two parts: a text area and a multimedia area (in which graphic, video, and audio content, interactive animations etc. can be presented). This approach allows the student to browse smaller or larger amounts of text, without losing the multimedia material to which reference is made to in this text from the visual field. This information organization is a collection of best practices related to non-linear navigation opportunities provided by the information and communication technology.

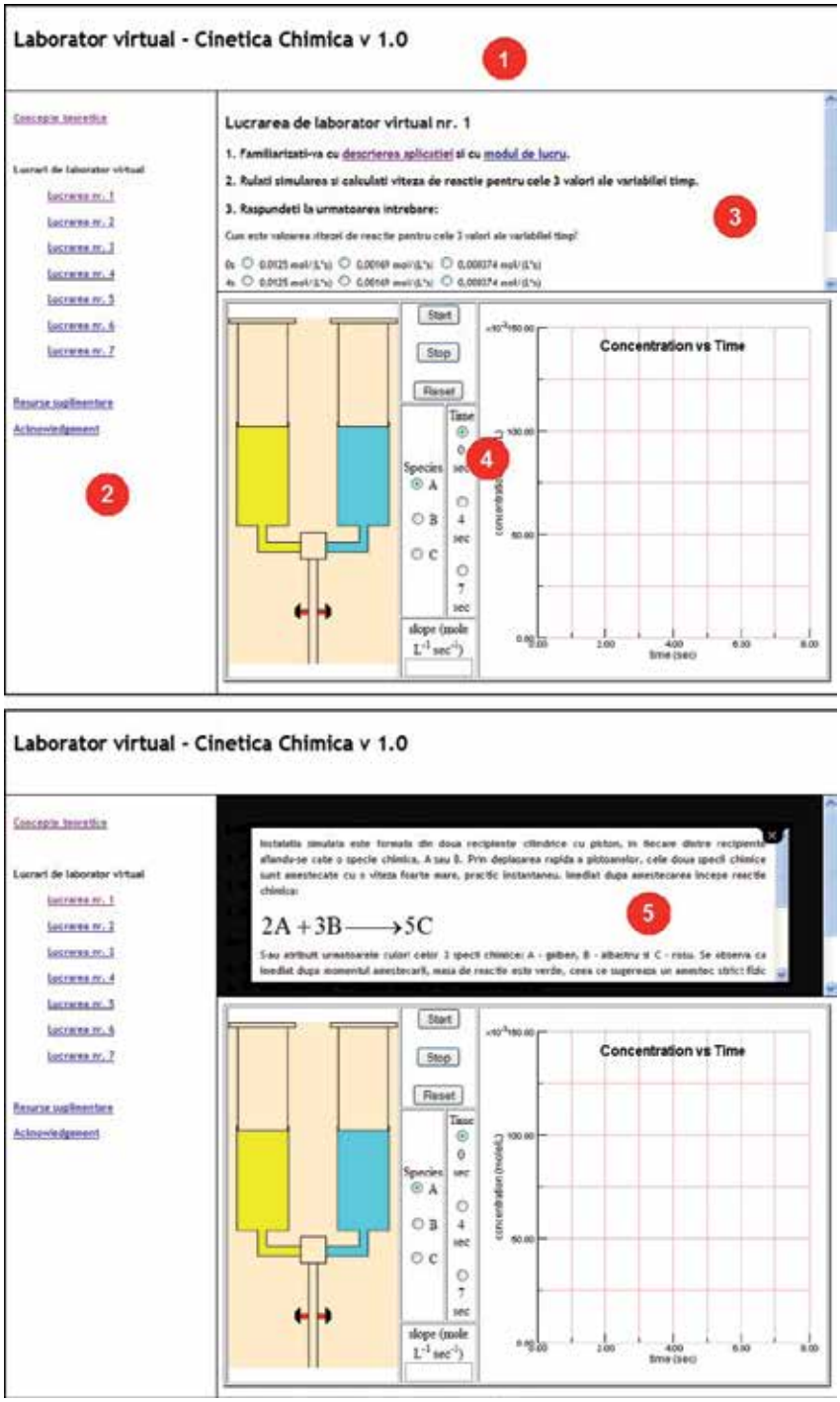


Figure 8. HTML technology usage for screen division in a multimedia instruction system for a virtual laboratory experiment: 1 - General data area; 2 - Table of contents, 3 - Text area; 4 - Multimedia area; 5 - Pop-up window overlapping the main text.

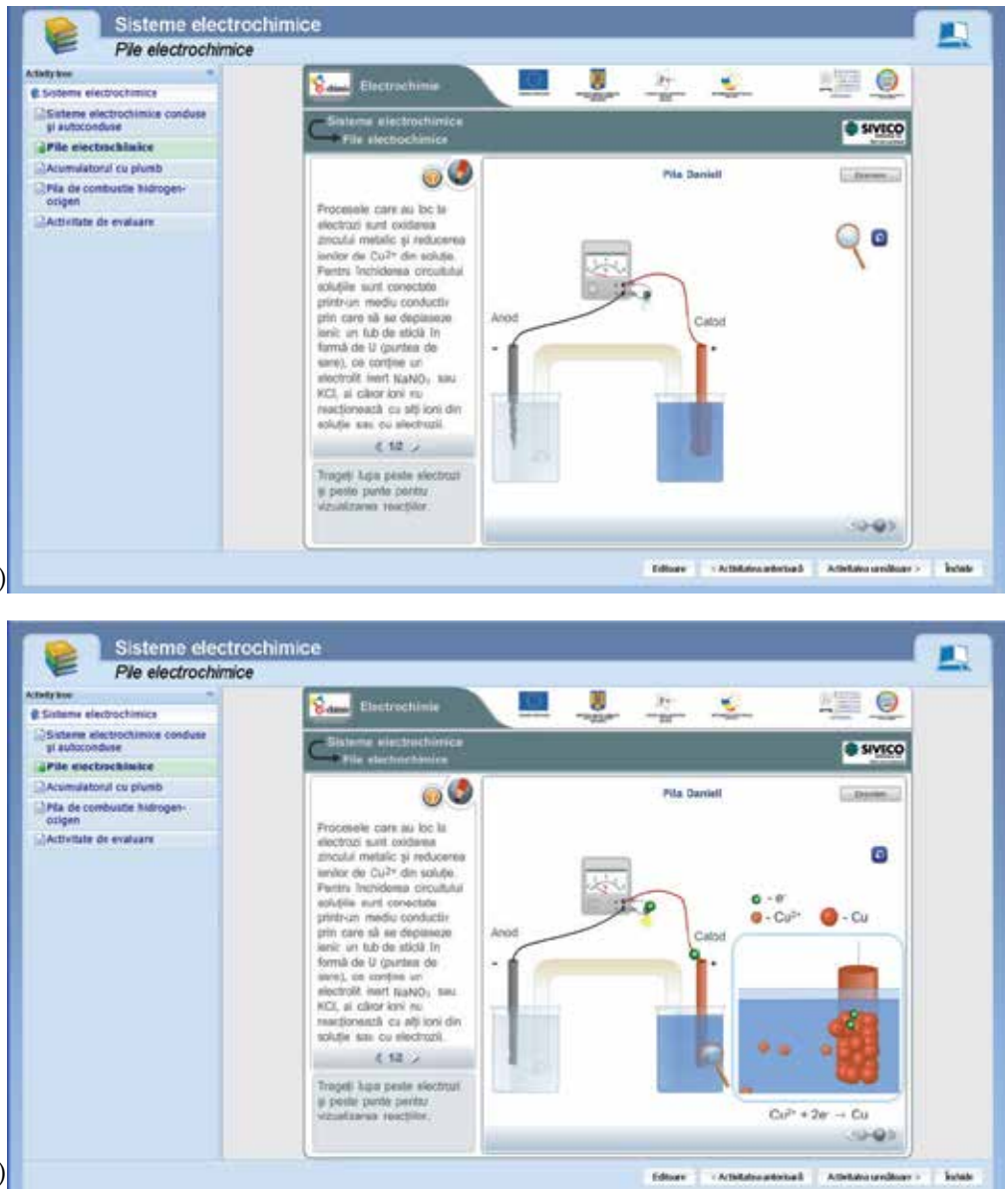
When the student is directed to the content of a virtual laboratory, he finds the content structured in a way that suggests to browse through the different information modules in an absolute individually way.

Before starting the laboratory, the student is guided to the module attending the constructive and functional presentation of the equipment, and the operation mode, however being not obliged to go through it, if he considers himself familiarized to this piece of information from previous educational experience. If he/she accesses the link to any of these modules, a pop-up window appears, which overlaps with the main text, thus not allowing temporary access to it, but that does not overlap with the interactive application that simulates the equipment. This way, a selective, contextual presentation of information is achieved. Moreover, this content structure is subject to the contiguity principle, which states that better transfer occurs when corresponding contents are presented simultaneously, both temporally and spatially. Temporal contiguity means that corresponding words and pictures are presented at the same time, while spatial contiguity means that corresponding words and pictures are presented near rather than far from each other on a page or screen. In other words, an important visual image should not be placed on one page or frame, and then discuss it in a preceding or following page/frame without continuing to show the visual image.

The split-attention problem arises not only in determining the optimal navigation system in the virtual environment, but it is also related to the information presentation in a multimedia application. There are situations when presentation of a theoretical concept through the aid of a static graphical item requires a high information density. In physics and chemistry such situations are quite common, for instance when understanding a process requires presentation of macroscopic aspects, but also the microscopic intimacy of the process. Presentation of the two categories of information together, in the same image, impedes process understanding, while presenting them in different images dilutes the logical connection between the two aspects. In the frame of project I the simultaneous presentation, in the same multimedia application, of both macroscopic and microscopic aspects of the studied process was necessary. A simple and elegant solution was adopted, and, according to the feedback collected from students, it proved to be a real success. When running the application, the user can watch the process evolution at macroscopic level; when he/she is quite familiar with it, he/she can, by moving an instrument available permanently on screen, in a particular area of simulation, visualize the microscopic level evolution for the specific area (as demonstrated in Figure 9).

Another critical factor that must be taken into account in developing educational multimedia materials is pacing. The pacing principle states that better transfer occurs when the pace of presentation is controlled by the learner, rather than by the program. Learners vary in the time needed to engage in the cognitive processes of selecting, organizing, and integrating incoming information, so they must have the ability to work at their own pace, to slow or stop the presentation if necessary. If the pace of the presented material is too fast, then the cognitive processes may not be carried out properly and learning will suffer. Also, if the pace is too slow, that can lead to student irritation, with negative effects on the educational process. A technical

solution at the reach of multimedia developers is the possibility of attaching a slider to interactive applications, through which the user can pause, rewind, and fast-forward the application. This technique was used in many multimedia applications developed for project I (see an examples from project I in figure 10).



(a)

(b)

Figure 9. Visualization of an electrochemical process at macroscopic (a) and microscopic levels (b).

An important usability dimension in developing multimedia instruction and education systems relates to the degree of planning and structuring the learning activities. Different

learning contexts need different types of applications in order to support the activity task. For example, a multimedia application useful as support for quick help may not be a usable learning support in a continuous perspective. The content may be similar, but the context is different. This has important implications for usability, because the context partially determines how a given application will be used. Consequently, analysis of the learning context is vital. Within project I a situation somewhat atypical in terms of this so-called learning context was faced. As it has been previously mentioned, the project objective was to create a virtual educational environment for chemistry teachers working in the K12 education system, but also to offer guidelines for using it. Consequently, we have had to deal with a double educational process, with two categories of end users. On the one hand it is about knowledge transfer from instructors to teachers, followed by another transfer, this time from teachers to students. In this equation, teachers are learners in the first phase, and become instructors in the second. Consequently, application development had to be carried out in such a way that it could be used in both educational contexts, with maximum efficiency. The biggest challenge has been the design of applications for both adult learners and young learners. It is well-known that adult learners have another set of motivations than young learners.

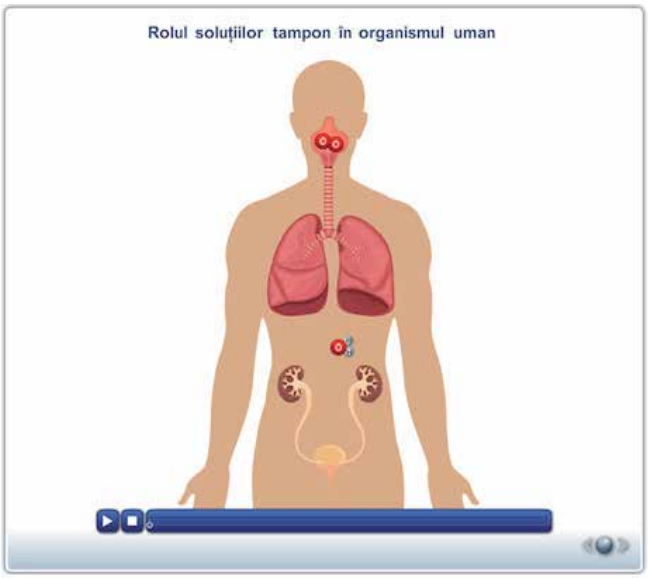


Figure 10. Using sliders in multimedia applications: The role of buffer solution in the human body.

Adult learners need to know why they should learn something, want to learn experientially, approach learning as problem-solving, and accumulate best when the topic is of immediate value. Another feature of this project is linked to the fact that learning activities planning and structuring do not aim to bring around an alternative way to traditional learning, but to create a significant shift from traditional learning to e-learning. Learning is carried out in social settings, by adopting ideas, ways of thinking and how things are done. Introducing new learning methods like e-learning will normally alter the existing learning culture. Not

only what we learn, but also how we learn becomes a major issue. Understanding the target audience should help in defining the communication style of the newly created e–learning environment. Where appropriate, learner's profile must be used to develop an instructional design, style, and tone. To improve the readability of an e-learning environment, natural language must be used, avoiding slang or acronyms. As it has been declared previously, the constructivist theory is almost universally adopted in the e–learning philosophy. Recently, the constructivist approach has been significantly extended from social perspectives to so-called socio-constructivism.

But how is it possible to project this social component of constructivism into the technical solutions used in developing instructional virtual environments? The answer is simple: given that the educational multimedia content is mostly delivered through web technologies, the shift from Web 1.0 to Web 2.0 can bring a quantum leap in expressing educational virtual environments. Web 2.0 defines web features that facilitate participatory information sharing, interoperability, user-centred design, and collaboration on the World Wide Web. Web 2.0 allows users to interact and collaborate with each other in a social media dialogue as creators of user-generated content in a virtual community, in contrast to websites, where users are limited to the passive viewing of content that was created for them. The shift to Web 2.0 has its counterparts in both e-learning technology and methodology. Thus, Web 2.0 concept can result in the e-Learning 2.0 concept, for which one of the core support methodologies is connectivism, concentrating on making connections among learning resources and people. e-Learning 2.0 emerges inspired by the popularity of Web 2.0, which places increased emphasis on social learning and use of social software. Conventional e-learning systems were based on instructional packets that were delivered to students using Internet technologies. The role of students consisted in learning from the reading and preparing assignments. By contrast, e-Learning 2.0 is built around collaboration, which assumes that knowledge is socially constructed. Learning takes place through conversations about content and grounded interaction about problems and actions. Collaborative learning has been found to increase student motivation and enhance their performance. Through collaboration, students become actively engaged in the learning process, exchange ideas, and produce knowledge, helping other students to better understand the learning material. In contrast to traditional education, typical e-learning environments lack face-to-face interaction between students. Therefore, the introduction and adaptation of collaborative techniques in these environments is especially necessary. Successful design of collaboration will help students to feel less isolated and become part of the virtual course community, resulting in better educational performance, motivation, and persistence in the course. Many strategies are proposed, focusing on promoting communication, social interaction, and participation to scaffold e-learning. Therefore, it is desirable to design and develop learning environments to achieve e-Learning 2.0, encouraging learners' active involvement to resource contribution, enabling convenient resources accessing and utilization, and facilitating better interaction and collaboration. One of the ideas with great potential in this direction (but that unfortunately remained, so far, more in this idea stage) consists in achieving collaborative e-learning environments

enhanced by wiki technologies. Wiki technologies enable communities to write documents collaboratively, by adding, modifying or deleting the content. Openness of wikis gives rise to the concept of '"darwikinism", which is a concept that describes the "socially Darwinian process" that wiki pages are subject to. Basically, because of the openness of wikis and the rapidity with which wiki pages can be edited, the pages undergo a natural selection process like that to which nature subjects living organisms to. "Unfit" sentences and sections are ruthlessly culled, edited, and replaced if they are not considered "fit", which hopefully results in the evolution of a higher quality and more relevant page. Whilst such openness may invite "vandalism" and posting of untrue information, the same openness also makes it possible to rapidly correct or restore a "quality" wiki page. Sustainability of the wiki concept is endorsed by achievements based on it, the best known example being Wikipedia, the largest and most popular general reference work on the Internet.

e-Learning 2.0 can also bring strong focus on content syndication, its reuse/re-purposing, adaptation, and personalization. There are high quality multimedia applications in the World Wide Web virtual space, made available for free by prestigious institutions. Moreover, the authors of these applications make available source codes, thus allowing and even encouraging their modification, in order to improve or customize them. Many websites managing these resources contain planning and structuring of learning activities customized for different educational scenarios, and, as in the case of source codes, the contribution of users is allowed and even encouraged. If in the project I educational multimedia applications were developed together with SIVECO ROMANIA S.A., one of the largest software companies in Romania, a different approach was used in project II, namely using freeware resources, existing in the virtual space of the World Wide Web: PhET, Virtual Chemistry Experiments (http://www.chm.davidson.edu/vce/index.html), ChemCollective (http://ir.chem.cmu.edu/).

Some of these are:

1. PhET: Free online physics, chemistry, biology, earth science and math simulations (http://phet.colorado.edu/)
   PhET provides interactive, research-based simulations of physical phenomena, from the PhET™ project at the University of Colorado. To ensure educational effectiveness and usability, all these simulations are extensively tested and evaluated. These tests include student interviews in addition to actual utilization of the simulations in a variety of settings, including lectures, group work, homework and lab work. All PhET simulations are freely available from the PhET website and are easy to use and incorporate into the classroom. They are written in Java and Flash, and can be run using a standard web browser as long as Flash and Java are installed. There is a "Teacher Ideas & Activities" page, which is a gateway to instructor-submitted contributions, designed to be used in conjunction with the PhET simulations. PhET simulations are available in 6 categories (Physics, Biology, Chemistry, Earth Science, Math and Cutting Edge Research) and are organized into projects, each of which can contain one or more related simulations. For example, the "nuclear-physics" project contains 4 simulations,

including "Alpha Decay" and "Radioactive Dating Game". The source code for all PhET simulations is available for use and/or modification.

2. Virtual Chemistry Experiments (http://www.chm.davidson.edu/vce/index.html)
   Virtual Chemistry Experiments are a collection of interactive web-based chemistry tutorials. The tutorials employ Physlets and Chemistry Applets to simulate experiments or depict molecular and atomic structure. The guiding concept is to involve the read in making observations and acquiring data, and then using this information to draw conclusions and infer chemical principles. The interactive content is made possible through the use of Java. Exercises dealing with molecular and electronic structure also employ Java3D. Virtual Chemistry Experiments web pages may be downloaded and deployed locally.

The role of usability in minimizing distraction sources for the user in the educational process is very important. One of the current sources is the coherence degree of the material. More elements shown in a material are not necessarily beneficial for learning, leading the learners to focus away. The applications with too much ornament can confuse the learner. On the other hand, the lack or the insufficiency of some absolutely required elements can create user frustration, with equally negative consequences as those caused by distraction. Consequently, it is important to find technical solutions for achieving an optimum. In this context, in the frame of project I it has been very important how to describe the virtual equipment in a virtual simulation. One of the technical solutions identified in this respect is presented in figure 11.

Thus, there is a button always present on the application screen which can bring in, at any moment of its dynamic run, the necessary information for describing the equipment. This information is presented in a transparent layer which overlaps the main content of the simulation, which will fade in the background. For expediency, this layer stays open as long as the user keeps pressing the button which calls the layer.

A particular aspect of usability is learnability. Learnability is a measure of the degree to which a user interface can be learned quickly and effectively. User interfaces are typically easier to learn from when they are designed based on core psychological properties, and when they are familiar. Familiarity may come from the fact that it follows standards or the design follows a metaphor from people's real world experience. An instructional interface is especially effective when the learner is able to focus on learning content rather than on how to access it. Multimedia content developers must be consistent and follow standards in layout and content organization: consistency ensures a predictable environment for learners. A standard look and feel for the course must be created. The organization of content and objects should be meaningful to the user. Using a minimalist design is a good practice, not only for aesthetic purposes, but also for learning. Simplicity reduces the demand on users' brain power and focuses users' attention on the task. Multimedia content developers must strive for simplicity in layout, screen function, structural design, and other program elements. Complex or extraneous interface elements unnecessarily burden users' working memory. The colours should be used wisely and the application must not rely on colour alone to communicate a message.

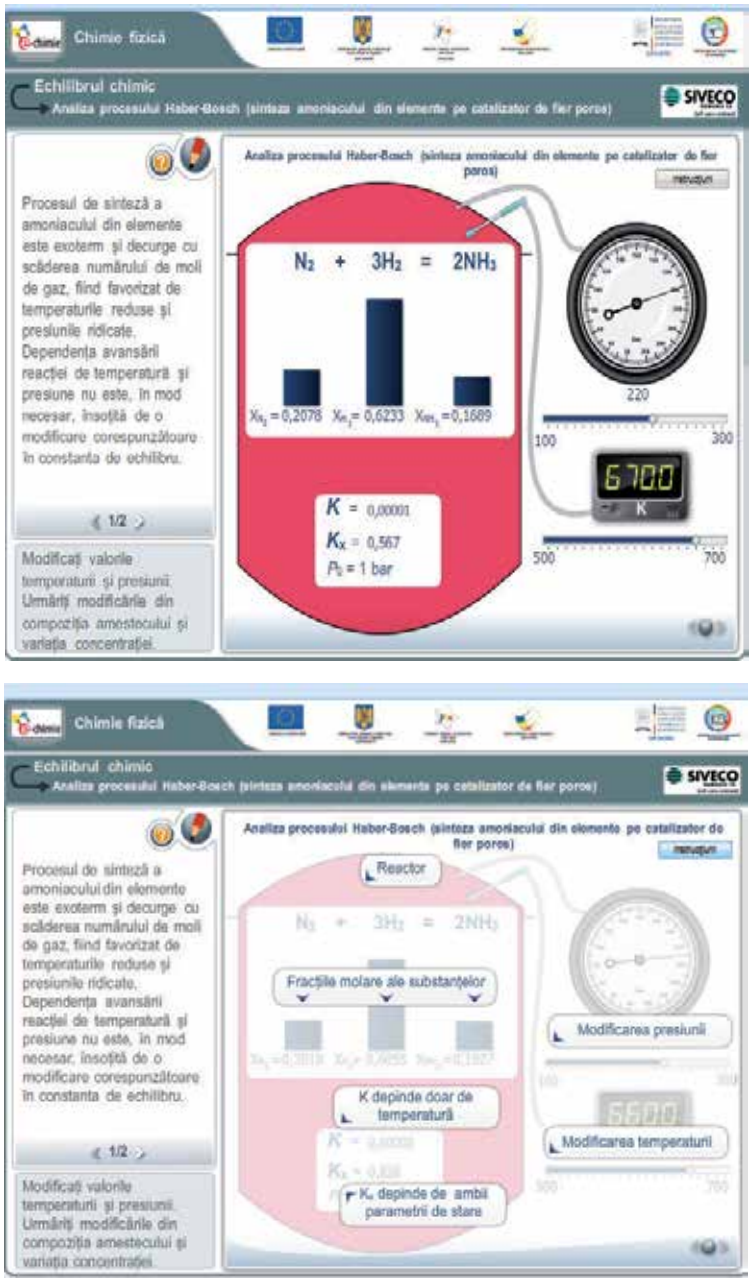


Figure 11. Information presented in a transparent layer (b) which overlaps the main content (a).

Error prevention is also a good usability practice. According to specialized studies, errors lead to loss of credibility in multimedia applications. Thus, such a design is required so that it predicts all possible states that can be triggered by the user. Unlikely or strange situations should also be considered. Unfortunately this task is even harder to accomplish when there are several user input parameters. We have faced such a situation in the project I, with an

application that simulates a titration (figure 12). The relatively large number of parameters to be decided by the user, along with the drivers and complex mathematical models behind the simulation, lead to configurations in which the simulation could give errors. We have adopted a solution that has proven very effective, namely, we designed a sequential progress, wizard-type, where required parameters are introduced in several steps, each step being somewhat influenced by the decisions made in the previous one. For instance, titrant and titrated species can be chosen only at step 2, from a list filtered by the option made at step 1, by the choice of type of titration. Thus, the temporal split of application may have consequences in the delimitation of those elements, whose combinations represent sources of errors.

Multimedia content developers must strive for simplicity in layout, screen function, structural design and other program elements. Complex or extraneous interface elements unnecessarily burden users' working memory.

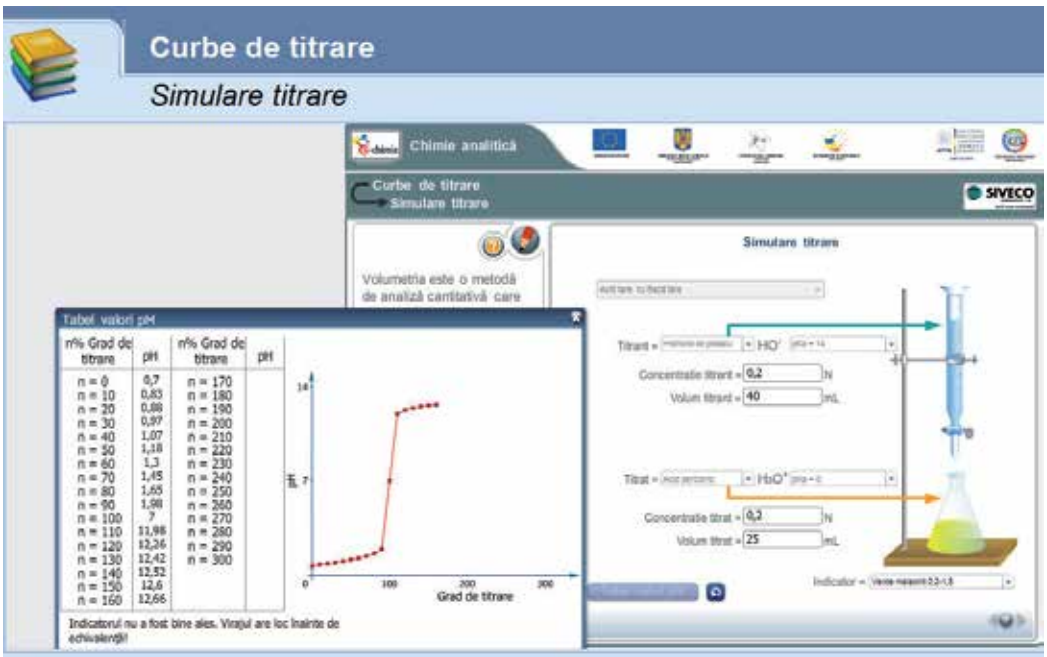


Figure 12. Wizard-type multimedia application

4. Content development: Examples

Since 2004, higher education in Romania has been undergoing substantial changes, in order to achieve the highest possible efficiency in developing adequate skills for young graduates, skills essential for their employability. The content development for the e-learning system in the faculty of Applied Chemistry and Materials Science followed the relation between technology and pedagogy, as presented in the previous section.

A first attempt to know the preferences of our students was by carrying out a survey on a 237 people sample [9]. This survey revealed the position of different categories of students:

undergraduates, aged 18 – 22, and postgraduate students, studying for a masters' degree, aged 24 – 55. In the mature students category there was a special lot formed by educators involved in primary and high school education; they were enrolled in a complementary–type continuing education master program and showed rather similar opinions in connection to the main educational issues.

The dominant feeling among the student population is that computer aided instruction is very useful in modern pedagogy for all teaching levels, higher education included. As regards the direct link between the technology and pedagogy, 93 % of the students agree that pedagogy should be defined according to the chosen technology. It is interesting to note that all participating mature students have expressed their preference for the constructivist approach, while half of the undergraduates (41 people) declared to be happier with an instructivist education style.

A group of enthusiastic students was identified, adopting e–learning to match their constructivist preference for the educational process. There is a second group using gladly technology, but preferring a classical pedagogical approach. A third group is satisfied by a constructivist approach in face–to–face educational activities, but does not see the advantage of using any ICT tools. Finally, a fourth group still does not acknowledge the potential of using e–learning as an interactive tool for teaching and learning, and therefore show deliberately no interest in testing computer aided instruction - CAI (figure 13).

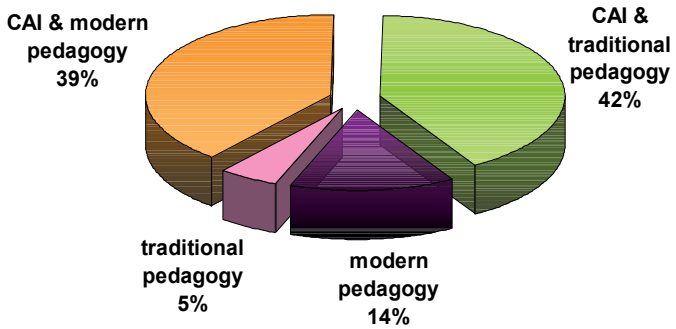


Figure 13. Students' pedagogical options for the educational process

In addition to the different requirements of various learning tasks, the students identified other variables likely to influence learning success: learner's experience for the subject in question, background knowledge, learning preferences ("learning style/cognitive style/thinking style") and orientation, including his or her reaction towards technology, learner's sensory pathways and cognitive processing abilities, emotional state, gender and age differences, cultural / corporate / institutional / societal requirements and values, presence or absence of collaboration with other learners, learning environment, including "learning distracters", availability of human and technological resources, and whether an individual or a group is being taught to (figures 14 and 15).

The content development in the e-learning system implemented in the faculty of Applied Chemistry and Materials Science followed an ascending route starting with the creation of

content delivery modules for faculty application consisting of lectures presented as power point presentations, including animations and links to videos concerning the topic in view (dedicated to instructivist teaching approach), simulated interactive laboratory experiments for all major subjects, and knowledge evaluation tests. These were included in the "Library" module of the e-learning platform and were accessible in the class, assisting the teaching stuff in delivering vivid lectures, or they could be accessed by each student that had access to the platform on his/her own computer [10]. The industrial chemistry curriculum has a certain characteristic that makes it different from other technical courses: the higher amount of shared knowledge between different disciplines. As mentioned in the literature [11, 12], the classical teaching methods often fail in achieving the required fluidity between the curriculum subjects. By nature, an e-learning system allows modules from different disciplines to connect, and furthermore, to interact [13].

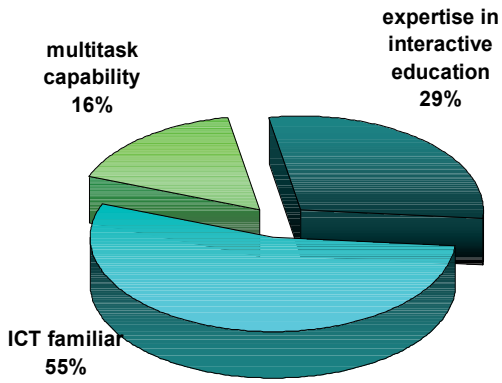


Figure 14. Required skills when using ITC technology.

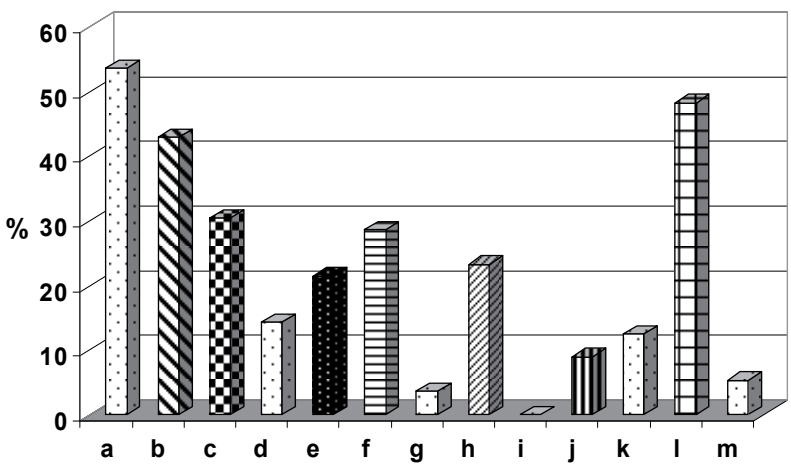


Figure 15. Main variables important for learners
(a -experience in the subject; b - background knowledge; c-learning preferences; d-learning reaction towards technology; e - sensory pathways; f - cognitive processing abilities; g - emotional state; h - age differences; i - gender differences, j – cultural/ corporate /institutional societal values; k - collaboration with other learners; l - learning environment; m – none)

In the same time, an exceptional effort was done to design and implement complex chemistry lessons for the e-learning community created within the collaborative project "**WE LOOK TOWARDS THE FUTURE-***Professional Training of the Teaching Staff for Using Modern Digital Resources in Efficiently Teaching Chemistry***",** developed in the frame of the European Social Fund - SOP HRD 2007-2013, SOP HRD 61839. This project (referred to in the contribution as project I) had the following main objectives:

- development of ITC skills for teachers who teach chemistry and technology-related subjects in the K12 system,
- design of pilot ICT instruments suitable for transferring chemical knowledge,
- promoting on-line learning techniques in the K12 system,
- building-up a collaborative virtual community spread across Romania.

Face-to-face sessions with on-line and off-line activities have been designed and specially tailored digital educational resources for the K12 system have been implemented. Digital lectures and virtual laboratory experiments have been created for all main fields in chemistry (Inorganic, Organic, Analytical and Physical Chemistry). In order to improve the way chemistry is seen by high school students the project aimed to ensure: a relevant chemistry education philosophy, an optimized curriculum, and appropriate teaching approaches in chemistry by using ICT tools. Relevant assessment and evaluation strategies and relevant professional development for teachers have been also considered. The project also creates a collaborative virtual network between the chemistry teachers involved in the project which will be a good start for future collaborations.

As concerns the chemical engineering education in the faculty of Applied Chemistry and Materials Science, an important number of subjects such as analytical chemistry, chemical engineering bases, unit operations in chemical engineering, computer programming used the e-learning platform for teaching, and examination in a blend of assisted (virtual classroom) and non-assisted (virtual library) training sessions. Some examples are given bellow.

Figure 16 represents an aspect of some unit operation lecture included in the library of the e-learning system. As figure 16 shows, on the same slide students can see the main equations governing the design of a distillation column, the representation of vapour and liquid streams in the column and graphical solution for the calculation of the number of stages.

Figure 17 presents a moment from an Analytical Chemistry lesson, where the main steps in choosing the titration agent are explained. For each step links to further details are provided. Figure 18 presents an application for an interactive seminar session were students are asked to study a two-stage vapour compression refrigeration system. The application allows to choose the refrigerant, the suitable temperature ranges and to follow the fluid transformation in an enthalpy-pressure diagram.

In higher education chemistry laboratories, the practical experience is essential for students to increase their analytical skills and understanding of chemical concepts.

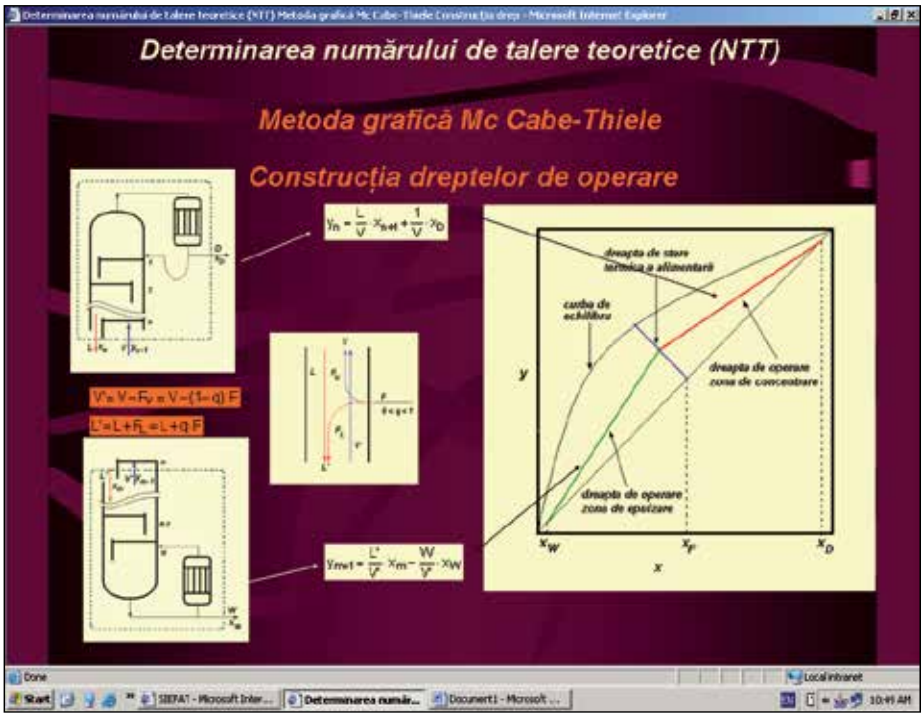


Figure 16. Design of a distillation column: Lecture in e-learning platform

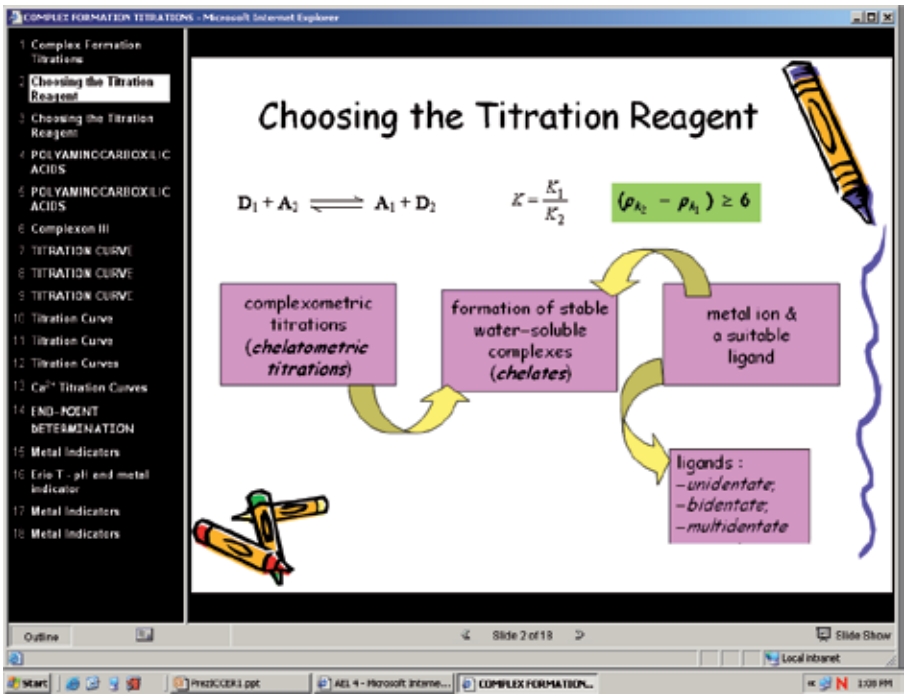


Figure 17. Analytical Chemistry lesson implemented in the library module.

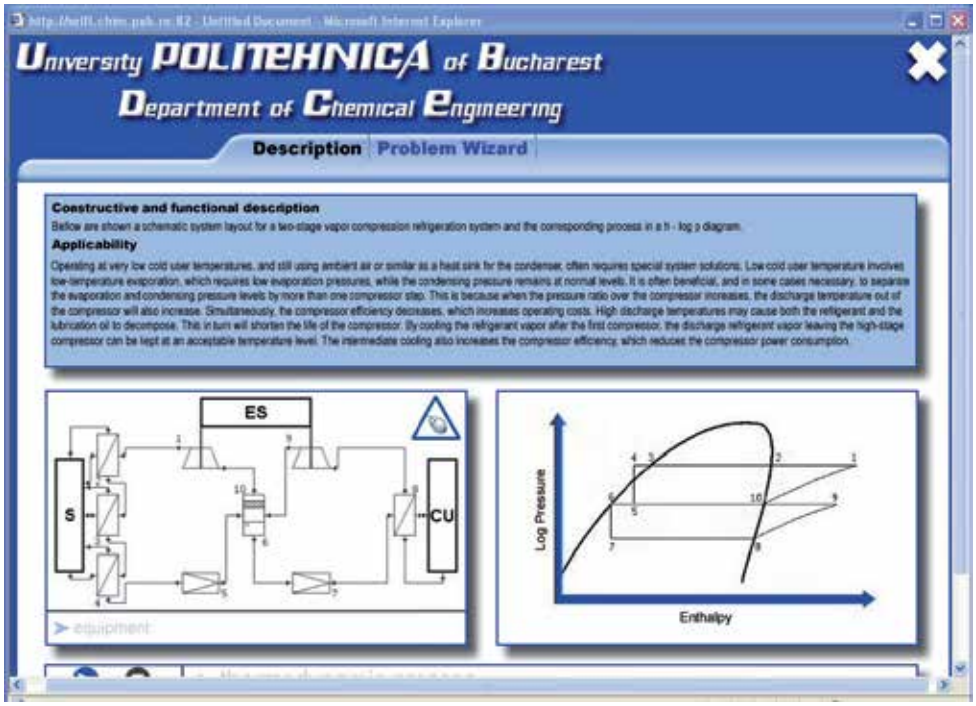


Figure 18. Vapour compression refrigeration system

The necessity to follow strict directions are factors of limited time, large numbers of students, cost restrictions, and the need to ensure the safety of all students in the laboratory. Laboratories should not only provide students with the opportunity to increase their analytical skills, but also to actively engage in practical activities while learning. One alternative to the traditional laboratory are virtual and remote labs, which can provide an interactive learning environment and connections to real world scenarios. Virtual laboratories should be used in conjunction with traditional laboratories. Virtual laboratories can be used as pre-lab to traditional laboratories, follow–ups for further exploration, or as substitute to traditional labs every now and then.

Virtual laboratories have been designed for both higher education and high-schools need. An example is a complex analytical chemistry experiment where students have to study the absorbance of a given indicator using the spectrophotometric analysis (figure 19). After a brief theoretical presentation (figures 19 a, and b) a new window is opened when the multimedia application button is activated. This window presents the laboratory equipment necessary for preparing buffer solutions of different *p*H values. The samples are prepared in Berzelius vessels using two burettes from two distinct solutions: citric acid and diacidic sodium phosphate (Figure 19 c); then different indicator solution at given pH values are obtained by mixing buffer and fixed indicator volume, while a final pH measurement is carried out (figures 19 d, and e). Figure 19 f presents the absorption spectrum of each solution obtained with the aid of a virtual spectrophotometer and the registration of the absorbance value. When the sample is analysed, a pop-up window opens to show the

spectrum, and, when selecting the red dot indicating the maximum absorption, the value is registered in the table (Figure 19 g). Finally, the calculation can be done according to the sheet that is provided by the application (Figure 19 h). As figure 19 shows, all principles of usability applied to a navigational system of a multimedia instruction system (as presented in section 2) are applied: indication of the place in the system, instruction to use the application (up left corner), pup-up buttons (figure 19 b).

Apart from simulated laboratory experiments, a **remote laboratory module** was implemented in the e-learning system in the University 'Politehnica'of Bucharest [14]. This approach has both advantages and disadvantages. In the advantages category one should mention: provision of laboratory experience to on-campus students, as well as to distance learning students, more efficient use of premises and equipment, design of laboratory pilots matching closer the industrial reality, and increased responsibility of the student user when operating the available equipment.

As for drawbacks, the list includes consistent acquisition, implementation, and running (consumables, staff, energy) costs, and the development of on-line communication and security tools for continuous supervision of on- and off-campus students.

The remote laboratory module is based on an in-house developed robot consisting of a central processing unit, mechanical set-up for sample and sensors handling incorporating a stable frame, revolving disc, and a miniature step-by-step engine, and flexible sensor arms, chemical sensors, and the communication interface with the portal.

The graphical integration at level of workspace and teaching/learning space is defined for the two actors: teacher and student.

The teacher can create courses (embedding the theoretical parts of the experiment), schedule courses, add participants, and initiate the laboratory (sensors, solutions). The student can access the course assigned in the learning space, study the experiment theoretical issues, and finally perform the experiment.

The remote laboratory module can be accessed from the e-learning portal. The professor creates a course in the system and adds objects to the courses (Figure 20). Figure 21 presents the remote laboratory general structure.

The next major moment in education is implementation of computers, not only for teaching, finding information or solving complex calculus, but also for testing purposes. The creation and implementation of evaluation test grids was an important step in the development of our e-learning systems [15]. This already-not-so-new form of examination arises for both reducing-time and increasing-objectivity purposes (a written test contains now *many little problems*, instead of *few big problems*, and could be marked in real time). To avoid repetition, which leads the students to learn the grid instead of studying the course, the test grids should be *refreshed* from time to time.

The technical schools were the last to adopt this form of examination, mainly because it seems very unsuitable for this area. Usually, a test grid is composed from several *short questions*, each of them having a few given, alternative, and *exclusive* answers. This manner is perfect to test

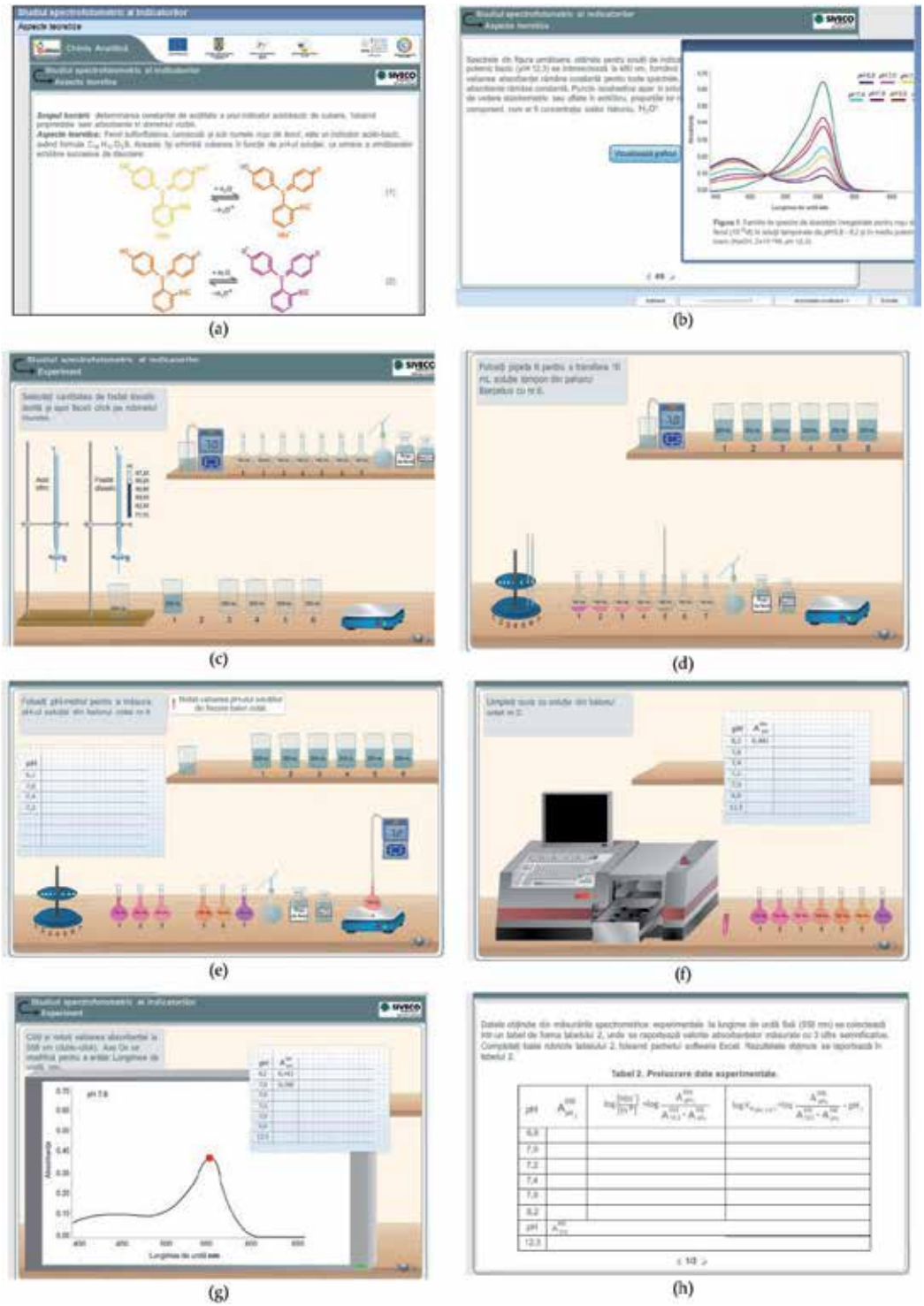


Figure 19. Spectrophotometric study of *p*H indicators

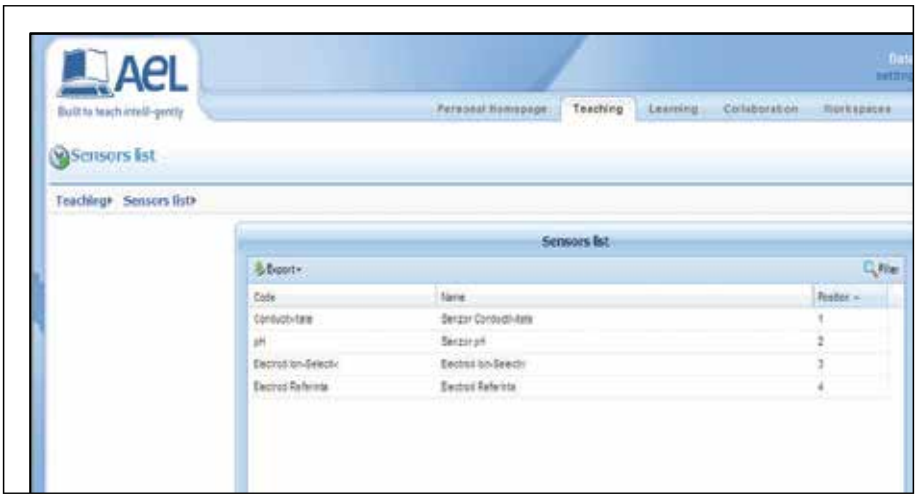


Figure 20. Adding sensors from the sensors list

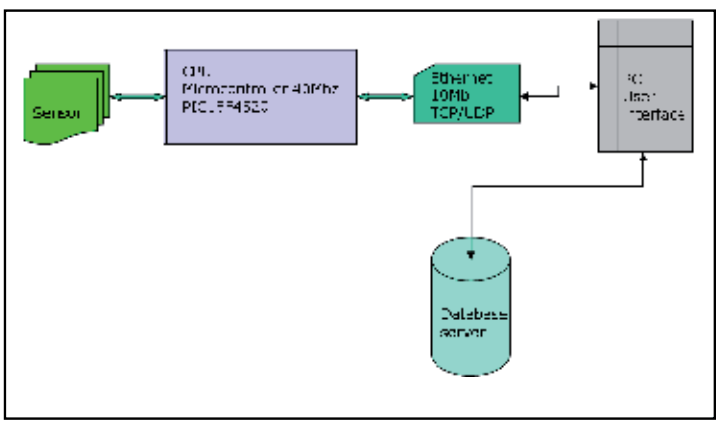


Figure 21. Remote laboratory structure

acquired information, such as geographic or historic data. Using an evaluation test grid for technical purposes means was avoiding some ridiculous situations like the following:

"Solve the given cubic equation and find its solutions: $x^3 + 9.4 \cdot x^2 - 17.12 \cdot x + 5.28 = 0$.

a. 1.2; – 11; 0.4;
b. 1; 0; – 1;
c. i; 0; – i;
d. – 1.2; 11; 0.4;
e. 1.2; – 11; – 0.4".

It is obvious that no abilities to *solve* high degree equations are tested here, since the candidate has nothing else to do but to *replace* the given values and check if they are real solutions. Although a test grid like this is usually called "with multiple choices", very often only *one* choice is true!

It is obvious that this kind of test grid is not suitable for technical purposes. But, with adequate reformulation the above example could be easily changed so that the student has to really solve the equation and, moreover, to test other connected abilities:

"For the cubic equation $x^3 + 9.4 \cdot x^2 - 17.12 \cdot x + 5.28 = 0$, please check the *false* answers:

a. all solutions are imaginary;
b. all solutions are real and positive;
c. all real solutions are positive;
d. the absolute value of some real solutions is above unity;
e. the imaginary part of one solution is *i*;
f. there are no real solution less than – 10;
g. there are opposite real solutions;
h. there is at least one null solution;…"

Now the equation should be *really* solved, although first two points could be prior checked, while there is always at least one real solution for a third degree equation and, from inspection of the positive free term, it yields that at least one negative solution arises (it represents the inverse product of all three solutions). In this manner, someone who doesn't know the formula or being in time-crisis (at the end of allocated time) could check something, but all requirements are fulfilled only by solving the equation. While several good answers could be expected, consequently a more refined evaluation is possible – if a student had checked only part of the correct alternatives, perhaps some fraction of the attached points should be given. The major disadvantage of all test grids may be real only with bad composed / organized test grids.

"For the given cubic equation $x^3 + (7.8 + 0.1 \cdot \mathbf{N}) \cdot x^2 - 17.12 \cdot x + 5.28 = 0$, please…"

In this manner, one can have at the same time and in the same classroom up to 31 students solving the same problem, but with slightly different data. Also, a small database containing the given number for each student will allow repeating the test and get a different integer that will be assigned using a small program. In order to correct these slightly different problems, the instructor should solve them all, but this is not such a big obstacle while a lot of matrix-oriented solvers are available (Excel, Mathcad, MATLAB). Even the double-checking and the point attribution could be carried out with an algorithm and a developed code.

An example of test grid implemented in the faculty e-learning platform for the final examination in "Chemical Engineering Bases" is given bellow. Each student receives three files in his directory, one containing the application text, where some data are given as functions of the number **N** (the exam number, which customizes the problems) (figure 22). Also, instructions to solve the problems are given in a separate file, while the third one contains an empty table to be filled by student only with his results (figure 23). This is another innovation: we are no longer interested in how the student works to solve the problem, since same type problems were already solved during the semester – our philosophy here is that perhaps two or three methods are appropriate to solve and at least

one hundred various mistakes could happen, so there no "prizes" only for applying an appropriate formula to get a wrong answer.

A well mixed vessel with a volume of V=5 m^3, contains m_0=(1000+100 × N) Kg of an aqueous solution of a salt, A, having the initial concentration $w_{A,0}$=0,15 (mass fraction). The vessel has an overflow and a bottom drain connection. At a given moment, the vessel is fed at constant flowrate, $G_{m,i}$=(5-0.15×N) kg/s with salt concentration of $w_{A,i}$=0.3-0.01×N. After 10 min, the liquid in the vessel begins to be evacuated by the bottom drain with constant flowrate $G_{m,e}$=10 kg/s.
1. What is the maximum quantity of solution in the vessel?
2. What is the corresponding salt concentration when the maximum quantity of solution is in the vessel?
3. Calculate the required time to evacuate all the liquid in the vessel (min).
4. What is the salt concentration in the vessel after 15 min from the beginning of the experiment.
Note: The density of the solution is considered to be 1000 kg/m^3 whatever the value of the salt concentration.

Figure 22. A personalized numerical evaluation test containing the parameter N).

A good engineer should supply the *approximate* good answer in a limited time, no matter the method. The table supplied is an Excel sheet, protected to receive only figures in some cells, and perhaps with imposed measure units in others. This type of table is very easy to be collected and passed through a validation algorithm, were some intervals are checked against written numbers (i.e., there are accepted solutions having small deviations like ±5%, of course if this is not *aberrant*).

Results double-check against a "teacher's table of truth", containing already solved applications for all numbers **N**, like in figure 24 (this time, a Mathcad sheet) were also provided.

	A	B	C	D
1		**N =**		
2	**Literal code**	**Subitem number**	**Numerical value**	**Measure units**
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

Figure 23. Answering table for problems

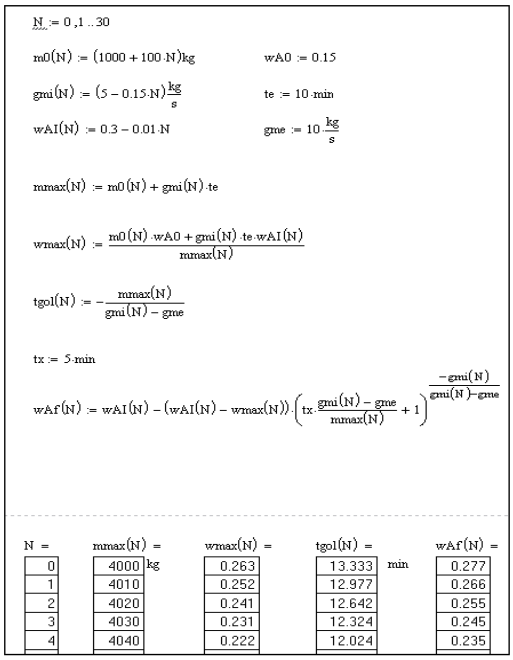
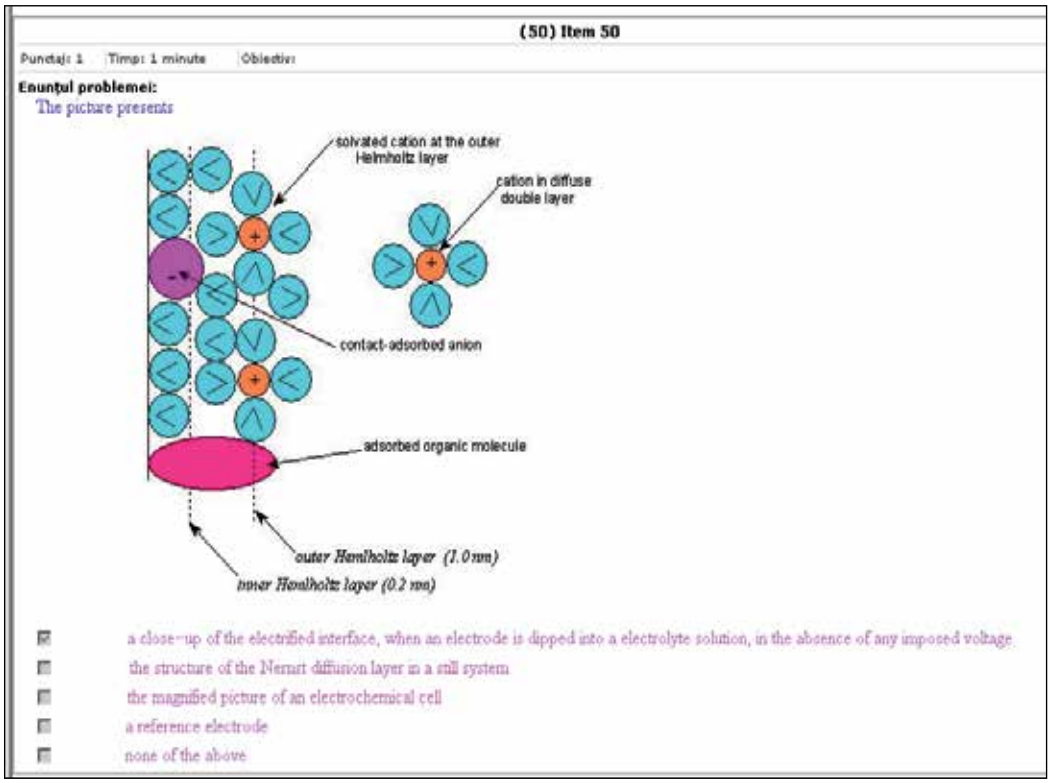


Figure 24. Solutions for parametrical problem

Next stage of an on-line examination is the *theoretical test grid*. When the test grid is prepared, other innovations may be used. First, the whole taught material is divided into "slices", say *subjects* (for example, several subjects could arise from each lecture – they are like paragraphs in the book). Next, the *text* for every subject should be formulated as generally as possible (and yet, very brief, for example, "Identify true / false statements", "check the correct / wrong answers", etc.). Then, for each subject, a small database containing a large number of options, either true or false, is constructed. The number could be increased from time to time, and also each variant could be modified if necessary. For example, from chapter 2 of a given course, six subjects can be formulated, numbered 5 to 10, each one having more than 10 answers (at least one is true and/or one is false). Usually, there is almost the same number of true and false alternatives. The central point is how to construct a test grid from this database, in order to be both *complete* and *new*, even for students who re-sit the examination? This can be done using a *selection* algorithm, which is instructed to randomly choose an established number of subjects from each chapter. In the given example, there will be 2 subjects, of any combination of numbers between 5 and 10. At the lower level, the algorithm will randomly select a given number of variants (say 5 or 6) from the given database; the *order* (i.e., the position in the list, denoted by small letters, from **a** to **e**) could differ, the only constraint being to have at least one true and one false answer. Tests are automatically generated in this manner, and they have a different content, customized for each candidate. Also, a variable solving time could be used, to adjust to the difficulty.

Figure 25 presents some theoretical test-grids implemented in the faculty e-learning system.



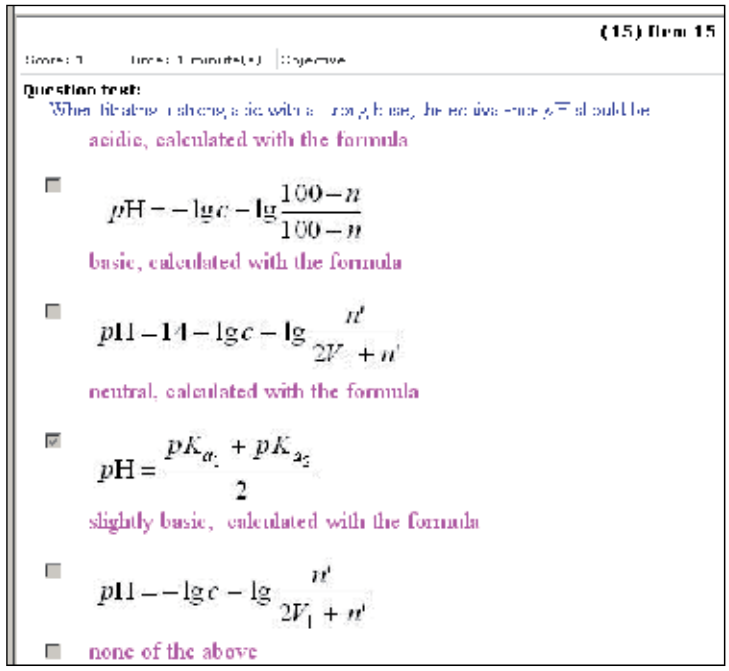


Figure 25. Evaluation grid test in analytical chemistry examination.

As concerning specific content development for high school education, applications were created in order to make more attractive all basic chemistry knowledge, such as the periodic table of elements, the chemical bonds, physical and chemical properties of elements and compounds. Some more complex lessons were also designed in order to increase the interest of young people towards practical applications of chemistry in various technical fields and environment protection. As research has shown, chemistry teaching is unpopular and irrelevant in the eyes of students, does not promote higher order cognitive skills, leads to gaps between the students' wishes and teachers' teaching and, most important, is not changing, because teachers are afraid of change and need guidance [16]. The usage of vivid lessons involving ICT tools is expected to increase the interest towards chemistry in Romanian high schools.

The content implemented in the e-learning platform as an aid for high school chemistry education is designed according to the pedagogy-technology relationship presented earlier, in order to be easy to access and attractive. Some examples are given in the followings, to illustrate all domains in which interactive lessons are available.

Figure 26 shows how chemical bonds are explained in an inorganic chemistry class. As figure 26 shows, two atoms with unpaired electrons (a) can create double or triple bounds (b) that are represented in a schematic manner as figured in (c).

Figure 27 is a moment from an inorganic chemistry lesson where the dissolution of an ionic salt in polar solvents (water) is explained. On the left side of the screen some theoretical explanation is given. On the left it is shown how water, that is pored over solid NaCl crystal, acts upon the ions in the crystalline structure, displacing ions, and, finally, both chloride and sodium ions move freely in solution.

Another example is the presentation of a simple experimental device to calculate the capacity of an accumulator. This is implemented as interactive lesson for high school students in the XIth grade. The experimental set-up must be built by using its elements (Figure 28 a). The application allows only the use of the correct positions for each element in the predefined scheme. When the experimental setup is ready, the experiment may start and the results are registered automatically (Figure 28 b), until the accumulator is totally discharged (Figure 28 c). Based on simulated experimental data the calculation sheet is provided (Figure 28 d).

Some easy to use virtual laboratories are designed for environmental protection lectures. Figures 29-31 present three moments of a virtual laboratory studying the evolution of two plants (begonia and philodendron) in water and simulated acid rain water.

Figure 29 corresponds to the initial moment, when all the four plants are full of life. When the "start" button, placed in the window down on the left side, is activated the simulation of plants evolution begins. After starting the application, the clock indicates the elapsed time and so does the calendar on the shelf. Figure 30 corresponds to the situation noticed after 4 days: the plants in water are flourishing, while those in simulated acid rain regress. After 6 days (Figure 31), the plants in simulated acid rain water are no more alive.

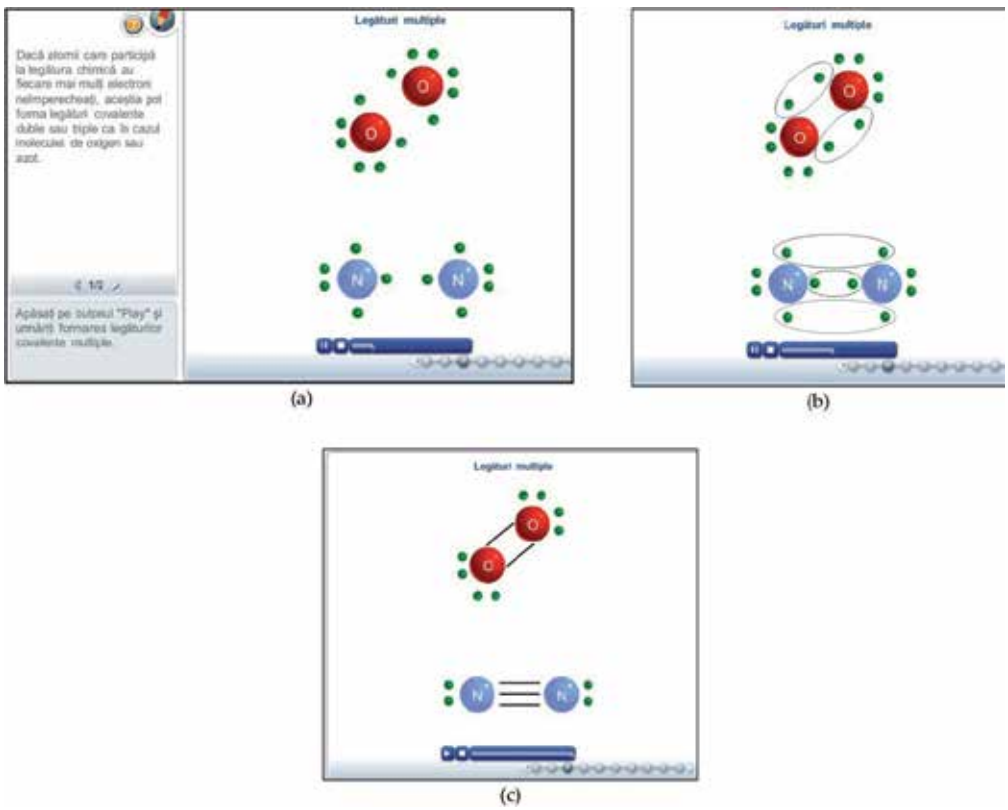


Figure 26. Animation used in teaching the formation of covalent bonds.

Figure 27. Properties of ionic compounds

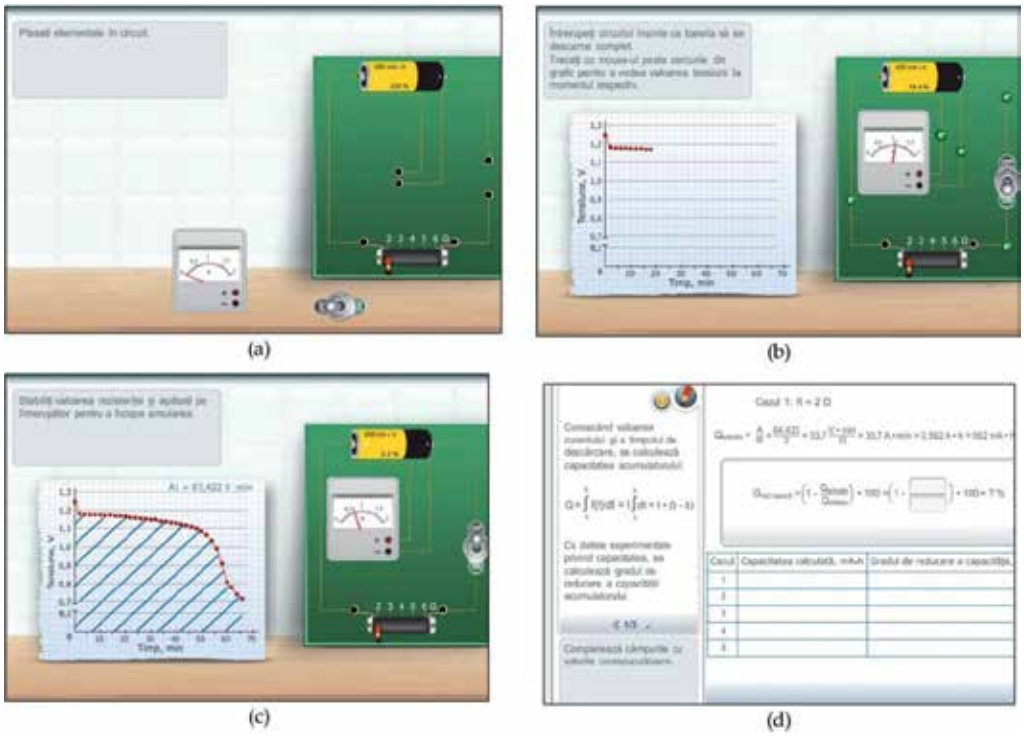


Figure 28. Virtual experimental to calculate the capacity of a Ni-Cd accumulator

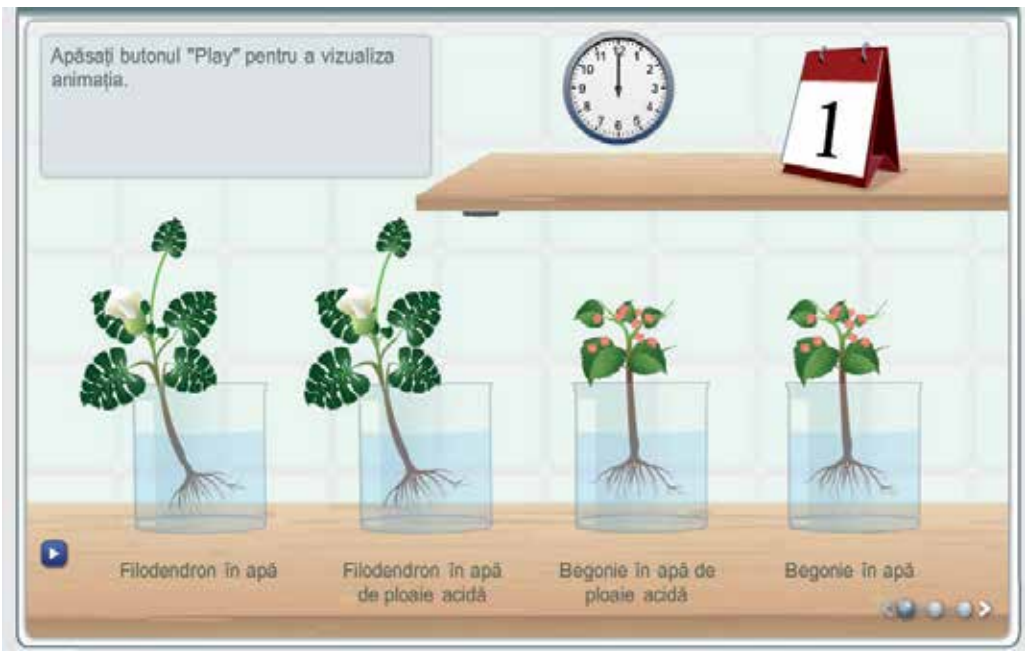


Figure 29. Environmental protection virtual laboratory-plants in water and simulated acid rain-initial moment

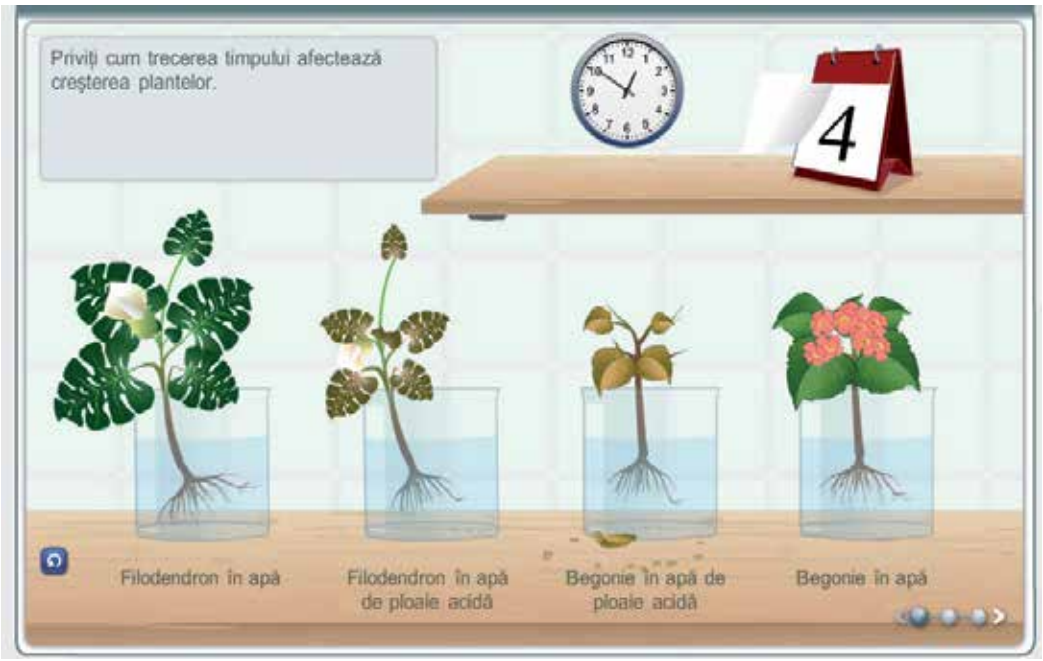


Figure 30. Environmental protection virtual laboratory-plants in water and simulated acid rain-after 4 days

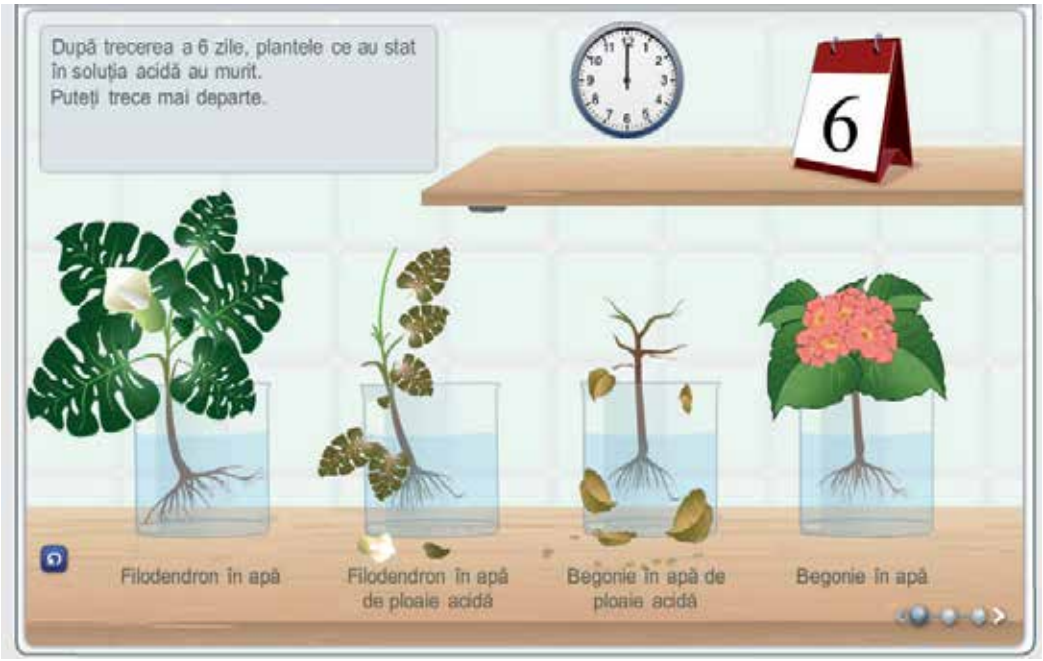


Figure 31. Environmental protection virtual laboratory-plants in water and simulated acid rain-after six days

5. Conclusions

The use of ITC tools in teaching chemistry and chemical engineering can help K12 and higher education students to understand theoretical concepts easier and make chemistry a more attractive subject. The experience gained over the time by part of the teaching staff in the Faculty of Applied Chemistry and Material Sciences in developing and delivering educational resources with the aid of ICT tools has been shared in the present chapter, giving enough evidence that computer aided instruction is a valid, modern pedagogical approach for high school and university educators, will lead to increasing quality of education, and represents a realistic strategy for convincing young people to approach jobs in science and engineering as a valid life perspective.

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6. References

[1] Baltac V and Mihalca D (2007) On Romanian Experiences Related to Universities and ICT industry. 2nd IT STAR Workshop Universities and ICT Industry, Genzano.
[2] Pearson J (2006) Investigating ICT Using Problem-Based Learning in Face-to Face and Online Learning Environments. Computers & Education 47: 56-73.
[3] Josceanu A M, Isopescu R, Pleşu V, Zelch O (2006) Scorm-Based Content Delivery and e-Learning Platform for Chemical Engineering Education in University ‚Politehnica' of Bucharest. PRES 2006, Prague.
[4] Onofrei R, Josceanu A M, Postelnicescu P, Pleşu V (2005) e-Learning Interactivity Approach in Chemical Engineering Education. Chemical Engineering Transactions 7: 431-436.
[5] Elshorbagy A and Schönwetter D (2001) Engineer Morphing: Bridging the Gap between Classroom Teaching and the Engineering Profession. Int. J. Engng. Ed. 3: 295-300.
[6] Josceanu A M, Isopescu R, Postelnicescu P, Onofrei V, Plesu V (2007) E-Learning Support for Bologna-based Curricula for Chemical Engineering Education. Chemical Engineering Transactions 12: 561-566.
[7] Josceanu A M, Isopescu R, Postelnicescu P, Dumitrescu A M, Plesu V, Zelch O, Stefan C (2008) Enhancing higher chemical engineering education and collaboration in the frame of an e-learning platform. PRES 2008, Prague, CD-ROM of full texts.
[8] Josceanu A M, Postelnicescu P, Dumitrescu A, Danciu T (2008) Communication and collaboration in the frame of an e-learning platform in chemical engineering education. 9th European Conference E-COMM-LINE 2008, Bucharest, CD-ROM of full texts.

[9] Josceanu A M, Dumitrescu A M, Danciu T, Isopescu R, Postelnicescu P, Pleşu V, Stefan C (2010) E-Learning Today. Chemical Engineering Transactions 21: 1057-1062.
[10] Project no.1270/2006 Development of an advanced e-learning platform for higher education institutions.
[11] McCowan J (2002) An Integrated and Comprehensive Approach to Engineering Curricula Part Two: Techniques. Int. J. Enging. Ed. 18: 638-643.
[12] Wanks S (1995) Curriculum design. From an art towards a science. Berlin: Tempus Publications. pp 6.
[13] Kartan N, Al-Reshaid K (2002) Design and Implementation of a Web-based Multimedia Techniques for Construction Education. Int. J. Engng. Ed. 4:682-691.
[14] Josceanu A M, Postelnicescu P, Dumitrescu A M, Pleşu V, Stefan C (2009) Remote Control Experiments in Chemical Engineering Education, Chemical Engineering Transactions 18: 773-778.
[15] Danciu T, Dumitrescu A M, Postelnicescu P, Josceanu A M (2009) Test Grids in Technical Universities. The 10th European Conference E-COMM-LINE 2009, Bucharest, CD-ROM of full texts.
[16] Holbrook J (2005) Making Chemistry Teaching Relevant. Chemical Education International 6:1-12.

Chapter 6

Virtual Reality Technology as an Didactical and Pedagogical Resource in Distance Education for Professional Training

Elomar Christina Vieira Castilho Barilli

Additional information is available at the end of the chapter

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1. Introduction

When we read a good book, soon our imagination takes us to amazing situations: in an instant we are transported to sumptuous castles... in another we are piloting huge spaceships or traveling inside the human body. More than this, we sometimes ask ourselves how it would be like if fiction became reality and we could fly through clouds or explore subsea mountain ranges?

Today, what seemed impossible 'can' already be done through a technology that combined knowledge from many different domains (Anatomy, Biology, Biochemistry, Physics, Computer Sciences, Graphic Design, etc.) into one single multi-disciplinary entity capable of providing non-specialized users virtual worlds that simulate reality with a wealth of detail, giving them even the subtlest of sensations through its output devices. As regards the 'real world', in some areas like Health, there is no room for rehearsals and much less for errors. Technical mastery can mean the difference between life and death.

Virtual Reality (VR) involves revolutionary technologies in the development of applications, as a result of the new possibilities it gives to the man-content interface, via multi-sensorial devices, navigation in three-dimensional spaces, immersion in the context of the application and real time interaction.

Costa et al (2001) state that VR is the most natural of the Man-Computer Interfaces (MCI) due to its potential for multi-sensorial interaction. This means that, through this technology, the computer-generated virtual environment can provide the user with interaction with the use of senses (sight, hearing, touch and, more recently, smell). Apart from that, due to the manipulation of objects and movement in the environment happening in real time, the

authors believe that the big advantage of this interface lies in the fact that experiences occurring in the physical world can be intuitively changed in the virtual world.

As regards Education, it should be pointed that the increase in the use of Information and Communication Technologies (ICTs) requires the construction of a new pedagogical model in which the educational activities for the apprehending of (re)constructed knowledge promote the use of its resources to assist human beings to overcome physical, social, and cultural barriers universally.

Beyond the factors that are connected only to scope and/or scale, Education seeks more than expanding access opportunities. The challenge is to diversify the ways to present and represent the organized bodies of knowledge to foster the construction of meanings for cognitive appropriation.

Its goal is to enable the student to reflect on his or her own needs and potentials, contributing to the development of a critical consciousness about the contents that are relevant for the educational process, allowing them to decide when and how to use the knowledge acquired.

The integration of these factors make Distance Education (DE) one of the most promising educational alternatives, for its capacity to transcend time and space and assist in the development of an organized stance while providing human interaction and favoring cooperative learning.

In this context, the use of VR technology can contribute to motivate the learning experience through the 'experiencing of real phenomena', being free of the consequences the real world imposes. Thus, new educational possibilities can arise from the VR-DE integration.

At the same time, Colleges and Universities are experiencing a special moment, resulting from contemporary social demands: to prepare future professionals for a highly competitive job market, which requires workers with special profiles, well-defined technical competencies but, chiefly, capable of critically thinking about the daily phenomena of work and, with a generalist basis and knowledge, propose solutions to solve complex problems.

As a result, apart from technique and basic competencies (reading, understanding, interpreting, listening...), other highly-valued human competencies come to the fore (such as negotiating, getting to know the context of work, applying the method, sharing...,), as well as being adapted to the technological world people live in. Indeed, the creation of different technologies seems to emphasize its status as pre-requisite for the access to the possibilities of qualification for the job, through physical attendance to classes or in distance education.

In the field of professional training education the knowledge applied is multi-disciplinary and complex, and often requires visualization and manipulation. Thus, VR technology is a powerful ally to the 'from a distance' education proposal, capable of providing multiple educational opportunities. Together with it, the use of VRML (Virtual Modeling Language) enabled the use of its applications on the Internet, which contributes to the use of VR in education. Apart from the simulation of reality, after VRML its systems and applications became lighter and faster, an important feature in e-learning educational processes.

VRML is a platform-independent language that describes and enables the creation of 3-D virtual environments on the Internet, where one can browse and visualize objects from different angles and interact with them, changing their characteristics if necessary. The immersion is not possible in VRML sites although they offer 3-D worlds, interactive and integrated with other worlds and Web links, giving them a flexible access nature (they can be accessed from notebooks, tablets, smartphones etc.).

The VRML environment can be written with a code produced in a word processor, describing the environment and the events associated with it, with no need of a compiler. The applications can then be produced with the use of commercially available editing software (Cosmo World, ISA and others), that will be interpreted by the browser with the assistance of a plug-in (http://www.cortona3-D.with/Products/Viewer/Cortona-3-D-Viewer.aspx). For more complex projects, however, 3-D modulators and graphics editors should be used as support tools.

Its execution is run from a link that, once decoded by the browser, loads a text file with the description of the environment and, after that, loads the textures. In other words, to open a Web address (URL) that contains a VRML document (**.wrl** extension). Once the browser detects the file type, a VRML visualizing plug-in enables the visualization and movement of the objects in the 3-D virtual world. From there on, the system is operated by the user.

The figure below shows a VR app for the Web where the student can rotate, and zoom the object in and out, apart from simulating different weighing operations and calibrations.

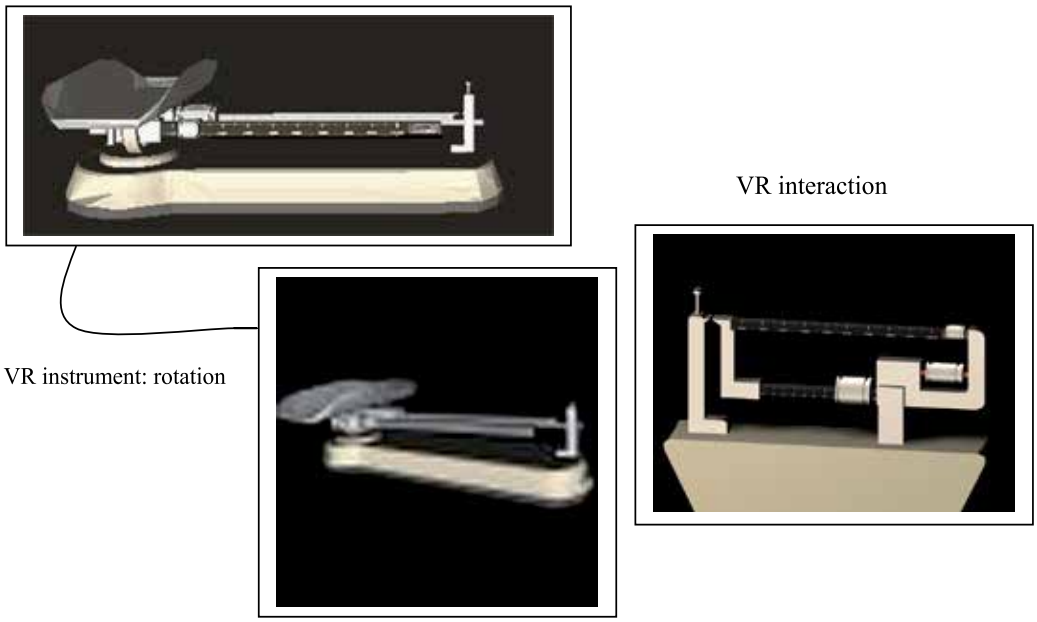

Figure 1. Distance Education Course on Food and Nutrition Inspection for Indigenous Health: Training in Anthropometrics (http://www.DE.fiocruz.br/course/index.cfm?cursoid=794) Distance Education Coordination of the Brazilian Public Health School – Fundação Oswaldo Cruz

2. Pedagogical or technological reference: Which one is more powerful?

2.1. Permanent professional training

With the aim of demystifying the use of VR or any other technology (given that technology is not a panacea capable of solving the issues of education, but a resource to strengthen it) it should be noted that the theoretical-pedagogical reference is the element that determines the entire educational project the technology is inserted in.

According to Darsie (1999, p. 9), 'all the educational practice carries in it a theory of knowledge'. Thus, should the pedagogical orientation adopt "instructivism", which embraces an associationist and mechanistic epistemology (Neves and Damiani, 2006), the use of technological innovations will only reproduce traditional educational models supported on the pedagogy of memorization (mechanical learning), error and success.

On the contrary, that which is sought is the use of VR, with the implementation of construction processes that find identity with the theories of interaction-based constructivism and with dialectics, which bring as fundamental truths: 1) that all knowledge comes from social practice and returns to it; and 2) that knowledge is a collective undertaking, and cannot be produced in the loneliness of the subject (Vygotsky, 1984 apud Neves and Daminani, 2006). According to Beker (1993), authors considered as social constructivists such as Piaget, Freud, Vygotsky, Wallon, Luria, Baktin, and Freinet have the action of the student as a praxis in the medium of the learning process, as their common place, understanding 'praxis' as any intervention of human beings in society and on nature.

To the authors above, we can add to the theoretical premises that steer the learning processes to the autonomy, liberation, and citizenship of the student, via the dialogue.

DE can and should be considered as an educational modality that brings with it technology as a strategic resource that, if used 'rationally', can work as a mediating instrument between contents and learning. However, discussing the rational use of the technology in education requires a reflection on some points: 1) with physical presence or from a distance, the educational proposal is inserted in the field of Education and should therefore be subjected to its theoretical and methodological premises, that is, education with physical presence and DE are not different things that should be treated according to different theoretical references and therefore...; 2) the pedagogical reference should be the guiding element for the planning, definition of strategies, actions and resources (media). Thus..., 3) the means of communication are conditioned by the access parameters of the public that is the target of the educational proposal, and; 4) the teacher responsible for the pedagogical mediation (teaching), should get educational assistance to support one's actions.

The UNESCO's World Declaration on Higher Education in the 21st Century established essential elements, where we can find: the concern with social issues, the emphasis on fundamental values and the giving value to diversity in Education through the innovative use of educational methods that allow critical thinking, expansion, creativity, and growth opportunities through Distance Education.

Based on these points, strategies for professional qualification currently include elements related to the theoretical principles of psychopedagogy, relating them to the construction of knowledge from experience (constructivism), resulting from human cooperation in a social context (social constructivism), observing the ways of teaching and learning that are provoked by the theories of Andragogy and significant learning.

Andragogy examines how adult students learn, incorporating to the educational project elements such as the needs of problem identification, analysis, decision-making, and autonomy. Significant Learning brings relevant context elements to the learning process, allowing the construction of sense (meaning) for the student.

As regards professional qualification education, the theoretical lines mentioned comply with the approach of Permanent Education (PE). PE is the concept in teaching/learning adopted by the Brazilian Health Sector, which recommends organic relations between teaching and the actions of the health services. PE starts at work, transforming everyday events into learning situations.

Teaching strategies attempt to take the student to identify the critical moments in the daily life at work and study them under the light of a theoretical set of references aimed at decision-making and towards a more effective action.

The goal of PE is therefore to qualify the work practices through education. In this conceptual scenario, the use of active learning methodologies seems to be the obvious choice, building teaching strategies that focus on provoking a reflection on real situations of the work context (case studies and problematic situations) to enable the student to reflect and question one's own reality.

In this context, the diversification of contents and the presentation of a simulation of external stimuli will certainly help motivate and enhance learning.

For Santos (2008),

> [...] From the perspective of today's Cognitive Psychology, the human mind is regarded as a system that computes representations. The mind receives sensorial information from the world and generates representations about it. These mental representations are ways to intimately re-present the outside world (p.10).
>
> VR acts here as a tool capable of meeting the educational needs in distance teaching contexts, as it entails different cognitive styles and sensations of the outside world. VR rises as a new interface generation where, using tridimensional representations that are closer to the reality of the user, it allows breaking the barrier of the screen, enabling natural interactions (Kirner and Siscouto, 2007, p.4)

From e-mail to the GPS, much has been discussed about the ways to provide distance education, its potential and limitations in a scenario of social and cultural diversity that rises from a proposal that goes beyond time and space: the role of the actors involved, the ways to construct and acquire knowledge...

PE seeks to blend daily-life factors, using technology to unite people and, in the case of VR, to simulate situations as realistically as possible, bringing the learning experience to the concrete practice.

However, for the educational project can contribute and lead the students to conquer their place in the world with dignity, with quality in their survival and well-being, it is necessary that all available resources are used within the perspective of a rationale of citizenship for the construction of autonomy. It is not enough to educate for work; it is necessary to educate for life.

Following this reading, how would you answer the question asked by the title of this topic?

3. The technology of Virtual Reality (VR)

Since the summer of 1896, when Frenchman Joseph Nicéphore Niépce obtained the first photograph of the window of his house, Man has been attempting to move from the role of a passive spectator of whatever is presented by nature towards becoming an agent that culturally interferes in Nature (Barilli et al., 2011). From that moment on, Niépce opened the door to a vast array of possibilities offered by his intelligence, to quench his thirst in understanding the unknown, create and improve mechanisms, which put him on a constant search for innovation.

In the history of the Computer Sciences, VR was, until recently, rated as a new technology, because of its dependence on technological advances that were associated to the processing of computer systems and the standardization of equipment conceived for interaction. The latter can be considered an important element in the democratization of its use in different knowledge domains.

VR is the result of a long evolutionary process. The first VR applications appeared in the 1960s in the US military sector, due to the need to provide training to aircraft pilots. A virtual environment aimed at simulating real situations and risk factors, minimizing cost and, at the same time, raising safety and efficiency levels in training. Presently, the military industry still uses this technology, improving the presentation / interaction of its interfaces.

The advancement in communication technologies, as well as IT and computer technologies, however, broadened its use, allowing other knowledge domains to also benefit from it, simulating phenomena for domains such as the mining, oil, health and education sectors (amongst others).

The word *virtual* comes from the medieval Latin word *virtualis*, stemming from *virtus*, which means strength, power. In Scholastics[1], virtual is that which exists in possibility and not in

[1] Scholastics represents the last period of Christian thinking that goes from the 9th century to the end of the 16th century, that is, the constitution of the sacred Roman barbarian empire at the end of the Middle Age that is usually marked by the discovery of America (1492). This period in Christian thinking is known as Scholastics as it was the branch of Philosophy taught in schools back then by the masters, known as a result as scholastics. The subjects taught in medieval schools were represented by the so-called Liberal Arts split into three subjects: Grammar, Rhetoric, Dialectics, and into four disciplines: Arithmetics, Geometry, Astronomy, and Music. Scholastics rises historically from the special development of Dialectics. (http://www.mundodosfilosofos.com.br/escolastica.htm

the act. The virtual tends to get updated without having moved, however, to effective or formal materialization (the tree is virtually present in the seed). In strictly philosophical terms the virtual does not oppose to the real, but to the present. Virtuality and actuality are only two ways of being different' (Lévy, 1996, p. 15).

VR technology allowed that, apart from being an observer, Man became an explorer, interfering and modifying the elements of a virtual environment which, in real conditions would be inaccessible, in systems designed not only to mirror the real world but to represent all of its imaginative power. This characteristic places the student as an active agent in the learning process, vital condition for distance education.

The expression VIRTUAL REALITY appeared in the 1980s when Jaron Lamier (father of the data glove and presently a specialist with the MIT - Massachusetts Institute of Technology) felt the need to coin an expression that would set 'traditional' simulations apart from the virtual worlds he then developed (Braga, 2007; Vilela, 2006).

For Vilela (2006), VR 'consolidated itself due to the convergence of immersion and interactivity in the man-machine relation'. For this author, the constant search for the feeling of immersion (and interaction) in the virtual environment, as supported by VR, is responsible for its evolution.

There are several accepted definitions for VR. This is partly due to its interdisciplinary nature but also to its historical development.

VR is the 'generic' name that represents a technology through which the user can freely visualize, explore/manipulate, and interact with complex data in real time (Alves et al., 2011).

With the grouping of other concepts, one can say that VR is an advanced technical interface capable of providing the user a feeling of immersion (feeling of being in the environment), of browsing and interaction in a computer-generated synthetic tri-dimensional environment, using multi-sensorial channels.

The environments developed in VR have five elements that form its main characteristic (called 5 "Is"): Immersive, interactive, intuitive, illustrative, and intensive.

Thus, VR can be immersive or not. That which sets it apart is the use of physical technologies (supported by logical ordering technologies). The first type depends on input/output devices (helmets, gloves, and even projection rooms). The non-immersive one is based on the use of a monitor, mouse, or touch screen. These are simpler and have low cost and are ideal for distance education courses via the Web.

The image below shows a student browsing the contents of one of the distance education courses that uses VR on a monitor.

In order to intensify the feeling of immersion, a helmet and gloves can also be added, as well as sound (sound can create a feeling of movement and location).

Figure 2. Monitor VR

Kirner and Sicouto (2007, p.92) state that a VR system can be synthetic (generated in real time), tri-dimensional, multi-sensorial, immersive, interactive, realistic (reproduction of real objects) and with presence. Therefore, we can consider it as a tri-dimensional graphical environment that integrates audio, generating in real time and that allows interactivity.

Audio-Visual Realism is the experience of uniting sight and hearing. Sensations of touch and strength (haptic devices) allow the system to be more realistic, minimizing, at the same time, its own presence (size and weight). These are the last devices, known as tactile interfaces and refer to the study of how to integrate the human sense of touch to a computer-generated world.

For Smith (2007), a problem displayed by VR systems is the lack of stimulation for the sense of touch. If an user tries to grab a virtual glass, for example, without a haptic device, it will not be possible to know whether the glass is in contact with the virtual hand. It is expected, in the short term, that studies on haptic feedback devices may supply this demand. Haptic devices can be further divided into: 1) tactile feedback - through which one feels shapes and textures. They are the devices that provide interaction with the nervous endings of the skin and that indicate heat levels and textures. The feeling of touch provides information on the surface geometry, its texture or temperature. It is largely used in virtual environments where the light levels are low or non-existent (sea floor, for example); and 2) force feedback or kinesthesia[2] - through which one feels feedback forces and movement. They are devices that interact with the muscles and tendons, giving the user a feeling of application of force in the opposite direction. The feeling of force provides information on the weight of the object and its consistency. These devices are part especially of the robotic manipulators that push the user against the forces that correspond to the virtual environment.

[2] Kinesthesia - sense that perceives the position of the body, movement, force, weight and resistance through the movements of muscles and tendons.

Immersive VR logically provides more possibilities for interaction and involvement. However, depending on the goals and possibilities, non-immersive VR can be a feasible choice, as it is easy for developers (there is no need for writing special drivers or doing very complex programming) and for users (can experience the virtual environments with simple hardware configuration settings and in any place).

VR systems also have the characteristic of uniting four basic ideas: immersion, interaction, presence, and involvement:

a. Immersion – Apart from the visual factor, the devices connected to the other senses also are important for the feeling of immersion, such as sound, automatic positioning of the person and of the movements of the head, force feedback controls, etc.;
b. Interaction – The idea of interaction is connected to the capability of the application to detect the inputs from the user and immediately change the virtual world and the actions in it (reactive capability). People are captivated by a good simulation in which one can see the scenes change in response to one's commands (this is the most striking characteristic in videogames);
c. Presence – obtained through multi-sensorial sensations (Costa, 2001);
d. Involvement – this idea links to the degree of motivation that drives the user to run a given activity. The involvement can be passive, such as reading a book or listening to good music, or active, in taking part in a game with other people. VR has potential for the two kinds of involvement when, apart from allowing the exploration, also provides user interaction with a dynamic virtual world

3.1. VR systems

1. Tele-presence (tele-operation, tele-robotics, tele-existence); this technology increases human and sensorial mobility and the capability of solving problems in a remote environment. In tele-presence, a robot is physically separated from its human operator, who carries out the operations that are executed by the robot at a distance, offering a sensorial feedback to the human operator. This causes the operator to have the feeling of being present in the remote environment. This system has been widely used in the medical area, allowing technical immersion in the undertaking of remote surgery procedures by specialists who work in large urban centers. The surgical procedures supported by tele-presence minimize the distortion inherent to the human hand, increasing the precision of the cuts.
2. Augmented Reality (AR) is the overlapping of computer-generated virtual objects in a real environment, using a technological device. It is considered that AR is a sub-group of the so-called mixed reality which is a blend of the real environment over the virtual environment as generated by the computer. They can be split into: a) Augmented Virtuality: there is a predominance of virtual elements in the real environment, and b) Augmented Reality: where the predominant elements are the real ones.

Taking advantage of the advances in mobile communication technology, a growth in Virtual Reality is observed for Mobile Computing or VR applications for mobile devices. This

resource can provide Distance Education with yet another resource for the enhancement of Mobile-Learning or simply m-Learning. This includes smartphones and tablets due to their portability and ease of use.

VR systems are designed not only for reflecting the real world but to represent all the creative power of Man. Therefore, in its environments, the computer generates a simulation of a world that can be real or imaginary, using a graphical or text interface. For Distance Education (DE), second life environments are very much used as we shall see below.

4. The use of virtual reality technology in education

The human forms of apprehension are multi-mode in their nature (Treviranus, 2004) and, as regards the constructivist premises of learning, this means placing the student at the center of the learning process, giving her/him the tools necessary for this experience and appraisal, especially in the Sciences where the visualization/manipulation of tri-dimensional objects are important for learning, as already used in the teaching of geometry systems (Augmented Reality) (Lima et al., 2007, p.3) and Algebra, facilitating the understanding of abstract concepts.

In Statistics, in the work with multi-varied data, the analysis and interpretation can be done interactively in immersion systems (digital CAVE), allowing students to understand and manipulate complex data sets (Sawant, 2000).

One characteristic of this technology that interests education is its adaptation to different forms of learning, that is, cognitive styles. For people with problems to understand equations, theories, and principles, VR can be used to make this type of information concrete. For those with a taste for the visual and not the verbal, who prefer graphics and images rather than explanations and formulae, VR is again useful, especially because of the its highly visual aspect. As regards those that would rather learn through exploration instead of deduction, VR can enable a detailed analysis that would often have been impossible by other means. Finally, for those who learn better by actively interacting with the environment, instead of learning in a reflexive way, with thinking and introspection, VR environments can be highly interactive, allowing the direct manipulation of environment elements that respond to the actions of the user in real time.

Young (2000) states that the insertion of VR technology in DE contributes to increase the quality of the educational processes as the access to the own contents and communication of DE can be strengthened by a report of experiences had in real time. Apart from that, the so-called monitor VR contributes to the humanization of DE, as it allows the student the personal impression resulting from the selection of individual routes and the use of the elements of interaction, setting the number of times for manipulation and / or the time of permanence at the place in the virtual world that attracted one's attention the most.

There is no doubt that the advances and the appropriation of the Web by part of the society in the world have forced the domain of Education to think about new ways for distance Education. More than the ease of access to information, the education seeks to incorporate

new manners of shared learning and in a networked way (to avoid the isolation characteristic of the 1990s).

The idea, as we have seen it, is not to reproduce the space of the classroom in the distance but to construct a new space for human communication and interaction for learning through the collective production of contents and bodies of knowledge.

The virtual classrooms of today have transcended the old bi-dimensional ones used in chats for a tri-dimensional model that is increasingly like that of the real world. The idea is to provide students with a realistic environment to reduce the distance and encourage peer cooperation.

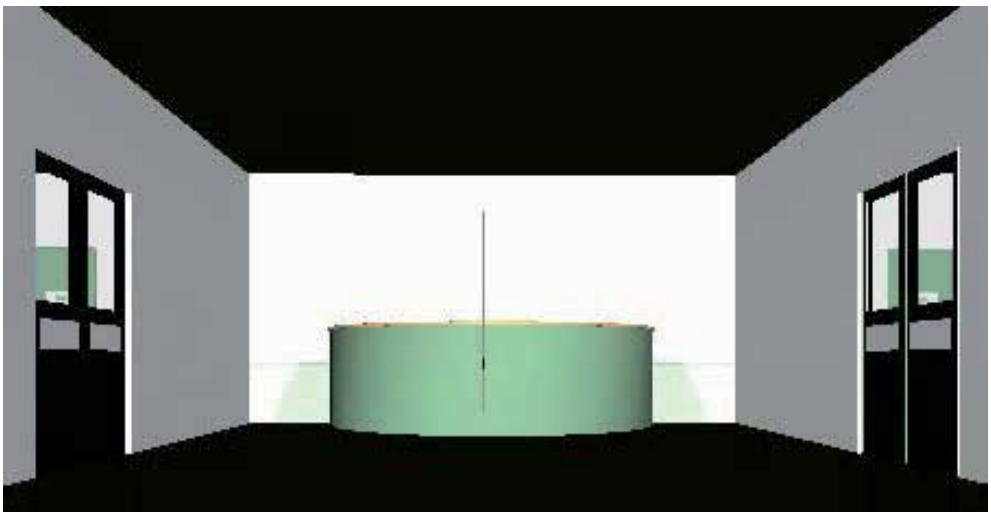

Figure 3. VR school

In Distance Education processes, the introduction of the technology is giving a new meaning to the role of students, teachers and the organizational ways of appropriation. When using VR technology, however, these changes gain greater magnitude as they allow experiences quite similar to the real world, where the members of learning community can relate between themselves (seeing, hearing, and touching) without never having been physically with one another.

There are several educational activities that already benefit from the use of VR. In the field of applications for the Health Sciences its use, dated from the 1990s, revolved around the field of Therapeutics. Now, the tri-dimensional and robotic models assist in bold plans for professional qualification: emergency rooms, surgical procedures and other activities linked to the promotion, care and protection of health.

As we have seen before, the inclusion of system resources depends of the characteristics of the target public, a fact that conditions the adjustment of VR for education. The figures below show a virtual environment based on VR for the Web, designed to contribute as a

supplementary learning environment for the course to qualify professionals associated with the Distance Education Course on Food and Nutrition Inspection of the Brazilian Department of Health.

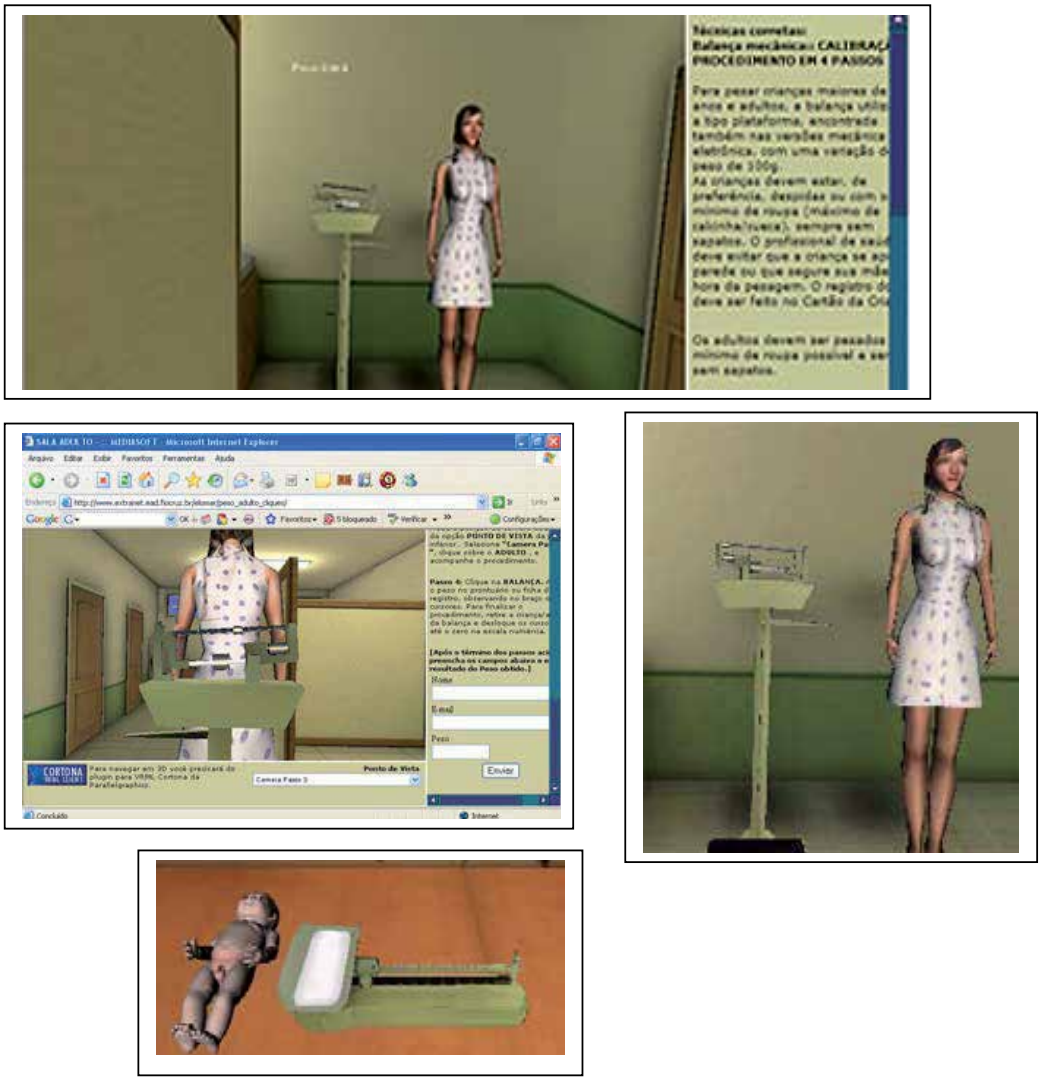

Figure 4. Virtual Learning Environment in VR technology: Course of the Food and Nutritional Surveillance System, Distance Education Coordination – Brazilian Public Health School –Oswaldo Cruz Foundation

Apart from the contents already discussed in the didactical materials of the course, the virtual environment was developed as a prototype to assist in the anthropometric qualification (weighing and measuring), as such data is the basis for the construction of interventions related to the control of nutrients for the Brazilian population.

In pedagogical terms, the system offers the possibility of interaction with 3-D tools, procedure visualization and execution (scale calibration, patient positioning, result indication and readings), analysis and interpretation of a case study. Due to the fact that the instruction design of the course adopts the theoretical references of constructivism and Permanent Education, the answers to the exercises proposed and the study case are sent (via email) to the teacher that is asked to discuss them with the student, using the error (if any), as the starting point for the joint revision.

Other examples can be found in the oil & gas industry (offshore) that are used to simulate in the digital CAVE learning situations in deep water and also to train naval industry engineers.

The simulators work with a replica of the cabin with all the active, integrated controls of a visualization system in digital CAVE. [Image: COPPE/UFRJ. Extracted from
http://www.inovacaotecnologica.with.br/noticias/noticia.php?artigo=simulador-portuario

Figure 5. Port Simulator

Still as regards the use of VR in Distance Education, Second Life (SL) has been one of the systems most used. SL is a virtual tri-dimensional environment that simulates some real life aspects. It can be understood as a 'parallel environment' where an individual 'extends' one's real life, expanding one contact network in a virtual environment. As regards the educational context, SL applications have been used to widen the interaction amongst the learning communities where the students participate in distance academic events.

SL environments have therefore been considered as collaborative environments (AVCs - Collaborative Virtual Environments) as the participants are simultaneously present in a world that simulates the real or the imaginary domain, and can interact with elements in real time. The communication is usually made via a conversation (chat) tool or as an audio

or video conference. Each participant takes over an avatar that has one's physical characteristics (or not). However, the personal traits are evident.

Figure 6. Second Life environment (JOVEAD 2011)[3]

Despite all the potential provided by the VR, it is important to concentrate the efforts in the search for its use, as well as for the technological apparatuses available as motivator elements of the reflection on the practice thus reaffirming that the technology, in itself, does not promote the education.

Finally, due to its characteristics VR has been considered as a technology that occupies a 'market' that is highly promising as it can be used in very profitable areas (entertaining, oil & gas...). The reduction in dimension of the devices, coupled to processor speed has made this technology an object of investigation all over the world.

In the scientific field, however, it is expected that is seen as a multi-disciplinary approach, spanning involving knowledge of the areas of IT, Man-Computer Interfaces (tri-dimensional entity behavior, real-time interaction, etc.), Education, Psychology, amongst others, aimed at enhancing communication, rehabilitation, qualification... with the goal of having virtual learning contribute to the qualification of the real-world citizen.

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[3]http://search.babylon.com/imageres.php?iu=http://3.bp.blogspot.com/-35_qlYNVBsE/ThJ2YpXol8I/AAAAAAAAEnA/8bqkm12-8VI/s250/sla.bmp&ir=http://explorando-metaversos.blogspot.com/2011/07/apresentacao-de-trabalho-no-jovaed-2011.html&ig=http://t0.gstatic.com/images?q=tbn:ANd9GcQoBLYZNDwwFQWUZaJJkrRQ4iiLWsX-0-HCYkNM9BvWHEeH9P95liP8RA&h=146&w=250&q=jovead+second+life&babsrc=SP_def

5. References

Alves M.; Aghina A. C.; Mól C. A.J.; Celso L.; Nomiya D.; Cunha G. G.; Landau L.L.. *Tangible Interfaces for Virtual Nuclear Power Plant Control Desks. Information and Communication* Technologies Research Laboratory (LATEC/UFRJ), from the Federal University of Rio de Janeiro (UFRJ), in partnership with the Applied Virtual Reality Group (GRVa), from the Laboratory for Computational Methods in Engineering (LAMCE) from COPPE/UFRJ, 2011. Available from: http://www.latec.ufrj.br/revistas/index.php?journal=realidadevirtual&page=article&op=view&path%5B%5D=194

Barilli E. C. V. C.; Ebecken N. F. F.; Cunha G. G.. The technology of virtual reality resource for formation in public health in the distance: an application for the learning of anthropometric procedures. *Ciênc. saúde coletiva* vol.16, supl.1, Rio de Janeiro, 2011.

Becker, F. *Modelos Pedagógicos e Modelos Epistemológicos*. Porto Alegre. Paixão de Aprender, No. 5:18-23, 1993.

Behar Patricia Alejandra. *Modelos pedagógicos em educação a distância*, Chapter 1, 2009. http://downloads.artmed.com.br/public/B/BEHAR_Patricia_Alejandra/Modelos_Pedagogicos_Educacao_Distancia/Liberado/cap_01.pdf

Braga I. Realidade Aumentada em Museus: As Batalhas do Museu Nacional de Belas Artes, RJ. Tese de doutorado em Engenharia de Sistemas Computacionais. Universidade Federal do Rio de Janeiro, 2007. XIII, pp. 153.

Costa R. C.; Vidal L. A. Experimentando um Ambiente Virtual com Pacientes Neuropsiquiátricos. Comunicação apresentada na II Conferência Internacional. Challenges, 2001.

Lévy, P.. *As tecnologias da inteligência*: o futuro do pensamento na era da informática. RJ: Editora 34, 1996.

Lima A. J.; Haguenauer C.; Cunha G.. *A Realidade Aumentada no Ensino de Geometria Descritiva*. GRAPHICA, Curitiba, 2007.

Kirner Claudio; Siscouto Robson. Realidade Virtual e Aumentada: Conceitos, Projeto e Aplicações. Livro do *Pré-Simpósio IX Symposium on Virtual and Augmented Reality*. Petrópolis – RJ, May, 2007.

Neves R.; Damiani M. Vygotsky e as teorias da aprendizagem. *UNIrevista* - Vol. 1, No. 2, April, 2006.

Santos A. Complexity and transdisciplinarity in education: five principles for rescuing the lost link. *Rev. Bras. Educ.* vol.13, No. 37, 2008.

Sawant N. *The Tele-Immersive Data Explorer (TIDE)*: A Distributed Architecture for Tele-immersive Scientific Visualization, Master of Science in Electrical Engineering and Computer Science, Graduate College, University of Illinois at Chicago, 2000.

Treviranus, J. *Adding Feeling, Sound and Equal Access to Distance Education*. Adaptative Technology Resource Centre. University of Toronto, 2004.

Vilela I. O. *Uma Arquitetura Multiagente do Comportamento de Personagens Virtuais*. Tese de Doutorado em Engenharia de Sistemas Computacionais. Universidade Federal do Rio de Janeiro, COPPE. 2006, 221 pp.

Young J. *Virtual Reality on a Desktop Hailed as New Tool in Distance* Education. Information Technology, 2000. Available from [http://chronicle.com/free/v47/i06/06a04301.htm].

Chapter 7

Quality Assurance in Distance Education in Brazil

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Additional information is available at the end of the chapter

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1. Introduction

Distance Education constitutes one of the education fields that are evolving rapidly around the world. So, it is possible to consider it as an important instrument to reach youngsters and adults whom learning needs were not satisfactorily met by the traditional educational system. Distance Education has a great potential in several levels and niches in the society. This educational methodology has shown a new paradigm that permits access to much more people at the universities, as well as the improvements of the qualitative level of the professors who haven't much time to upgrade themselves, mainly in Brazil where most primary and high school teachers dwell in more than one school to complement their wages which are very low.

Due to the complexity of this process, which is still new for Brazilian reality, the institutions involved in this modality of education should spend time and money in evaluating the system performance in order to have it run smoothly. The whole process of Distance Education needs to face an overall evaluation. Each learning instrument or tool needs to be addressed for improving the quality of the knowledge the student will achieve during his learning process.

Within such a context, this chapter aims to analyse tutors', students' and university teachers' perception about quality assurance in a distance undergraduate management course offered in partnership with Brazil Open University, the Ministry of Education and the Federal University of Lavras in Minas Gerais, Brazil.

The next sections aim to highlight information and some authors' points of view on Distance Education conceptualization and challenges, and quality assurance in Distance Education. A practical experience on evaluating Distance Education is also addressed in this section. In the sequence, the authors present some aspects of the methodology used to gather data to discuss the Brazilian experience on distance education regarding teachers', tutors' and

students' points of views. The next part of this chapter deals with the results obtained in that research. Finally, the authors make some final considerations about the study and leave some ideas for new research on this matter in Brazil and worldwide.

2. Related literature

2.1. Distance education conceptualization

It is possible to define Distance Education as a way of education such that the professor/instructor is geographically distant from the student/trainee [1]. One form of distance teaching is using the Internet; gathering information together and making it available for those in need of it. Online courses offer opportunities in creating new ways of learning, and integration of multiple media (text, image, audio, and video) in a single tool. On the other hand, Distance Education can be seeing as a systematically organized way of self study in which the student instructs himself from the study material that is presented to him, and the follow up and the student success supervision are accomplished by a group of tutors and or professors [2].

Though, Distance Education presents the following elements: "Physical separation between professor and student, that distinguish itself from the in loco education; educational organization influence (planning, systematization, plan, project, tutored organization etc), that make it different from the individual education; utilization of communication technical means, usually printed, to transfer or disseminate technical contents or knowledge; forecast of a bi-directional communication, in which the student gets the dialogue benefits, and the possibility of initiatives bi-directional; occasional encounters possibilities with didactic purposes and of socialization" [3].

Distance Education is "a teaching-learning method, which shortens the distance between the students/courses-taken and the educational institutions, enabling them to construct their own bank of information with technical support, i.e., computer science (hardware and software), and the means of communication (satellite, cable or digital satellite TV, written and audiovisual web, and videoconferences, among others), both synchronously and asynchronously" [4]. Thus, this alternative reduces the number of excluded people from the digital world by teaching, informing and training them in Computer Science. However, the evasion in continued formation courses is still very high and has caused a deep concern to its idealizers and other people involved in Distance Education. As a result, this theme is becoming more relevant each day, calling for identification of gaps and faults, which can be prevented, so that the students can finalize their courses without the evasion risks. Thus, identifying higher quality patterns is relevant for corporate or traditional education institutions. However, understanding the authors' views and perceptions about distance courses is important.

Keeping these considerations in mind, to validate the use of this methodology is relevant to evaluate its results. Thus, the next section describes some theoretical review about the challenges in offering this modality of education in large countries like Brazil and each country with its specificities.

2.2. Distance education challenges

The specific characteristics of Distance Education show the potential of long distance teaching and learning not only in Brazil, but worldwide. The challenges for Distance Education may rise at different levels, such as: the visibility of the pedagogical proposals and its connection to the quality of teaching and learning; the creation and organization of the managerial infra-structure; the access to appropriate communication technology; and the promotion of the interaction among students, tutors, staff, and teachers.

In the specific case of Brazil, the biggest challenge for spreading Distance Education in this huge country is related to the diversity of contrasts and discrepancies at the social, economic and cultural levels. Many regions in the country are completely excluded from electric energy (which is the first condition to connect people to the internet to provide them more access to the evolution of digital technology) [5]. These are the moving powers necessary to promote large changes on Distance Education inside the country.

Another problem is related to the low family income level, which reflects directly on the school grade or level among children and even adults. In this specific case, the actions of local, regional and federal governments are essential to minimize this problem. In this context, The Ministry of Education of Brazil has created specific regulations for implementing Distance Education as an official teaching in the country. The main specific regulation for implementing Distance Education in Brazil is the Decree No. 5.5622 - December 19, 2005. This Decree regulates article 80 of Law no. 9.344 – December 20, 1996. It establishes the directives and bases of national education. This Decree characterizes Distance Education as an official educational modality, being its didactic and pedagogical mediation in the teaching-learning process developed via Information and Communication technologies, and by its teachers and students developing educational activities in different times and places [6]. In this context, a big challenge for all players at the educational sector is to ensure quality at this modality of education.

2.3. Quality assurance in distance education

Distance Education constitutes one of the education fields that are evolving rapidly around the world. So, it is possible to consider it as an important instrument to reach youngsters and adults whom learning needs were not satisfactorily met by the traditional educational system. Distance Education has a great potential in several levels and niches in the society. This educational methodology has shown a new paradigm that permits access to much more people at the universities, as well as the improvements of the qualitative level of the professors who has not much time to upgrade themselves, mainly in Brazil where most of primary and high school teachers dwell in more than one school to complement their wages, which are very low.

For this reason, the whole process of Distance Education needs to face an overall evaluation of assurance quality. Not only Brazil, but also other parts of the world illustrate the importance of quality standards. The American Council on Education, in 1996, the American

Federation of Teacher, in 2000, and the Council for Higher Education Accreditation, in 2005, have distributed and circulated documents outlining quality standard for distance education. Therefore, each learning instrument or tool needs to be addressed for improving the quality of the knowledge the student will get or achieve.

An environment that provides knowledge construction in distance education needs: to offer activities centered on the active student, which leads to the meaning of the real learning process – learning by doing; to propose activities inside situation where it is possible for the student to contextualize and re-contextualize in order to learn in a more natural form; to offer opportunities for negotiation and interpretation involving several perspectives conducting all the actors to a more reflexive mentality; highlight and incorporate previous experiences and experiences from day-to-day life for the meaning construction during the process of knowledge assimilation and construction; and use technology to measure the higher mental processes [7].

On the other hand, the challenge for improving quality in Distance Education is to ensure that pedagogical project contemplates the Best References for this modality of course, which were set by the Secretary of Distance Education Secretary, from the Ministry of Education and Culture – SEED/MEC. This is a quality assurance framework in distance education to be adopted by all initiatives on this modality of education in Brazil. This proposal involves [8]:

- Pedagogical mediation should be the result of the dynamic equilibrium and interaction among the actions developed to guarantee the pedagogical intention and to help students to reach a better level of awareness;
- The proposed activities should bring learning control and responsibility upon the student;
- The interaction among students, teachers, and other actors involved in the learning process should be covered by trust, respect, and freedom for stimulating the coming up of weaknesses and strengths;
- The digital resources should be appropriated to the nature of the knowledge, the students' profile, and the access conditions;
- Finally, it is necessary to set an appropriated virtual learning environment where all the activities are well connected and interrelated in an invisible and dynamic net, allowing the development of the knowledge construction process.

Along with that, the Ministry of Education through the National Institute of Educational Studies – INEP developed a framework to warranty quality in distance education in Brazil and they evaluate every course to provide "Accreditation" to each of them. The evaluating occurs before the course starts to give "Authorization" for its beginning, two years after to give "Recognition" to the course and after the first graduation to offer "Renew of Recognition". This framework involves eight aspects and they should be fully expressed in the Pedagogical Political Project of every distance education course [9]. These aspects are: (i) The design of education and curriculum in teaching and learning; (ii) Communication Systems; (iii) Educational material; (iv) Evaluation; (v) Multidisciplinary team; (vi) Infrastructure support; (vii) Academic and Administrative Management; (viii) Financial

sustainability. The evaluators have to consider all these aspects during in loco evaluation in order to accredit the course as a qualified course.

Keeping these ideas in mind, we may say that it is relevant to evaluate distance education, because it is a reality in Brazil and worldwide. A proper evaluation will assure improviments and quality in order to offer an appropriated knowledge for people in different areas of the country and people who did not meet the educational standards for their proper age. One of these experiences is the CEDERJ Consortium, celebrated among higher degree institutions in the state of Rio de Janeiro and the state government of Rio de Janeiro.

The Consortium for Distance Education in the State of Rio de Janeiro - CEDERJ was officially launched by the honourable State Governor, the honourable Science and Technology State Secretary, and the Magnificent Rectors of the public universities in the State of Rio de Janeiro, on January the 26th, 2000. The consortium objectives are: to contribute to the free offering of good quality superior education to the countryside in the State of Rio de Janeiro; contribute so that access to the superior education is available to the ones that could not attend the traditional time-table; acting at distance for the continued formation of professionals in the State, with special attention to the updating process for the teachers engaged on state primary and secondary schools; and to increase the vacancy offering in the graduation and post-graduation courses in the State of Rio de Janeiro [10].

In 2000, it launched the first course with 160 places for Mathematics from the partnership with UFF and UFRJ. In the second semester of 2005 there were 9,864 students registered for 5 graduation courses: Mathematics, Biology, Physics, Pedagogy, and Computer Science spread all over the state. The students get the didactic material in book form; they have in loco attendance in the so-called poles; attendance at distance through a free phone line; they are also attended by e-mail, forum or chat in the platform. The main evaluation is done in loco in the poles and the student still cumulates evaluation points taken from the evaluation at distance [11].

Nowadays, the consortium counts on 7 poles at distance installed in the universities and CEFET Rio, 6 Science Spaces, and 33 Regional Poles. There are more than 30.000 students enrolled on 9 different courses. CEDERJ offered 5.433 vacancies for the second semester of 2012 for the following courses: Management, Public Mangement, Bachelor in Biological Sciences, Physics Degree, Degree in History, Bachelor of Arts, Bachelor of Mathematics, Pedagogy, BA in Chemistry, Bachelor in Tourism, Technology in Computer Systems and Technology in Tourism, Degree in Biology, Degree in Pedagogy and Degree in Chemistry. A total of 20.618 candidates enrolled on the admission tests [12].

This consortium was the first large experience in joining expertise from different universities with the support of the state goverment. This experience served as pilot projet for creating Brazil Open University (UAB), in 2006. This is an important iniciative of the Ministry of Education and many other public universities and municipalities to offer distance education free of charge inside the country. For all these reasons, the next section will address the

evaluation process developed by CEDERJ and its partner universities to ensure quality in this modality of education.

2.4. A practical experience on evaluating distance education

The Consortium for Distance Education in the State of Rio de Janeiro - CEDERJ is composed by The Federal University of Rio de Janeiro (UFRJ), The Fluminense Federal University (UFF), The Federal Rural University of Rio de Janeiro (UFRRJ), The State University of the Fluminense North (UENF), The State University of Rio de Janeiro (UERJ) and The Federal Institute of Rio de Janeiro (IFET). CEDERJ's headquarter is located at Visconde de Niterói Street – 1364 – Mangueira – Rio de Janeiro – Brazil.

In order to understand the process of adapting methodologies and instruments to evaluate distance education courses [13] discussed the evolution of the evaluation methodology in this regional consortium experience. The main idea of this study was to present the results of the evaluation performed in that consortium. It was evaluated virtual platform (www.cederj.edu.br), instructional material and tutorial using a structured questionnaire. However, other aspects were also analysed from different perspectives. The information was gathered mainly from structured questionnaires available at the virtual platform and technical visits organized to evaluate presentialy the different municipalities where CEDERJ courses were offered in partnership with the six universities of the state of Rio de Janeiro. These authors came to the conclusion that evaluation methodology turned into a very broad process that was also very important to redefine the methodology for the following years. In 2008, CEDERJ applied a different questionnaire with open questions for students, tutors, teachers, poles, directors and course coordinators [14]. Some secondary data was also gathered and analysed to validate the methodology. This evaluation was mainly influenced by the amount of data gathered from the previous evaluation. The previous evaluation is described below.

The whole evaluation process counts on 5 steps or phases. The first one was to stimulate students and staff working at the regional poles, using advertisements fixed on the boards, messages left in the virtual platform and tutors talking to the students. The second phase was the qualitative and quantitative data collection itself. The evaluation was held during the second semester of the year, the first experience happened on October 2005, and involved filling out the questionnaires and the technical visits performed in each pole or municipality. The next phase was the self-evaluation, carried on the base of the gathered data from the questionnaires and technical visits [15].

The forth phase was an external evaluation in order to double check the data and process some extra analysis on them and get views from different actors who are not directly involved in the process. It happened in August 2006. The last phase was a reconsideration of the process as a whole. It was necessary to organize a seminar in early October 2006 to offer subsidies to establish future actions based on the process of self-evaluation and external evaluation [16].

The evaluation to access quality of CEDERJ distance courses was composed by a questionnaire composed of 8 main blocks of questions and the students had to tick one of the five graduation possibilities in the scale, which varied from Poor (1) to Excellent (5). The first block was related to the regional pole infrastructure, which accessed and evaluated students' points of views about the place where they have direct contact with other students and mainly the presence tutorial; as shown in Appendix. The next block was about the Platform. In this block the student was supposed to evaluate the tools that were available for their interaction to distance tutorial and all of the other facilities they have in it. Didactic Printed Material or the booklets were evaluated in the following block of topics. This one was very important because most of the students place much more emphasis on the printed material then the other facilities provided by the system [17].

In the sequence, the students evaluated local tutorials considering different topics, and then at distance tutorials considering timetables, tutor attention and so on. In the following block they pointed out their views about local evaluations and at distance evaluations analyzing other topics. The students' assiduity comes next, and its efficiency was measured by the number of times the students access the platform, and attend local and at distance tutorials. It varied from none (so the student ticked number 1) up to more than 20 times (so the student ticked number 5). It is worth mentioning that the questionnaires provided very rich information to draw graphics and tables for visualizing the results according to the different poles, courses, and even subjects.

The questionnaire was returned to 3,345 students, whom were usually enrolled in 4 or 5 subjects per semester. The results were summarized in different topics, like: local tutorial, at distance tutorial, teaching team, subject evaluation tests, didactic booklets, didactic material available at the platform, U-Virtual or Virtual platform, and infrastructure of the poles. A program was developed to categorize and summarize all the data gathered from the questionnaires [18].

In this first round of the process, it was gathered 1,590 written messages. From these observations it was elaborated a summarized report, per area, with the main problems and their suggestions to improve the quality of the system as a whole. A part from that, a team of courses representatives visited the poles in order to perform the second step of this phase. Each course sent its representatives, and CEDERJ itself sent a representative to spend almost a day in touch with pole directors, tutors and students. The team also counted on one professional in charge of performing a short conference for the whole group of students and tutors from each pole [19].

As a result of each visit the team leader prepared a report summarizing the findings and addressing it to the evaluating team leader in the CEDERJ headquarter. The report has 2 or 3 pages and all the reports were sent to other colleagues for disseminating the information. The final phases of the evaluation process were the self-evaluation and then the external evaluation. Thus, some seminars were set to discuss the outcomes and prepare the following steps [20].

The evaluation methodology, presented here, has been implemented in the consortium and it seems to be working properly. The data from the questionnaires are usually processed into graphics and tables in order to better visualise and understand the students' perceptions and points of views about CEDERJ experience. The technical visits provide subsidies to re-orient the process. Some actions are always taken on the basis of the evaluation results. The whole methodology has been implemented every year and it is planned to last for one whole year. This means, each process starts when the previous one ends. This methodology is providing subsidies to improve the quality of the whole process including changes in the platform content and design, written material and tutorial activities. [21]. Since evaluation is a continuos process, CEDERJ improved the instrument of data collection and turned it into a more flexible instrument with structured and open ended questions.

Due to the complexity of this process, which is still new for Brazilian reality, the institutions involved in this modality of education should spend time and money in evaluating the system performance. Thus, the Federal University of Lavras and other different universities around the country, in partnership with the Bank of Brazil, offered an undergraduate managemnet course on distance bases. The Ministry of Education offered financial support to set such broad project. This is another experience and this chapter deals with some empirical results of teachers', tutors' and students' perceptions about the course. Some information about data gathering for this study is presented in the sequency.

3. Methodology

This section aims to explain the procedures adopted to perform this research. The course was offered in partnership with the Brazil Open University and the Ministry of Education. The course was offered by 18 public Brazilian universities spread all over the country. In 2010, there were 118 poles, or municipalities, involved within this pilot project. Each university attends some poles in order to certify the students at the end of the course. They also give support for presential activities and meetings. This experience is singular in the country, so it is relevant to improve the pattern of life within the country too. It is because the initiative helps to offer more access to higher education. It is worth to say that this course is not a sequential one; it is just one entrance course. This is a "pilot project" that is subsidizing the decisions of the Ministry of Education regarding the offering of other different undergraduate courses on distance education modality.

For this chapter the authors chose the Federal University of Lavras (UFLA) as a sample for this research. UFLA has 289 registered students at the course. Among them, 130 are staff and members of the Bank of Brazil, and 159 belong to the civil society. In order to evaluate the quality of the course a structured questionnaire was developed. The first section of the questionnaire was aimed to describe the profile of the respondents. All the main actors (students, tutors, and teachers) involved in the educational process were supposed to answer it. The main section of the questionnaire addressed questions related to printed material, platform access, tutorial, chat, exams, meeting, and other issues related to the process of offering the course.

The students, tutors and teachers answered a questionnaire at the end of 2009. The questionnaire was available at http://www.admead.ufla.br/moodle. This survey provided a huge amount of data that was addressed to improve the quality of the experience itself and the quality of other distance education initiatives, like the Public Management Course, which is being offered by Brazil Open University in partnership with UFLA and other universities around the country. It took about 10 minutes for them to answer it.

The data was systematized and analyzed using Excel spreadsheets and then the information was transferred into tables and graphs to facilitate the readers understanding. The next section aims to present the results gathered from the questionnaires answered by the students, tutors and teachers from the Undergraduate Management course offered by the Federal University of Lavras, at Minas Gerais, Brazil and its partner, the Bank of Brazil.

4. Findings and discussion of findings

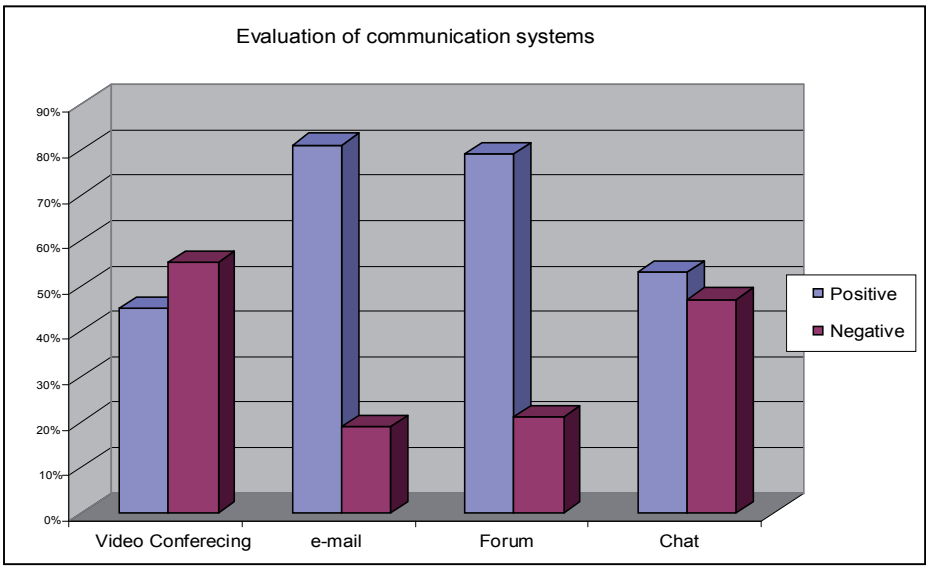
In order to evaluate the quality of this course we will discuss the actors' opinions about: mechanisms of interaction between students, teachers and tutors; assessment about textbooks; students' perception about teachers' and tutors' performance; teacher's view about technology, students' involvement, didactic material, structure and management support, and their own involvement within the course. All these topics and other ones that may be related to them will be addressed in the sequence.

Students were asked to evaluate the forms of communication between the actors in this model of education. As alternatives to this issue there were four interaction mechanisms: video conferencing, electronic mail, forums and chats. Those with the most significant results were e-mail and forum, with positive acceptance of 81% and 79% respectively, as shown on Figure 1. Another video conference and chat have been evaluated positively for 45% and 53%. Instruments of immediate interaction, such as video conference and chat, were badly evaluated probably because of the quality of internet connection in certain localities where the students undertake the use of instruments of immediate interaction, like what was indirectly mentioned by [22] when he pointed out the challenges for distance education in a big country, such as Brazil.

At Figure 2, we may observe tutors stated that students' and teachers' involvement predominate as they are considered the most important aspects for maintaining the quality of distance education. This reinforces that, although it is a course that relies on technology, in a decisive manner the human component makes a difference.

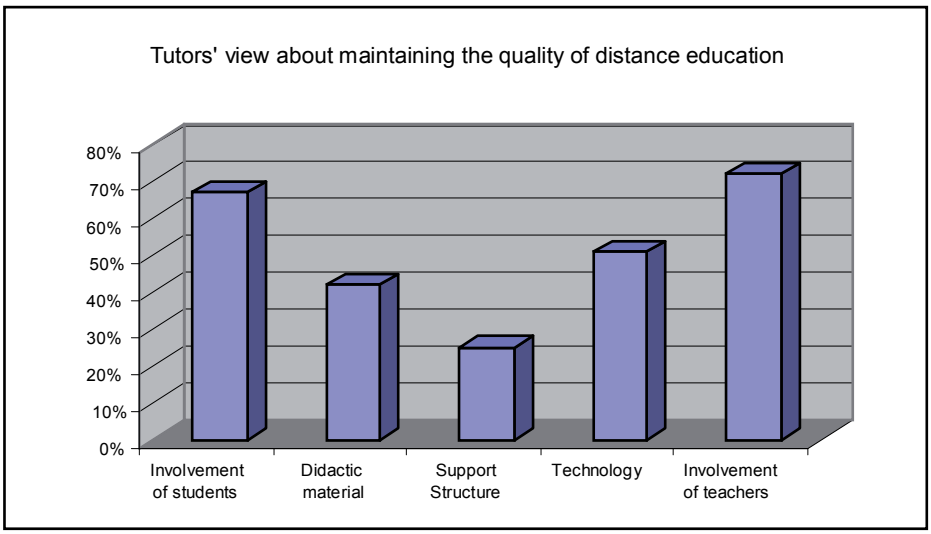
Respondents pointed textbooks or teaching materials as extremely important and significant in the process of teaching and learning at distance bases. All items questioned were evaluated with agreement by a least 77% of respondents (Figure 3). Teachers and tutors informed that interation with the content, development of skills and competences, interation among communication resources, and orientation related to the understanding of the proposed activities that are relevant to assess the quality of suitable printed material in distance education. They also mentioned that stimulating indeep appropriation of the

content is also relevant for students assimilating the content and generating new knowledge.



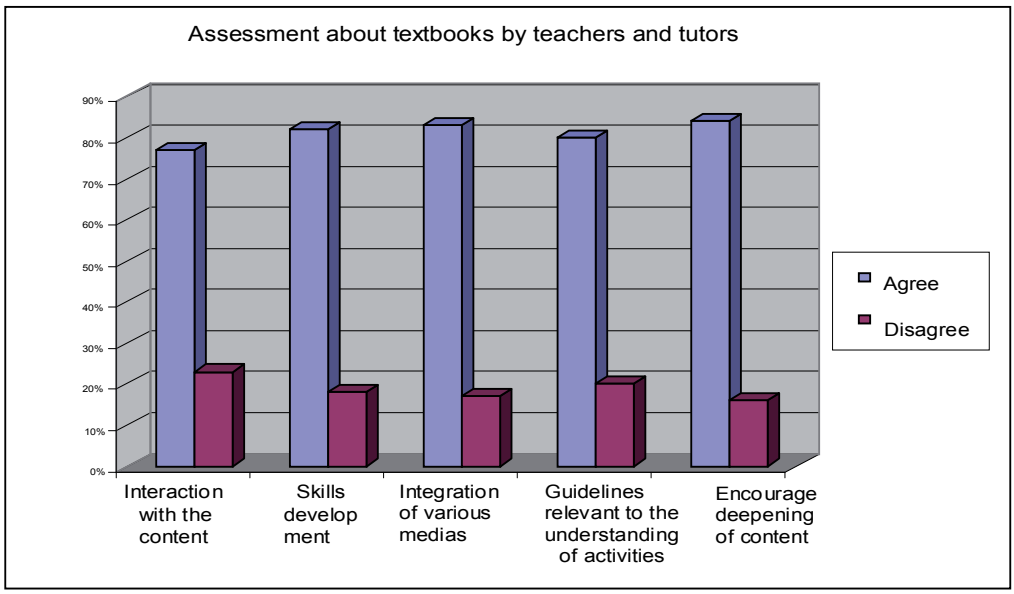
Source: Research data

Figure 1. Students' perception about communication systems



Source: Research data

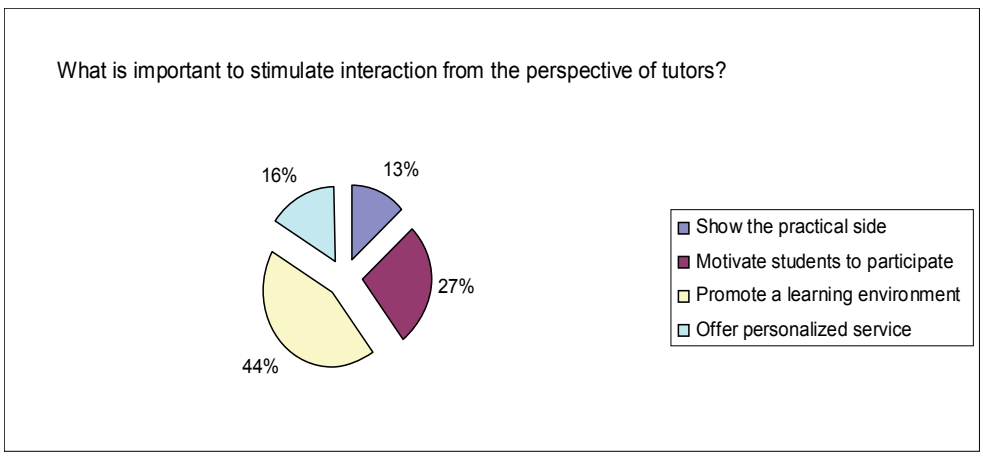
Figure 2. Tutors' view about quality of distance education



Source: Research data

Figure 3. Teachers' and tutors' points of view about textbooks

According to Figure 4, tutors who answered the questionnaire had concern with the environment that must be created so that students may have available all the necessary factors to assure quality learning. On the other hand, tutors showed little concern in transmitting the practical aspects of each subject.

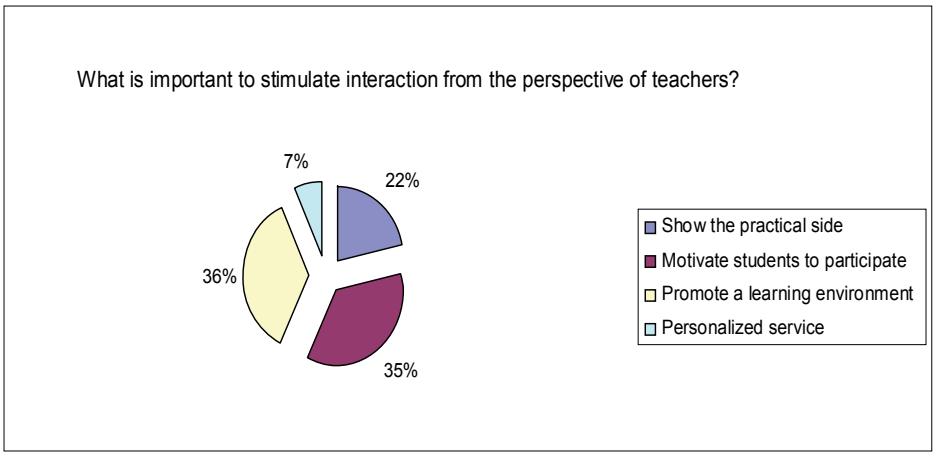


Source: Research data

Figure 4. Tutors' points of view about stimulating interaction

Teachers emphasized the promotion of a learning environment and encouraging students' participation through motivational elements to stimulate the interaction with the students as

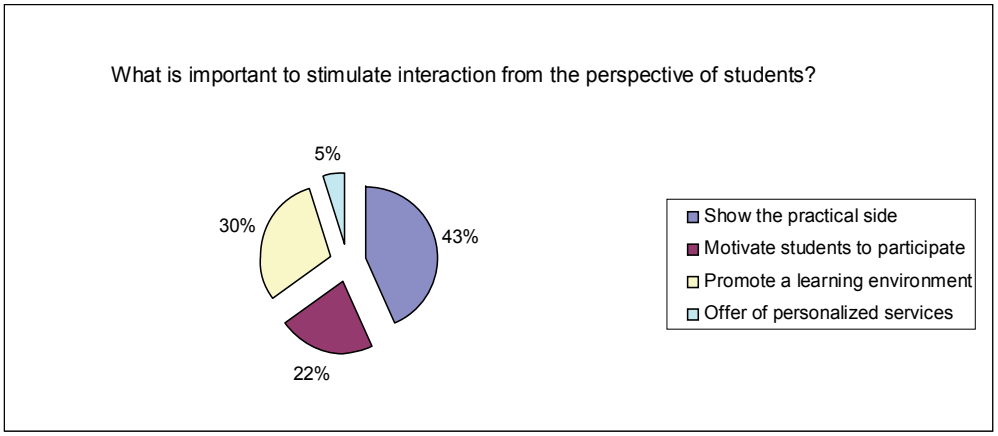
shown in Figure 5. Teachers understand that personal service is not as important as the aspects mentioned above.



Source: Research data

Figure 5. Teachers' points of view about stimulating interation

Students participating in this research highlighted the importance of being attached to practical content. This assertion was selected by 43% of respondents and shows how these students appreciate the combination of theory and practice to warrant quality on the whole system (Figure 6). Also noteworthy is that the students themselves do not believe it to be important to receive personalized service.



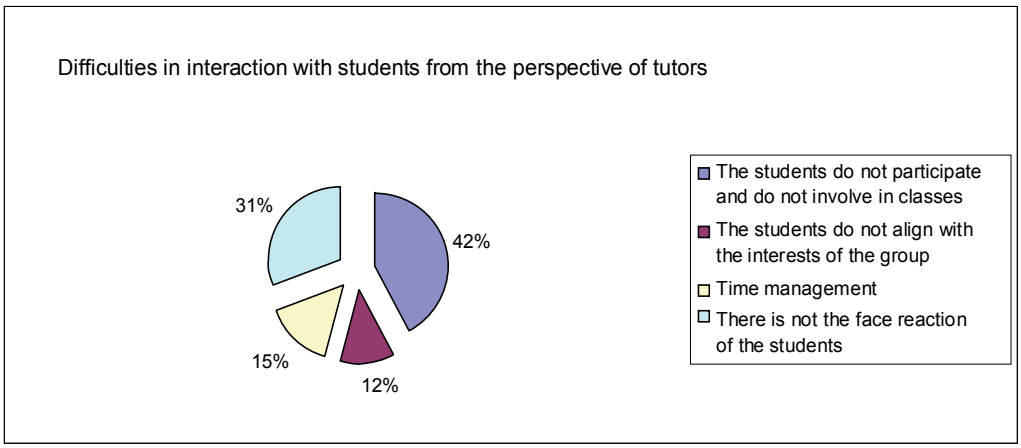
Source: Research data

Figure 6. Students' points of view about stimulation interaction

By comparing these three points of view, we can see that each actor in the educational process has a different perspective of quality regarding the interaction among them. There is

clearly a gap between the assessment of tutors and teachers about what is important and the assessment of students on the same time. The importance of practice that is emphasized by the students does not meet the same expectations in responses of tutors and teachers. On the other hand, there is a convergence of ideas about personalized services to be offered for different students. In this case, all the actors involved in the teaching and learning process do not emphasize this topic.

At Figure 7, we may see that tutors highlighted the absence of participation and involvement of students as the most significant difficulty in distance education, since 42% of the respondents indicated that alternative. Another element of note is the lack of physical and visual reactions of students, pointed as the main difficulty for 31% of the respondents. The other two options, time management and unproper alignment of students and others group members' interest, were not so relevant for interation according to the tutors points of view.



Source: Research data

Figure 7. Tutors' perspectives about difficulties in interaction with students

Teachers highlighted the absence of participation and involvement of the students as the most important difficulty in interacting with students (Figure 8). In this case, 49% of respondents chose this alternative. Another item often mentioned is the lack of face reaction of the students, with 27% of responses. It should be noted that time management by students was not considered a very significant difficulty.

Teachers pointed out lack of commitment of the tutors and absence of their participation as the major difficulties encountered in the interaction with them in order to warrant the quality of the educational process. On Figure 9, we may see that for 32% of the respondents, tutors should be more aligned to the interest of the group of students and work faster with information to improve the quality of distance education.

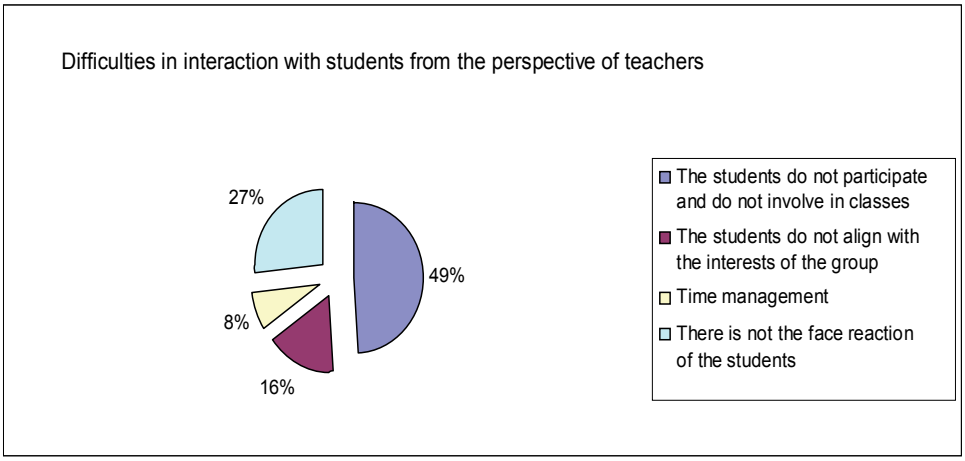


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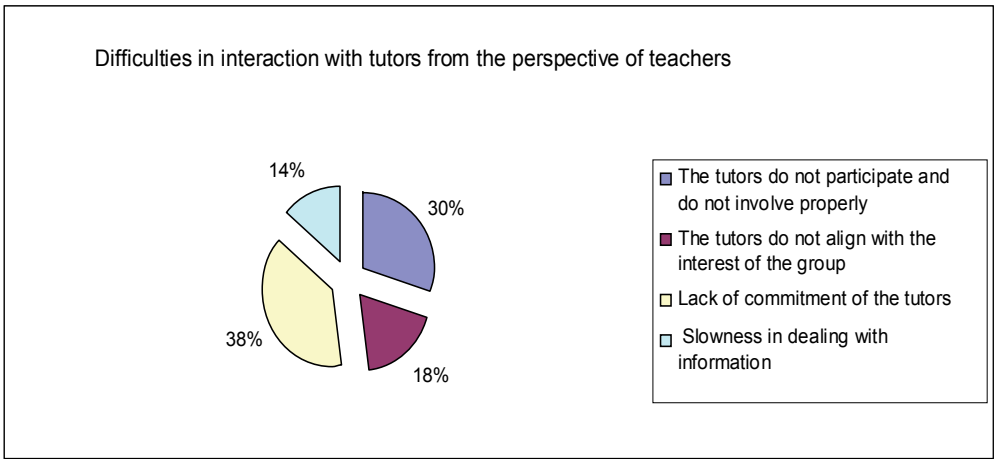
Figure 8. Teachers' perpectives about dificulties in interaction with students

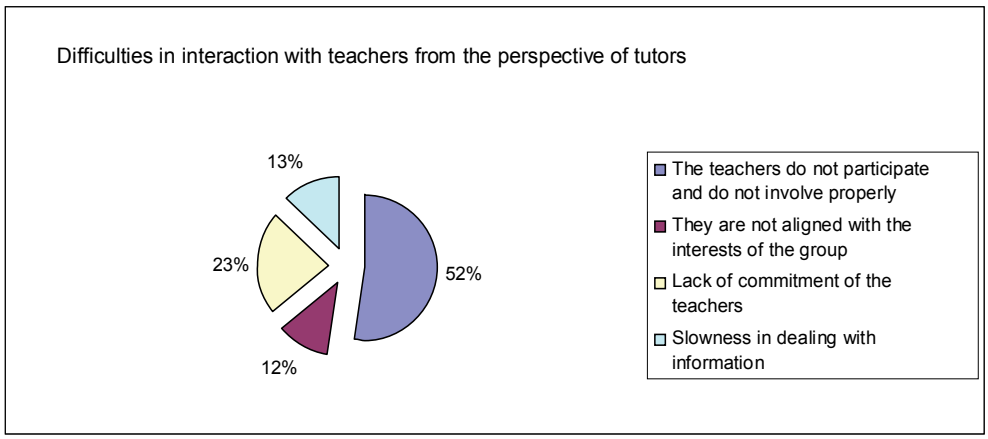


Source: Research data

Figure 9. Teachers' perpectives about difficulties in interation with tutors

Looking from the other side now, Figure 10 shows that tutors also pointed out lack of proper participation and involvement (52%) and lack of commitment of the teachers (23%) as the major difficulties encountered to assure quality in the distance education process. The percentages are bigger in this case. So, one may say that teachers should be more integrated with tutors to improve the quality of distance learning process. On this regard, we may point to the proposal of [23] about the characteristics of the environment that provides knowledge construction. On their words, this environment needs to offer activities centered on active students, and to offer opportunities for negotiation and interpretation involving

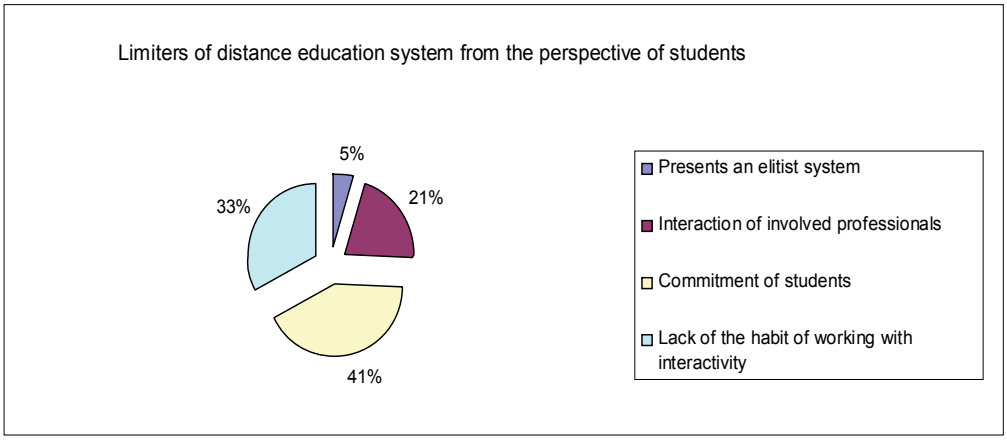
several perspectives. Therefore, these aspects are relevant to assure quality on distance education.



Source: Research data

Figure 10. Tutors' perspectives about difficulties in interacting with teachers

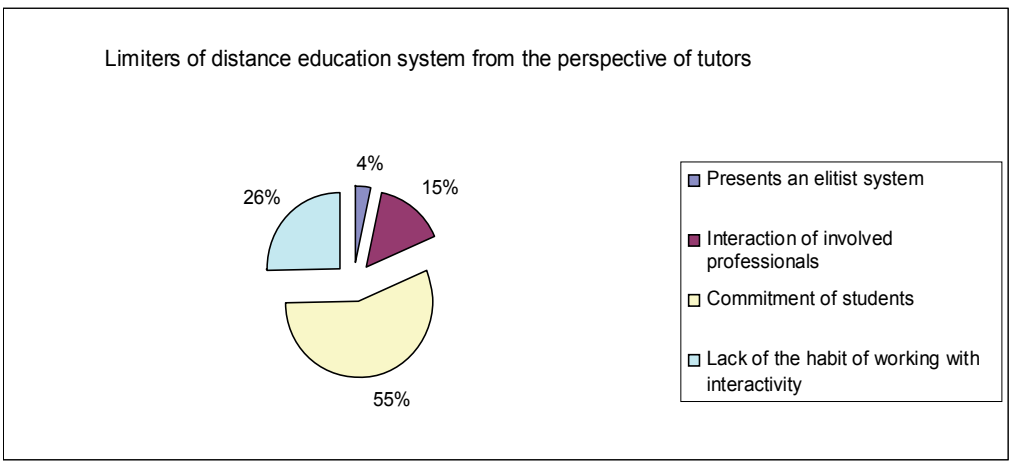
According to the students, to achieve real commitment from students is the most relevant limiter for achieving quality for distance education as shown on Figure 11. This is an important fact to observe because the students themselves are aware that their commitiment to distance course interfere in the quality of the courses. In this case, managers and course coordinators should look for alternatives of tecnologies or any other combination of present activities to involve the students more within the course and its technologies. Another important factor which is related to this one is the lack of habit of working with interactivity on the learning platform. Interaction of involved professionals was also mentioned as another limiter in the process.



Source: Research data

Figure 11. Students' perspectives on limiters of distance education

Similarly, the majority of tutors (55%) also pointed out the real commitment of students as the most relevant limiter of distance education (Figure 12). The second most relevant limiter is the lack of habit of working with interactivity (26%). The third limiting fator for tutors was also mentioned in the third position for the students, which is interaction of involved professionals (15%). So, it is possible to state that students and tutors have the same points of views about the limiters of quality on distance education. On this specific case, the team working with distance education should address these kinds of limiters during the definition of the pedagogical project to delimiate acitivites ansuring that different actors involved in the operacionalization of the course work together, as pointed out by [24]. Teachers, tutors and course coordinators have to work on participatory and integrative bases to decrease evasion during the courses.

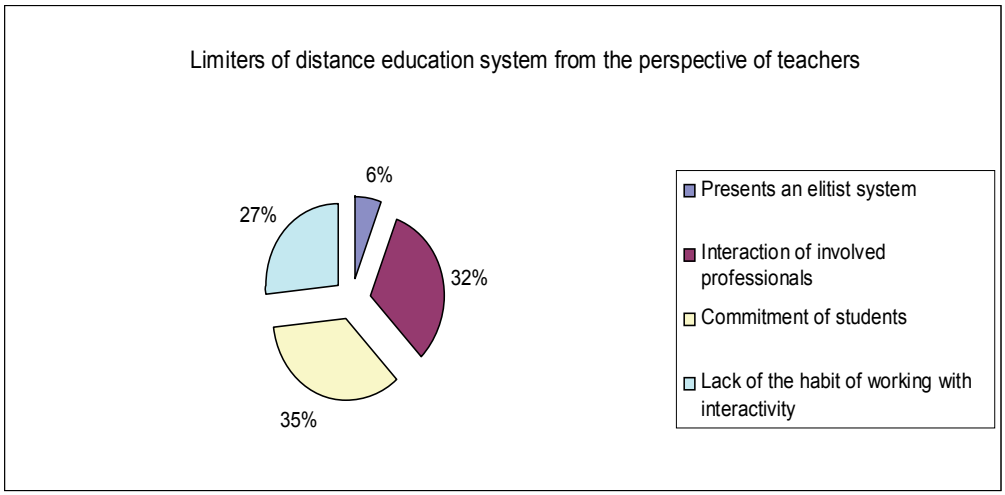


Source: Research data

Figure 12. Tutors' perspectives on limiters of distance education

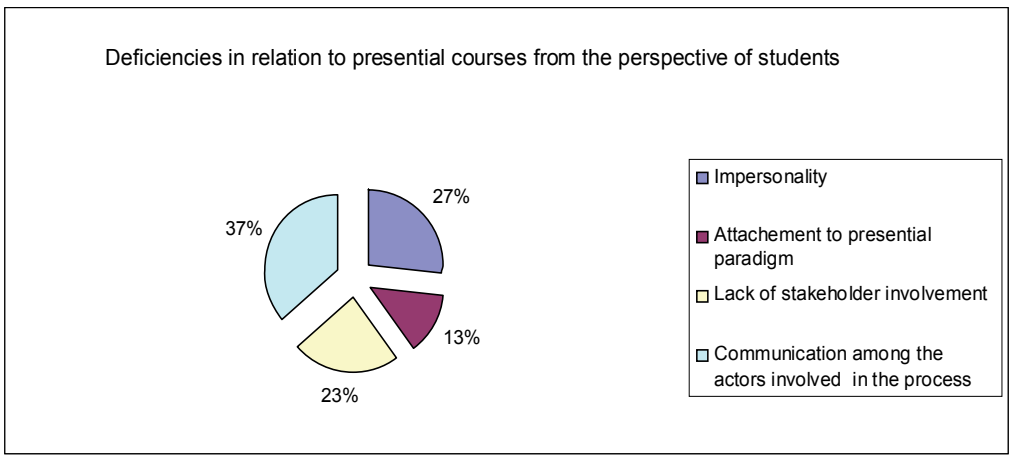
According to the perspective of teachers, commitment of students and interaction of involved professionals or actors are the most limiting factors for distance education as shown on Figure 13. Following these two limiters, comes the lack of habit of working with interactivity as another important condition to improve quality in this educational process. Comparing these three points of views, we may say that all the actors involved in the education process have almost the same perception about limiters in this modality of education. It helps to reinforce one of the challenges for improving quality of Distance Education presented by different authors. One of them states that "interaction among students, teachers, and other actors involved in the learning process should be covered by trust, respect, freedom for stimulating the coming up of weaknesses and strengths." [25].

Students' points of views about deficiencies of distance education courses in relation to presential education courses are presented in Figure 14. It shows that communication between the parts involved in distance education courses is not as good as communication between parts involved in presential courses (37%). The second most relevant item pointed by students is related to the impessoality that happens on distance courses. Apart from these, 23% of the respondents informed that lack of satkeholder involvement is another deficiency on distance education courses.



Source: Research data

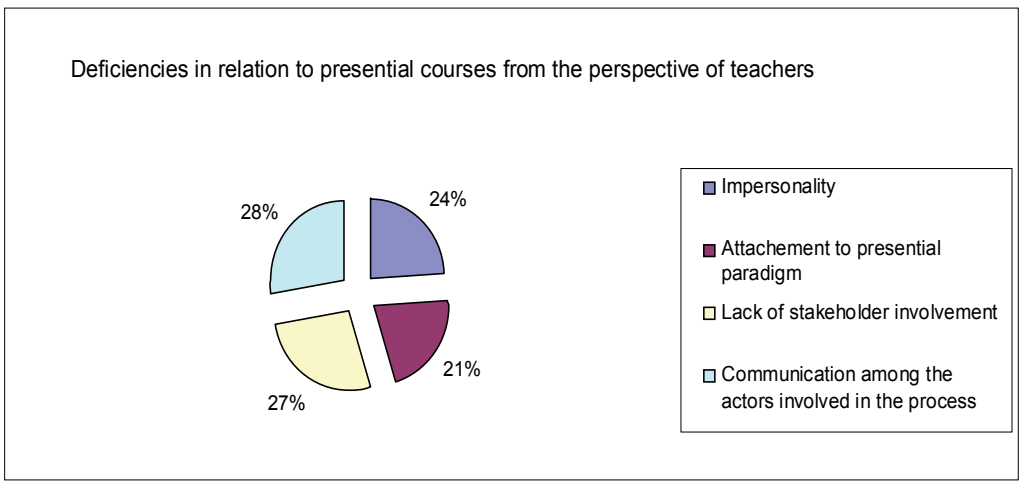
Figure 13. Teachers' perspectives on the limiters of distance education



Source: Research data

Figure 14. Students' perception about the deficiencies in relation to presential courses

Nonetheless, teachers' points of views about deficiencies of distance courses in relation to deficiencies on presential courses have almost the same pattern of responses. First, but with a slightly higher difference, are the difficulties related to communication among actors involved in the process followed by lack of stakeholder involvement (Figure 15). The other two options impersonality (24%) and attachement to presential paradigm (21%) were also almost equally mentioned by teachers. Thus, comparing these two groups, their points of views are also similar. For this reason, one may state that information technology is relevant to improve the quality of distance education courses. "It is necessary setting an appropriated virtual learning environment where all the activities are well connected and interrelated in an invisible and dynamic net, allowing the development of knowledge construction process" [26]. In this case, developing an appropriated platform for interaction among the involved parts and accessibility to didatic material is very important too.



Source: Research data

Figure 15. Teachers' perception on about the deficiencies in relation to presential courses

The aspects evaluated in this course in Minas Gerais - Brazil takes into account the framework to be considered by the Ministry of Education and the National Institute of Educational Studies – INEP in order to evaluate quality of Brazilian Distance Education Courses. As this course was a national piloting project it faced some difficulties mainly regarding communication systems involving students, tutors and teachers' interaction, educational material that sometimes were not totally appropriated for distance education courses and the difficulties regarding the multidisciplinary team, which was spread in different cities and sometimes could not articulate themselves properly to address students', tutors' and teachers' needs on time.

5. Conclusion and recommendation

Distance Education is showing a significant growth in the last few years in Brazil and more institutions are getting enrolled in this kind of education. The year of 2005 ended up with surprising news, and for the first time in Brazil, this education model was considered one of the priorities of the Ministry of Education and Culture (MEC). The reason is the great demand for vacancies, mainly in higher education, and the spread of information and communications technologies that make it possible. Apart from that, Distance Education may provide a great impulse to presential education because teachers receive support to elaborate didatic material and training to participate in the web platform.

Distance Education is growing, motivated by the demand of many students finishing secondary school, and other people from different ages and backgrounds that have begun to use on-line training as a way to update their knowledge in Brazil. This new educational paradigm is meeting students' expectations because they may study and work at the same, and they do not need to spend money and time to move from home to school every day. This saved time can be allocated for reading, exchanging ideas and information with other students, tutors and teachers by the internet or a free phone line.

CEDERJ experience, a consortium of the 6 universities of the state of Rio de Janeiro and the Federal Institute of Rio de Janeiro, is one of the well established distance education experience, which is working to improve the access and the quality of knowledge offered to the population in this state. More than 30.000 students are enrolled in its 9 graduation programs and for this reason, it is necessary to evaluate the quality of the system as a whole. The evaluation methodology, presented here, has being implemented in the consortium since 2006 and it suffered some changes during the process. One of the most significant changes was on the instrument of data collection to gather the students' opinions about their courses and the CEDERJ consortium as a whole. The technical visits provided subsidies to re-orient this process of evaluating distance education in Brazil. Different actions were taken on the basis of the results of such metodology of evaluation. The whole process is implemented every year and it is planned to last for one year. This means, each process starts when the previous one ends. This methodology is supposed to provide subsidies to improve the quality of the whole process including changes in the platform content and design, written material, tutorial activities, poles infrastructure and support, coordinating team and other actors involved.

Another experience addressed in this chapter was the undergraduate Management Course offered by The Federal University of Lavras in partnership with the Bank of Brazil and the Ministry of Education and Culture. This course was a pilot project which subsidized the organization and institucionalization of the Brazil Open University. This experience involved 18 public Brazilian universities spread all over the country. The course accounted 289 students registered at the Federal University of Lavras. They answered the

questionnaire along with tutors and teachers engaged in the course. The questionnaire was available at the distance education platform.

This research aimed to discuss students', teachers' and tutors' perception about quality assurance at distance education courses. It analyzed their perception about technology, mechanism of interaction, tutors' and teachers' involvement, communication tool used in this modality of education and teaching material (textbook) used during the course.

The results provided a useful amount of information to improve the quality of the course, including improvements on communication tools, printed material, and even the learning evaluating system and the facilities of the system used to implement the course. It also subsidized some important decisions of the Ministry of Education and Culture and Brazil Open University about offering new undergraduate course in the country. In the second semester of 2009, a Public Management Course started in the same bases of this pilot project. This study was supposed to support improvements on this new project too. The Federal University of Lavras is offering this new course in six new municipalities, and the "pilot project" on Management finished in the middle of 2011. Nowadays, the National Institute of Educational Studies – INEP is evaluating every distance course within Brazil to offer Accreditation regarding the framework stated at document References of Quality for Higher Distance Education [27].

Since the experiences addressed in this chapter were valuable to improve the quality of the courses, new researches at CEDERJ consortium, within the new courses offered by Brazil Open University and other broad iniciatives on distance education should be made to assess the quality of the courses offered nowadays. It is also recommended that new researches should be carried addressing the Accreditation in public and private institutions in order to evaluate the appropriateness of the model and the difficulties faced by the institutions in order to attend quality standard desired for distance education.

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Appendix

Evaluation Topics	1	2	3	4	5
1. Regional Poles Infrastructure					
Secretary attendance					
Studying rooms					
Physical space for tutorial					
Informatics Labs installations					
Equipments in the informatics labs					
Biology Labs installations					
Equipments in the Biology Labs					
Physics labs installations					
Equipments in the Physics labs					
2. Platform					
Information update					
Forum					
Downloading					
Tutorial rooms					
Support for the platform access					
Speed of access to the information in the platform					
3. Didactic Printed Material					
Clearness of the Printed Material					
Visual aspect of the booklets					
Illustrations applicability					
Lateral notes utility (boxes and short sentences)					
Motivation get from the booklets content					
Relevance of the proposed exercises					
Relation between the subject objectives and the activities indicated					
Didactic material in the platform					
Relation of the material available at the platform and the printed material					
Media elements (links, videos, images and animation) at the platform					
Contribution of the media elements for the learning process					
4. In Loco Tutorial					
Constantness of the tutors					
Punctuality of the Tutors					
Level of knowledge of the tutors					
Contribution of the tutorial for students learning					

5. At Distance Tutorial					
Timetable for distance tutorial attendance					
Interest and attention given by distance tutors					
Level of knowledge about students doubts					
Contribution for learning					
6. At Distance Evaluation					
Contribution of the topics addressed for in deep learning					
Correlation between the test questions and didactic material					
Language clearness in the saying of the questions					
7. In Loco Evaluation					
Contribution of the addressed topics for in deep learning					
Correlation between the test questions and the didactic material					
Language clearness in the saying of the questions					
8. Students Assiduity					
Monthly assiduity in using didactic material at the platform					
Monthly participation in the in loco tutorial					
At distance tutorial monthly					

Source: Vilas Boas et al (2007: 7-8)

Table 1. Evaluation topics included in the evaluation questionnaire

6. References

[1] Reis A M V (1996) Ensino a Distância: megatendência atual. São Paulo: Editora Imobiliária.

[2] Landin C M M P F (1997) Educação a Distância: algumas considerações. Rio de Janeiro: Biblioteca Nacional.

[3] Reis A M V (1996) Ensino a Distância: megatendência atual. São Paulo: Editora Imobiliária. p. 38.

[4] Carvalho Filho A de (2006) Educação a Distância: a experiência de uma organização militar com sede no Rio de Janeiro. Dissertação (Mestrado Profissional) - Instituto de Ciências Humanas e Sociais, Rio de Janeiro: UFRRJ.

[5] Mundin K C (2006) Ensino a Distância no Brasil: problemas e desafios. In: MEC/SEED. Desafios da Educação a Distância na Formação de Professores. Brasília, Secretaria de Educação a Distância. pp. 119-126.

[6] MEC – Ministério de Educação e Cultura. (2005) Educação a Distância. Decreto 5.622. Available: <http://portal.mec.gov.br/sesu/index.php?option=content&task=category&sectionid=7&id=100&Itemid=298>. Accessed 2005 December 05.

[7] Hannaffin M, Land, S (2000) Student-Centred Learning Environment. In: JONASSEN, David & LAND, Susan. Theoretical Foundations of Learning Environments. Mahwah, New Jersey: Lawrence Associates.

[8] Rezende F A. (2006) A complexidade possível de ser transposta na conformação de ambientes de ensino aprendizagem a distância. In: MEC/SEED. Desafios da Educação a Distância na Formação de Professores. Brasília, Secretaria de Educação a Distância. pp. 135-136.

[9] Brasil (2007) Referenciais de Qualidade para Educação Superior a Distância. Available: <http://portal.mec.gov.br/seed/arquivos/pdf/legislacao/refead1.pdf>. Accessed 2011 November 18. p. 7.

[10] CEDERJ (2001) Available: www.cederj.edu.gov.br Acessed 2001 May 21.

[11] CEDERJ (2004) Available: www.cederj.edu.gov.br Acessed 2004 July 05.

[12] CEDERJ (2012) Available: www.vestibular.cederj.edu.br Acessed 2012 April 5.

[13] Vilas Boas A A, Martins N S, Nogueira H G P (2008) The Evolution of the Evaluation Methodology in a Regional Consortium Experience in Rio de Janeiro – Brazil. Proceedings of the Online Educa Africa, Ghana.

[14] CEDERJ (2008) Questionário para Avaliação Interna. Available in: www.cederj.edu.br Accessed 2008 March 05.

[15] Vilas Boas A A, Oliveira G de J, Martins N S (2007) An evaluation methodology for distance education in a regional consortium experience. Proceedings of the Online Educa Moscow.

[16] Bielschowsky C E (2006) Educação Superior a distância: uma estratégia para avaliação institucional. In: MEC/SEED. Desafios da Educação a Distância na Formação de Professores. Brasília, DF, Secretaria de Educação a Distância. pp. 51-65

[17] Vilas Boas A A, Oliveira G de J, Martins N S (2007) An evaluation methodology for distance education in a regional consortium experience. Proceedings of the Online Educa Moscow. p. 7.

[18] Vilas Boas A A, Oliveira G de J, Martins N S (2007) An evaluation methodology for distance education in a regional consortium experience. Proceedings of the Online Educa Moscow.

[19] Bielschowsky C E (2006) Educação Superior a distância: uma estratégia para avaliação institucional. In: MEC/SEED. Desafios da Educação a Distância na Formação de Professores. Brasília, DF, Secretaria de Educação a Distância. pp. 51-65

[20] Vilas Boas A A, Oliveira G de J, Martins N S (2007) An evaluation methodology for distance education in a regional consortium experience. Proceedings of the Online Educa Moscow.

[21] Vilas Boas A A, Oliveira G de J, Martins N S (2007) An evaluation methodology for distance education in a regional consortium experience. Proceedings of the Online Educa Moscow.

[22] Mundin K C (2006) Ensino a Distância no Brasil: problemas e desafios. In: MEC/SEED. Desafios da Educação a Distância na Formação de Professores. Brasília, Secretaria de Educação a Distância. pp. 119-126.

[23] Hannaffin M, Land, S (2000) Student-Centred Learning Environment. In: JONASSEN, David & LAND, Susan. Theoretical Foundations of Learning Environments. Mahwah, New Jersey: Lawrence Associates.

[24] Rezende F A. (2006) A complexidade possível de ser transposta na conformação de ambientes de ensino aprendizagem a distância. In: MEC/SEED. Desafios da Educação a Distância na Formação de Professores. Brasília, Secretaria de Educação a Distância. pp. 127-146.

[25] Rezende F A. (2006) A complexidade possível de ser transposta na conformação de ambientes de ensino aprendizagem a distância. In: MEC/SEED. Desafios da Educação a Distância na Formação de Professores. Brasília, Secretaria de Educação a Distância. pp. 135-136.

[26] Rezende F A. (2006) A complexidade possível de ser transposta na conformação de ambientes de ensino aprendizagem a distância. In: MEC/SEED. Desafios da Educação a Distância na Formação de Professores. Brasília, Secretaria de Educação a Distância. p. 136.

[27] Brasil (2007) Referenciais de Qualidade para Educação Superior a Distância. Available: <http://portal.mec.gov.br/seed/arquivos/pdf/legislacao/refead1.pdf>. Accessed 2011 November 18.

Chapter 8

Generations of Distance Education and Challenges of Distance Education Institutions in Japanese Higher Education

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Additional information is available at the end of the chapter

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1. Introduction

Distance education has always provided some opportunities for pursuing education to those people who otherwise have not been able to do so. It had not been the mainstream of formal education until recently, but the status and attention of distance education has risen since the days of correspondence education, and now distance education has been discussed and practiced in many higher educational institutions around the world. In the near future, it may become a moot issue to discuss "distance" nature of "distance education", but "distance education" as a field of inquiry may not disappear altogether.

There have been numerous attempts to classify distance education in the past. Most of them classify distance education in terms of dominant technologies used. Distance education and technologies are considered inseparable as in order to reach students at a distance, one must use certain tools or technologies to do so. While technologies of instruction have been examined closely, the organizational transformation those technologies necessitate tends to be overlooked. In changing the mode of instruction or the educational model of distance education, an institution must also rearrange or transform its organizational structure to enable and effectuate such changes. Actually many distance education institutions fail to transform themselves to adapt to the changes and stay behind in adopting new technologies and methods of teaching and learning.

Distance education institutions are different from traditional campus-based institutions as the whole systems and operations of teaching and learning at distance education institutions have to be designed institutionally while at campus-based institutions, there are more rooms for individual instructors' discretion in deciding what methods and technologies to be used in their classrooms. In other words, divisions of labors among faculty and staff are more

prominent in distance education institutions due to the fact that many different technical aspects of teaching and learning come into play and instructors or tutors cannot be in charge of the entire operation and management of a course.

When an organization is centralized and the work flows in the organization are distributed among multiple stakeholders, the organization becomes rigid and difficult to innovate and change. If an institution is started in one mode of operation, it requires tremendous institutional efforts to change its mode of operation even if the change is relatively minor. Those distance education institutions that have been set up for mass production and delivery of learning packages are now facing big challenges in offering customized production and provision of learning experiences.

Theories of distance education have so far offered organizational models for industrialized operation of distance education [1] and later transactional models for interactive teaching and learning[2, 3], but few theories bridge the gap between those two; even those institutions who offer fully interactive teaching and learning have to have some theoretical base in organizing the institution, but organizational models for enabling such teaching and learning have rarely been discussed in the recent literature of distance education. As long as distance education is offered within the formal or non-formal educational frameworks, it is inevitable to consider organizational aspects of such offerings. As the industrial production model of Otto Peters was created to realize economies of scale, an organizational model to realize economies of scope should be provided for distance education institutions in the postindustrial era.

It may be the case that a division of labor with in an institution, which was one of the main characteristics of industrialized operation of distance education, will be replaced by a division of labor across institutions: some institutions with relatively deep pockets may focus more on production of contents and make those contents widely available; on the other hand, other institutions may focus more on the provision of learning supports. Some other institutions may mainly focus on credentialing learning using the contents and learning supports provided by other institutions.

This paper first reflects on the evolutions of distance education practices as expressed in its generations. Then, it takes a look at the evolution of distance education practices in Japan, including the history of the Open University of Japan. It also discusses the obstacles and challenges many institutions of higher education in Japan are facing in offering distance education programs in the postindustrial era.

2. Generations of distance education

The history of distance education tells us the evolving use of technologies. Bates [4] as well as Peters [1] mentioned that distance education had gone through three stages. The first generation of distance education refers to those which mainly utilize written and printed texts and postal services for delivering such texts in the forms of books, newspapers, and manuals. It is so-called print-based correspondence education. In this stage, the interaction

between teachers and students was usually limited to correspondence, meaning hand-written texts that were sent via postal mail.

The second generation is characterized by the use of radio and television as instructional media in addition to print materials. This generation is often referred to as the "industrial mode" of distance education with highly specialized division of labor in producing and delivering instructional materials and the potential to educate thousands of students at once. Most open universities including British Open University, Anadolu University's Open Educational Faculty in Turkey, Korea National Open University and the Open University of Japan also started as this second generation institutions.

In North America, many televised programs were developed to be broadcasted over closed-circuit television as well as satellite television in university settings. The teacher-student interaction can occur through postal mail, telephone, facsimile, electronic mail, face-to-face contact, teleconferencing or video conferencing. However, the interaction between teachers and students is usually discouraged in this mode mainly because the system is not designed for their full-interaction and it becomes too costly for the institution or too burdensome for the teachers.

The third generation of distance education utilizes information and communication technologies (ICT) to provide interaction in addition to content delivery. There are two aspects of interactivity in the use of ICT: the interactivity between the learner and the content as seen in interactive multimedia learning materials in CD-ROM as well as on the Web and the interactivity between teachers and students and among students. The latter interactivity makes the fourth generation of distance education.

It can be also said that there is an emerging generation of distance education where interactivity or two-way communication between teachers and students and among students becomes of utmost importance. In terms of technology, the social media or so-called Web 2.0 plays an important part in transforming learning experiences in distance education. In addition, the wide availability of the Open Educational Resources (OER) reduces the burden of content production by distance education institutions and enables them to focus more on learner support and design for learning.

Taylor [5] suggested five generations of distance education: First, the Correspondence Model based on print technology; Second, the Multi-media Model based on print, audio and video technologies; Third, the Tele-learning Model, based on applications of telecommunications technologies to provide opportunities for synchronous communication; Fourth, the Flexible Learning Model based on online delivery via the Internet; and Fifth, Intelligent Flexible Learning Model based on the interactive nature of the Internet. As this model was suggested before social media and Web 2.0 came into scenes, it is understandable that this model does not include the emerging generation of distance education, either, which was discussed above.

Criticizing those classifications based on technologies, Anderson and Dron [6] suggests three generations of distance education in terms of its dominant pedagogy: the cognitive-

behaviorist pedagogy, the social-constructivist pedagogy, and the connectivist pedagogy of distance education. According to Anderson and Dron, the first generation, the cognitive-behaviorist pedagogy, is characterized by the thinking that learning means some behavioral changes instigated by learning stimuli, and was the dominant thinking in computer-assisted instruction and instructional systems designs. The second generation of distance education pedagogy, the social-constructivist pedagogy, was originated in the work of Vygotsky and Dewey, and focuses more on learning instead of teaching. In this pedagogy, human interaction (student-teacher and student-student) is emphasized, which makes it costly for an institution to adopt. The third generation, the connectivist pedagogy of distance education, is built around networked connections and based on the learners' ability to actively participate in networked communities of their choice.

As Anderson and Dron state that, "Connectivism is built on an assumption of a constructivist model of learning, with the learner at the centre, connecting and constructing knowledge in a context that includes not only external networks and groups but also his or her own histories and predilections," the connectivisit pedagogy does not seem significantly different from the social-constructivist pedagogy, but it may be significantly different from other paradigms of teaching and learning in terms of the degree of control an institution has over students' learning. In the previous paradigms of distance education, the role of institutions in designing and evaluating students' learning is quite large while in the connectivist model where learners rely upon existing networked communities to develop their own net presence, the role educational institutions play in individual learning may be reduced to credentialing what students have learned.

So far the evolution of distance education has been classified into generations in terms of its dominant technology and its dominant pedagogy. Here it is suggested that distance education can be classified into three organizational models. The first organizational model of distance education is the "supplementary model," where distance education is supplementary or complementary to traditional education, which targeted those who were excluded from traditional education for some reasons and needed some "access and equity" in their lives [7]. As the distance education programs are supplemental to on-campus programs, the institutional investment in offering the distance educational programs is minimal and usually managed by a special office called "extension programs," "external study," "independent study," etc. The second generation of distance education is the industrial model discussed earlier. The industrial model has been associated with mass education where hundreds or thousands of students learn in the same program using the same content and the same method. In order to enable this, the institution has to have a division of labors within the institution; hence, it becomes the "industrial" model of production and delivery of courses. The third and emerging model of distance education is the "ad hoc model," in which institutions may play one part in the whole process of learners' learning in various ways. For example, one institution may offer learning content while another institution may offer tutorials and student support. Yet, some other institution may offer evaluation of learning and credentialing of what students have learned. It's a division of labor across institutions to meet the demands of learners being

arranged by an ad hoc institution based on learning goals students want to achieve. In other words, the emphasis is placed upon economies of scale in the industrial model while the emphasis is placed upon economies of scope in this emerging model of distance education. This third organizational model is still emerging, and has not yet been seen beyond experimental bases. As discussed above, there are many different models (whether it is termed as "generations" or not) of distance education and it is usually the case that evolving from one generation to another, or transforming itself from one model into another requires tremendous institutional efforts. It is so much easier to start anew rather than transforming one institution into that of a different generation or model.

The technologies or the pedagogy that are dominant in one generation do not go away when the technologies in the next generation arrive. The new technologies tend to be just added to the old ones as the supplement of the existing ones in the beginning and later as the dominant technologies. The printed materials have not gone away yet and, still in many distance education programs, they are the primary learning materials. Radio and television have not gone away though, in many distance education programs, those pave the ways to DVDs and streaming audio and video on the Internet. The animated interactive programs on DVD or on the Web have not gone away though they might have become one of many open educational resources that are shared and made available publicly. In other words, distance education has been becoming more complex and multi-faceted as time has gone by with added features and technologies. This is also true to pedagogies. No single pedagogy has provided all the answers and usually a combination of different pedagogies is used as the technologies evolve. However, the organizational models cannot coexist within one organization.

In considering distance education theories and practices, it is important to look at from the three perspectives: technologies, pedagogies and organizations. In the following, distance education in Japan is discussed to consider its evolution from the three perspectives.

3. Background of distance education in Japan

3.1. Brief history of distance education in Japan

In Japan, the first occurrence of distance education can be traced back to the "lecture notes" used in higher education in the late 19th century. In the Meiji period when higher education had not taken a solid form yet in Japan and no textbooks existed in Japanese, the only learning materials students could rely on were notes taken from the lectures given by professors. Thus, those "lecture notes" were printed and used by non-matriculated students in their studying. Waseda University, the Japan's premium private college, is well known for being the first one to implement this system. Those students who studied through the "lecture notes" could take an exam to obtain a certificate of completion. At that time, those who could not come to Tokyo to take college courses studied in this mode and took exams to gain certification. This is considered to be the origin of "correspondence education" or distance education in Japan.

In 1950, for the first time in its history, those correspondence schools or distance learning schools were officially recognized by the Ministry of Education, which enabled recognized schools to offer degrees to their students. According to the Higher Education Council in Japan, this is the beginning of distance education in higher education in Japan. Those distance education programs in Japan were mainly created to give access to higher education to those who otherwise did not have. Therefore, primarily the distance education programs were offered by existing on-campus universities and the credits earned through distance education programs were transferrable to the credits for on-campus programs (and vice versa). The distance education programs have to be open to anybody who wishes to study without any entrance selections unlike on-campus programs which mostly have some entry selection. The teachers of those distance education programs must be the ones who are full-time faculty of the institution. The distance programs were mandated to offer face-to-face sessions that worth 30 credits per year.

As indicated above, the Japanese Ministry of Education created and maintained two separate accreditation systems or the University Establishments Standards: one for traditional on-campus institutions and the other for correspondence education. This legal separation still exists today and distance education programs are regulated under the standards different from on-campus programs in Japan.

The majority of distance education in Japan has been done by distributing print-based materials through postal mail. Though those distance education programs had been officially accredited to offer degrees, originally 30 credits out of the 124 credits required to obtain a bachelor's degree had to be earned through face-to-face classes (i.e., schooling), as mentioned previously. In March 1998, the requirement of earning the minimum of 30 credits through face-to-face classes was relaxed and the government enabled those 30 credits to be earned through synchronous mediated communication such as videoconferencing. Then in March 2001, those 30 credits were allowed to be earned through interactions on the Internet. This made it possible legally to earn degrees solely at a distance without ever visiting the campus or learning centers. In other words, currently there are four ways of teaching and learning that can be offered through distance education programs: (1) print material based, (2) broadcasting-based, (3) face-to-face schooling, and (4) media-based.

Also in 1998, graduate programs through distance education began to be recognized officially and four graduate distance education schools were established in 2002. In 2003, doctoral programs through distance education were started to be recognized. Originally distance education programs were considered secondary to the regular on-campus programs as discussed earlier. However, the notion has been slowly changing and it has been discussed that the regulatory distinction between campus-based schools and distance education schools may disappear in the near future.

3.2. Current status of distance education in Japan

As discussed earlier, in Japan distance education programs have been regulated differently from campus-based programs of higher education. In 2011, 217,236 undergraduate students

were seeking degrees at a distance in 44 universities who provide undergraduate distance education programs, accounting for 7.5% of total higher education enrollees. The number of students enrolled in distance education programs and its percentage of total higher education enrollees has been decreasing in the past few years while the number of full-time faculty members who engage in distance education programs has been increasing except in 2001 (see Table 1).

Year	# of institutions with undergraduate distance education programs	# of undergraduate distance education students	% of distance education students out of total undergraduate enrollees	# of full-time faculty members in undergraduate distance education programs
2007	40	240,076	8.5	458
2008	41	229,734	8.1	493
2009	42	226,384	8.0	644
2010	44	224,314	7.8	725
2011	44	217,236	7.5	602

Table 1. Undergraduate Distance Education Statistics in Japan (2007-2011) (based on the data made available by MEXT in 2012)

The graduate distance education programs also show similar trends in the past five years (see Table 2). In 2011, 8,241 graduate students were seeking post-graduate degrees at a distance in 27 universities.

Year	# of institutions with graduate distance education programs	# of graduate distance education students	% of distance education students out of total graduate enrollees	# of full-time faculty members in graduate distance education programs
2007	23	8,820	N.A.	72
2008	25	8,649	N.A.	88
2009	26	8,437	N.A.	111
2010	26	8,429	3.0	151
2011	27	8,241	3.0	87

Table 2. Graduate Distance Education Statistics in Japan (2007-2011) (based on the data made available by MEXT in 2012)

Seventeen universities offer both undergraduate and graduate distance education programs; hence, a total of 54 universities offer distance education at an undergraduate or a graduate level. In addition, there are 11 institutions that offer distance education programs at an associate degree level. Out of all the 65 institutions that offer distance education programs in higher education, seven of them solely exist at a distance (meaning offering no on-campus programs) and are for-profit institutions.

In terms of subject matters students are studying through those undergraduate distance education programs, excluding those categorized as "others," the most popular one is social sciences, and the next popular is education. (see Figure 1).

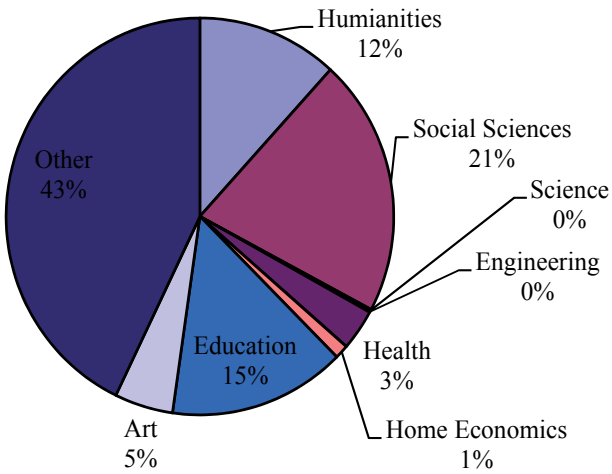

Figure 1. Subject Matter Breakdown for Students Enrolled in Undergraduate Distance Education Programs (based on the data made available by MEXT in 2012)

As for graduate programs, a majority of them are unclassifiable as shown in Figure 2.

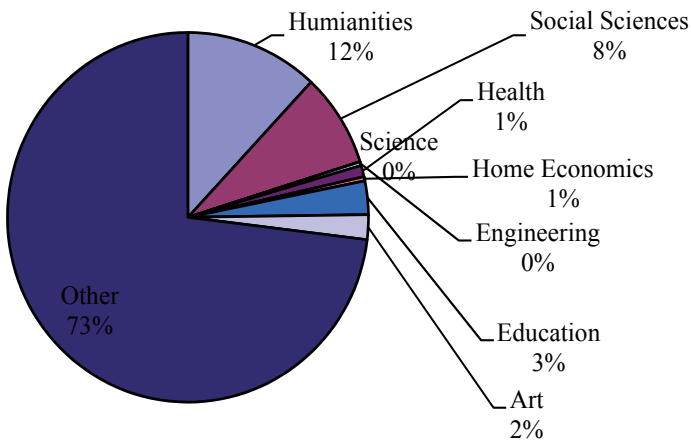

Figure 2. Subject Matter Breakdown for Students Enrolled in Graduate Distance Education Programs(based on the data made available by MEXT in 2012)

Many of the distance education programs deal with non-traditional professional subjects that are not unclassifiable in the traditional scheme of subject classification. As you see in those figures, the subjects in hard sciences are rarely offered at a distance in Japan.

The age distribution of students in distance education programs is also quite different from that of on-campus programs where almost all the students are within traditional college age cohorts (i.e., the ages between 18 and 22 years old). The largest age group in undergraduate distance education programs is 30s and the second largest is 40s (see Figure 3) while the largest age group in graduate distance education programs is 40s and the second largest is 30s (see Figure 4).

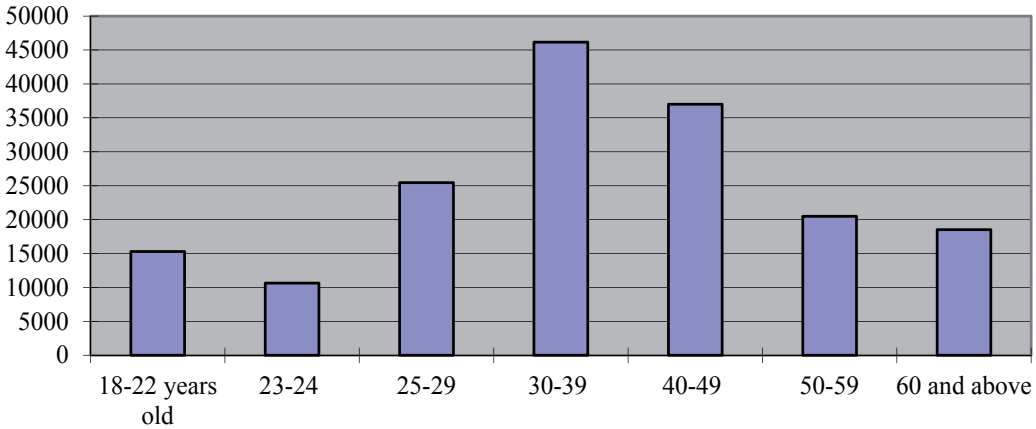

Figure 3. Age Distribution of the Undergraduate Distance Education Students(based on the data made available by MEXT in 2012)

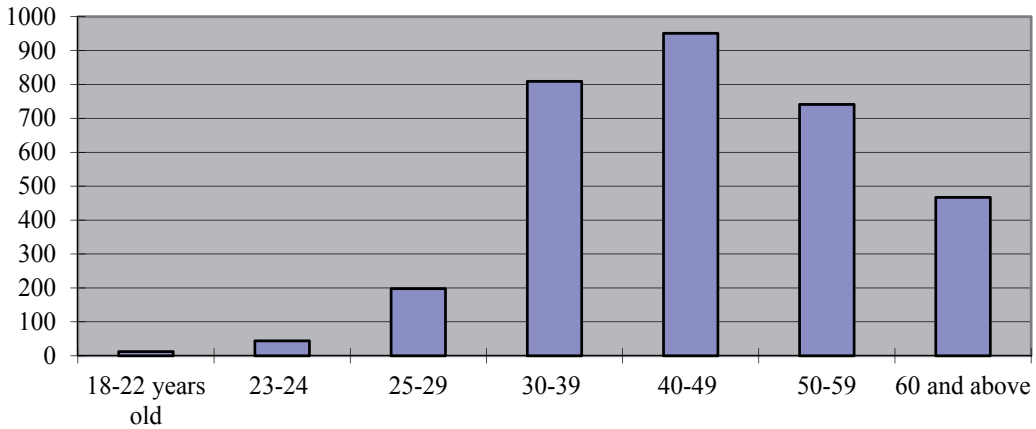

Figure 4. Age Distribution of the Graduate Distance Education Students(based on the data made available by MEXT in 2012)

The occupations of distance education students in Japan also show a difference from on-campus students who mostly study full-time. (See Figures 5 and 6.)

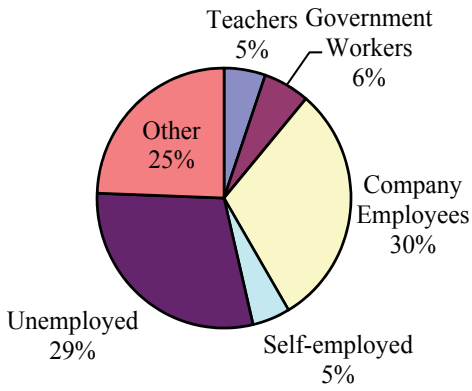

Figure 5. Occupations of Undergraduate Distance Education Students in Japan (based on the data made available by MEXT in 2012)

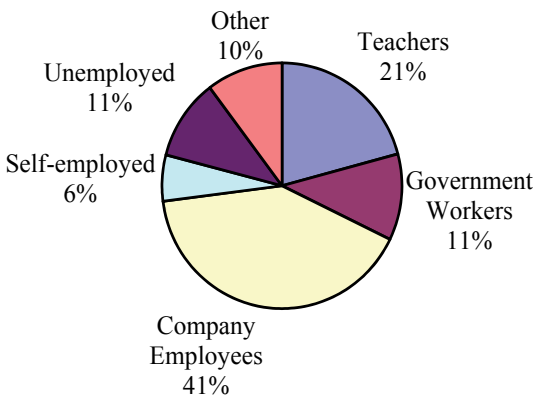

Figure 6. Occupations of Graduate Distance Education Students in Japan (based on the data made available by MEXT in 2012)

3.3. The use of ICT in distance education in Japan

Though Japan has been widely known in the world for its technological prowess, the use of ICT in education, especially in distance education, is amazingly behind of any other developed countries. The survey of distance education programs conducted by the author in 2008 showed that only less than 30% of the institutions made learning materials available online, and only one-third utilized the Internet or Learning Management Systems (LMS). A few of them utilized social networking services for creating student communities in 2008.

The number may have increased slightly since then, but not any drastic change has been observed.

Though since 2001 the law has allowed any distance education program to exist totally at a distance without offering any face-to-face classes by offering media or the Internet interactions, all the institutions surveyed except one offered face-to-face schoolings, and only one institution offered schooling that allowed students to participate from home using web conferencing. Those institutions which offered face-to-face schoolings, only three of them said those schoolings were mandatory for students to earn degrees. Schooling still remains a very strong component in distance education programs in Japan.

Most distance education programs in Japan do not allow students to directly contact their teachers. About a half of the institutions surveyed said student inquiries would be first sent to the administrative office while only about a quarter of the institutions allowed students to directly ask questions to teachers. Only three institutions said tutors would respond to student inquires. In the same survey, the institutions were also asked about the ways in which student inquiries were received. The Figure 7 shows the percentage of institutions who said they would use the following media to receive student inquires respectively: postal mail, email, telephone, discussion board, face-to-face, and fax. The last item showed if the institution proactively inquired students for any possible questions they might have. More than 70% of the institutions mainly receive student inquiries via postal mail and only three institutions said that they actively sought student inquires. In this age of the Internet, it is surprising to know that still the main mode of communication between students and teachers is the old postal mail. This illustrates that the dominant pedagogy of distance education programs in Japan is the cognitive-behaviorist pedagogy, not allowing rich interaction between teachers and students or among students.

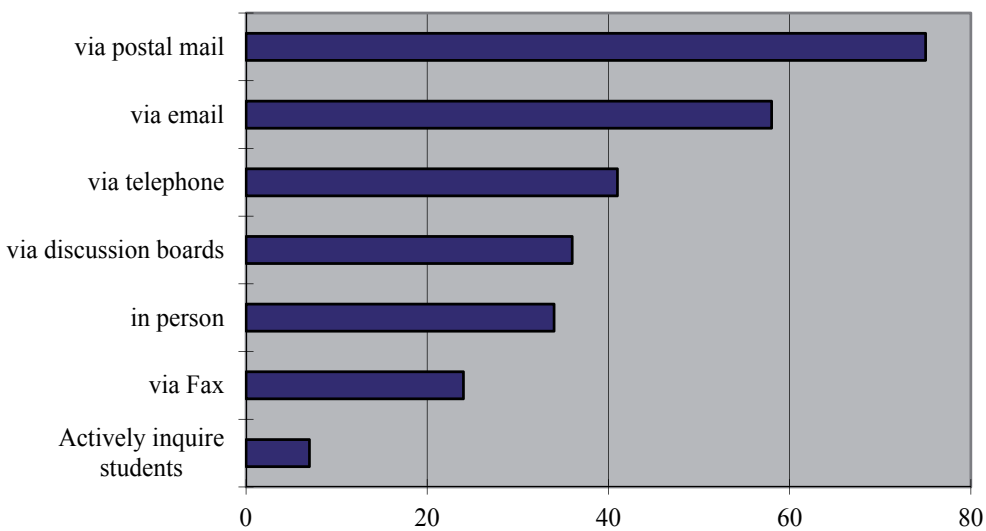

Figure 7. The Methods of Receiving Student Inquiries (based on the data made available by MEXT in 2012)

The length of time it takes for an institution to receive an inquiry from a student and send the response back to the student was mostly a few days. Only three institutions said they would respond within 24 hours and four institutions said they would respond in real time.

According to the same survey, the ICT tools most commonly used for teaching and learning at those distance education programs were: online discussion boards (43%), on-demand streaming video (42%), and LMS (41%). Even for the most commonly used ICT tool, online discussion boards, less than half of the institutions were using. As for the reasons why those tools were not used or not planned to be used in the near future, the most common reasons were "lack of budgets (47%)," "lack of support services (34%)," and "lack of human resources (34%)." It appears that the lack of a systematic institutional support in the use of ICT is the major problem in facilitating the use of ICT in distance higher education in Japan.

4. The Open University of Japan (OUJ)

4.1. History and characteristics

Among all the distance education institutions and programs in Japan, the Open University of Japan (OUJ) needs special attention in the history of distance education in Japan as it is the only distance education university in Japan that has been mandated by the government to use public airwaves to broadcast its instructional programs. OUJ was established as an independent four-year institution of higher education in 1981 and started its television and radio broadcast instruction in April 1985, modeled somewhat after the British Open University. The objectives and missions of OUJ were:

1. to provide working people and housewives with a chance of lifelong university level education;
2. to provide an innovative and flexible system of university level education open to high school graduates; and
3. to co-operate with existing universities and make full use of the latest scientific knowledge and new educational technology in order to offer a system of higher education which matches contemporary needs.

These missions still hold currently though wordings were slightly changed.

For the first five years of its existence, only students in the Tokyo metropolitan area could receive the broadcasts of the university lectures. The University began broadcasting nationwide via digital communications satellite in 1998 though only those who installed a special antenna and receiver could receive the signal. The main textbooks utilized as study materials for the courses offered by the university are still print-based.

In addition to those courses that were offered through print materials and broadcast programs, the face-to-face schoolings also play an important part in the educational system of OUJ. Those face-to-face classes are offered at 57 local study centers and support offices around the country; at least one in every prefecture. The university requires all students to take at least 20 credit hours of the classroom instruction that are mostly taught by adjunct

instructors hired through the local study center. Each face-to-face class comprises one credit and is taught from 10 a.m. to 5 p.m. on a weekend (Saturday and Sunday). The face-to-face classes offered at a local study center do not have any bearing to the broadcast courses and the topics of the classes are usually determined by the instructors hired to offer classes.

The local study centers are also used to give final exams. All the students belong to one of the local study centers nearby and they take final exams for the registered courses at the study center they belong to. Conducting final exams are a big operation at OUJ as final exams are the only ways to assess students' learning. The study centers also serve as the places where students can watch or listen to video/audio recordings of lectures so that students who have missed the broadcast of a lecture can come to the study center to view or listen to the recordings. Those recordings usually cannot be taken out of the study centers, and those who want to obtain those recordings have to pay a large sum. The university sells those recordings to other universities or offers them to those universities with mutual agreements on credit transfer, which use them to supplement their course offerings.

Currently OUJ has about 82,000 students in total (about 77,000 undergraduate students and 5,000 graduate students). Among them, 57% of the undergraduate students and 44% of the graduate students are female. In terms of their age groups, 49% of the undergraduate students are in their 30s and 40s and 37% of the students are over 50s. As for graduate students, 51% of them are in their 30s and 40s, and 43% are over 50s. About 52,500 out of 82,000 students are enrolled in degree programs full-time, and the average student spends 6.5 years before graduating.

The university offers more than 350 broadcast courses each semester in addition to 2,900 face-to-face classes offered at the local study centers that can lead to undergraduate degrees in life and social welfare, psychology and education, society and industry, human and culture, and nature and environment or master's degrees in life health science, human development science, clinical psychology, social management science, cultural information, and natural environmental science. Like other distance education programs in Japan, OUJ does not require undergraduate applicants to take an entrance exam, but requires one for admission into its graduate programs. OUJ is largely supported by the government for its operational budget, but is classified as a private university as a public institution is not allowed to own and operate a broadcast station.

4.2. Broadcast materials at OUJ

Since its inception, OUJ has relied on broadcasting mediums as the main mode of instructional delivery as its Japanese name still indicates "broadcasting university." Though it has the mission "anytime, anywhere, anybody," the television broadcast of the lectures was limited to the Tokyo metropolitan area until the broadcast through the CS (commercial satellite) digital service was started in January 1998. The uniqueness of OUJ among all open universities in the world lies in the fact that OUJ owns and operates television and radio stations which OUJ has to fill their airtime from 6 a.m. to midnight every day.

As it has been always a dream of OUJ to have a nationwide coverage of their broadcast, OUJ applied for the license of analog BS (broadcast satellite) station not long after it started terrestrial television broadcasting in the Tokyo area to expand its coverage nationwide. However, as the launch of the satellite which was supposed to relay the BS signals got delayed and also the digital BS broadcasting started to be planned about the same time, OUJ gave up on doing the analog BS broadcasting altogether. The start of television and radio broadcast of OUJ lecture programs via CS made the potential coverage of OUJ nationwide for the first time since its inception. Though signals could be received anywhere in Japan with CS broadcasting, in order to watch programs delivered via CS, people had to purchase and install a special antenna and receiver. Once they installed the antenna and receiver, they could view OUJ programs freely. Some cable television companies carried OUJ's channels and subscribers of such cable television services could watch OUJ programs without any additional fee or equipment.

In December 2006, OUJ started terrestrial digital broadcasting. Again, its coverage was limited to the Tokyo metropolitan area. Though OUJ's original application for obtaining BS analog license did not materialize, OUJ succeeded in obtaining BS digital license. In Japan, analogue television service was virtually terminated on July 24, 2011, except those areas where switching to digital services were delayed due to the unexpected disaster in March 2011. The number of households that can receive BS digital signals has increased dramatically recently as the newly manufactured digital television sets now have the built-in BS antenna. OUJ started its BS digital broadcasting service in October 2011, which made the OUJ signal more viewable by millions of households outside the Tokyo metropolitan area where the OUJ digital terrestrial service covers. It required a tremendous investment in switching the transmission facilities from the CS broadcasting to BS broadcasting, but OUJ hoped it would give a significant advantage in terms of its visibility.

With a superior compression technology, one regular digital television channel can carry one high definition program or up to three regular definition programs. With the demand for an increase in course offerings, OUJ is making a full utilization of these simultaneous broadcasting of multiple programs. However, with the tight allocation of budget that is foreseeable in the future, it'll become the trade-off between the quantity of programs and the (aesthetic) quality of each program. What is unique about OUJ among all the open universities in the world is that OUJ owns and operates its television and radio stations which OUJ has to fill their airtime by themselves. Other open universities that utilize or used to utilize television broadcasts as an instructional delivery, including UKOU, bought or leased the airtime from national broadcasters for their instructional programs. OUJ is the only open university in the world that has its own independent television and radio station. This, in my opinion, is increasingly becoming a bottleneck for innovation at OUJ as a major portion of its budget has to be set aside for production of broadcast programs, maintenance of the facilities, and operation of the stations.

In addition to the broadcast delivery of lecturers, OUJ also has sold videotapes and audiotapes (nowadays DVDs and CDs) of recorded lectures through its subsidiary, the Society for the Promotion of the University of the Air (SPUA). As students have free access

to those materials, the purchasers tend to be those municipal and school libraries and college teachers who want to use those materials in their classes. The price is quite high as a set of DVDs for one course, consisting of 15 45-minute lectures, is usually sold at about US$3800. A significant percentage of television lecture programs are now made available online to those registered students through the student portal though the video clips are only available as streaming video and not as downloadable video clips.

As for the actual production of broadcast programs, in the early days of OUJ history NHK (the only public broadcast network in Japan) and TV Asahi (a commercial television network in Japan) were assisting the production. But, gradually TV Asahi withdrew and NHK had become the sole technical support provider. Because of this, the relationship between OUJ and NHK has always been rather strong, and many technical people for video production at OUJ come from NHK. In addition, NHK Educational, a subsidiary of NHK, assists production of television lecture programs at the television studios located in the campus of OUJ. Recently under the new leadership, this relationship was reexamined and other television production companies were encouraged to bid for new production contracts. As a result, a few new independent production companies have started to work for producing OUJ's lecture programs, but still a majority of the production contracts go to the NHK Educational.

OUJ started producing all the television programs in digital format in 2006 when it started digital terrestrial broadcasting. It also started production in the High Definition Television (HDTV) format and since then it has been expanding the number of programs produced in HDTV format. Some OUJ programs take advantage of the HDTV format and offer high quality visuals. In addition, digital broadcasting allows providing additional data information and OUJ is planning to provide supplemental information to facilitate the understanding of the television lecture program via such data channels. About 20 percent of the programs were selected to carry subtitles for those who are hearing impaired.

It usually takes three years from the submission of a course proposal to the actual offering (i.e., broadcasting) of the course. For example, proposals for courses that will start in April 2014 are submitted in spring of 2011. Then, the decision is made in summer, 2011. A detailed syllabus for the selected course has to be submitted by the end of November 2011 and by March 2012 course team members have to meet for the first time to discuss the general structure of the printed material as well as the broadcast programs. A course team at OUJ usually consists of at least a chief lecturer who is usually a full-time faculty member of OUJ, a producer who is responsible for overseeing the budget for the entire production process, and a director who is responsible for the actual production process of the program. Directors are usually those experienced in directing educational programs in NHK programs or OUJ programs in the past. Within the three years faculty members in charge have to work very hard as they have to write a textbook of about 250 pages for each course by 16 months prior to the start of the course, and then have to produce broadcast programs within the year prior to the start of the course. It means the faculty members in charge have to prepare for all the scripts and visuals (sometimes with a professional help) and have to perform in front of the camera to produce 15 45-minute broadcast programs.

Once a course starts 15 broadcast lecture programs are usually broadcast one program per week on the national BS channel. The 15-week course is broadcast twice a year in addition to those intensive study weeks in summer and in winter when the course programs are broadcast every day for 15 days. On the terrestrial digital channels that are limited to the Tokyo metropolitan area, the programs are also broadcast every day for 15 days for each course. In other words, the same program is usually broadcast at least four times a year nationwide and two more times additionally in the Tokyo metropolitan area. The lifespan of a course is usually four years though the current tendency is to make it longer to recoup the initial cost of production. In 2011, a total of 330 course programs (169 television programs and 161 radio course programs) were broadcast during the first semester (from April 1 to July 21) and 331 programs (170 television programs and 161 radio programs) were broadcast during the second semester (from October 1 to January 20). Out of the 331 programs which were broadcast during the second semester, 71(21.5%) of them (36 television programs and 35 radio programs) were newly introduced programs. On average, 18 million yen (roughly US$220,000) is spent on producing one course of television programs (i.e., 15 x 45-minute programs).

In the early days of OUJ, television programs were made by filming the actual scenes of classroom teaching, but the style has changed to focus on a teacher talking directly to the camera. It has been considered that in this way a learner who watches those programs may feel more like being directly talked to by the teacher instead of observing a classroom interaction as the third party. In addition to the talking head of the teacher, photographs, video clips, computer graphics, and tables and charts which are printed on a board are often used to supplement the lecture. Yet, those talking heads programs are considered boring by many students and they opt to study only with the textbooks. It has never been actually measured, but it can be said that the viewership of the OUJ programs consists mostly of those who are not enrolled in the programs, but become accidental viewers by flipping the channels of their television sets.

Most television programs are produced in one of the three studios located in the main campus of OUJ, but some programs are filmed at an appropriate location outside the studio. This method is usually used when the theme of the program requires filming of actual operations of something or interviewing of people who cannot be asked to come to the main studio such as those who reside outside the country. There is a budget set aside annually for oversea filming, and a few courses are allowed to have oversea filming up to 10 days in the maximum of two countries. With a decreasing budget of broadcast program production, professional filming of locations outside the studios is strongly discouraged nowadays and some faculty members have started to collect video clips when they make research trips to some locations.

Recently, a budget production method was also introduced for some courses. It is mainly due to the financial pressure to cut the cost of production of broadcast programs and the desire to keep the same number of television programs. In this newly introduced method, the number of cameramen is reduced to zero and the camera is remotely operated in the control room. In addition, the visuals are made mostly by the teachers themselves instead of

being professionally created by graphic artists. The use of copyrighted materials is also strongly discouraged and Chroma key is used as the background instead of an elaborate physical set in the studio.

4.3. Online offerings at OUJ

Due to the recent prevalence of the Internet, the student demand to make the broadcast lecture programs available online has been increasing. OUJ started putting streaming video of some of the television lecture programs online in 2008 and currently in 2012, 97 undergraduate television courses and 12 graduate television courses (more than a half of the total television courses) are also viewable online to registered students in the form of streaming video. In addition, those streaming videos will also become viewable on mobile phones soon. However, still all those online video programs are not available in a downloadable format due to copyright constraints, which make students difficult to access at any time they want as it requires a high-speed Internet connection to view the video. The efforts have been made to increase the number of video lectures available online; however, some materials borrowed make it very expensive to be made available online.

Besides the use of the Internet for making broadcast programs more accessible to students, the Internet has not been used much in teaching and learning at OUJ, especially in facilitating communication between teachers and students or among students themselves. However, this has been changing slowly and for the first time in 2011, a very limited use of a Moodle-based learning management system (LMS) was started, which allowed students to ask questions online and to answer mid-term questions online that are mostly multiple-choice questions. Still the number of courses that allow students to do so is relatively small, but it is a good trend and so much better than filling the paper form of inquiry and send it via postal mail. It is still far from being an interactive course that is a characteristic of the third generation of distance education (technologically) or social constructivist pedagogy, but it is a step forward to the direction. A web conferencing system is also used in advising graduate students at a distance for their thesis writing.

The above indicates the official use of the Internet by the university. While the official use of the Internet is very limited still at OUJ, students are forming communities informally and utilizing Web 2.0 tools such as Facebook, Twitter, and blogs to express their opinions, to exchange information among students, and to ask questions, though the percentage of the students who are utilizing those tools is very small among the total number of students. Actually, the current president of the university is an avid user of those tools and students can reach to the president of the university easily using those tools. As every operation at OUJ is so centralized and systematized with little room for faculty members to be innovative in their teaching, it will require many more years for OUJ to embrace those tools in its system of teaching and learning.

Another notable use of the Internet is the student administration system called System Wakaba. The System Wakaba, which was implemented in April 2009, enabled existing students to access to their grade records through a web browser and to register for courses

online. Through this system, teachers can access to student information or enter the course grade information directly anywhere through a web browser. As the single sign-on system was also implemented in the beginning of 2010, now a student or a faculty member needs to log in only once to use any Internet system offered through OUJ. In 2010, for the first time ever, OUJ students were also started to be given email accounts through Gmail.

With the increasing use of the Internet tools, there is an issue of training students and teachers to use such tools effectively. Regular universities, where a majority of students are young people who have just graduated from high schools, may have fewer problems in training students to use such tools as they have been grown up in the digital age. However, at OUJ, a majority of the students are over 40 who are digital immigrants and not very familiar with such ICT tools and it's imperative to provide them with training opportunities so that they will obtain the skills to utilize ICT tools effectively for learning. For that purpose, face-to-face classes on computer literacy was started to be offered in October 2010 at more than a half of the regional study centers. Like other face-to-face classes offered at each of the regional study centers at OUJ, the computer literacy class consists of two day intensive meetings on a weekend. Instructors are dispatched from the OUJ headquarter to ensure the quality and consistency across different study centers, and classes are taught using the same textbook that has been developed by the task force consisting of seven faculty members.

According to the survey conducted in 2010 to grasp the media use by OUJ students (a sample size of 1,769), 87.6% of the respondents have said that they have at least one computer with the Internet access at home. This figure was actually much higher than the administration of the university expected as the lack of the Internet access had always been the excuse of not offering much online in terms of teaching and learning. Among those who have a computer with the Internet access at home, almost a half (48.7%) have access through the fiber-to-the-home (FTTH) and 26% of them through Asynchronous Digital Subscriber Line (ADSL). In other words, a majority of the students have access to the broadband Internet on a regular basis.

4.4. Obstacles for transforming OUJ into the distance education institution of a new generation

As discussed above, technologically OUJ is still stuck with the second generation of distance education as its main educational mean is broadcasting. Currently it is very difficult for OUJ to move on to the Internet as the governmental funding is conditional to offering broadcast programs as the binding law requires the university to do so. The administration of the university is afraid that if broadcasting does not become the main mode of instruction at OUJ, the government will significantly reduce its funding or suspend its funding to the university. However, at the same time, the university cannot innovate in teaching and learning as long as it has to spend a significant portion of its governmental funding on producing, delivering and maintaining broadcast programs.

Due to the primary use of the broadcast media, the pedagogy of OUJ's educational offerings is still cognitive-behavioristic as intensive interaction between teachers and students or among students, that is required of social-constructivistic or connectivistic pedagogies, is not available at OUJ. In order to provide such interaction, OUJ has to reorganize itself to allow a completely different educational model of teaching and learning that puts students at the center of learning. It means the organizational structure, which is primarily the industrial model of distance education at present, has to be changed to something which is more flexible and nimble in accommodating changes and responsive to diverse students' needs.

Thus, the major obstacles for OUJ to transform into the distance education institution of a new generation are legal/structural in nature. Even with a strong leadership and innovative technologies, it is impossible for the university to change if it has to legally conform to the stipulations that require the university to operate in the broadcasting mode. OUJ was conceived 30 years ago when there was no Internet and broadcasting was considered as a noble way of reaching mass audience. The time has changed and the government has to relax its regulations over it if it wants OUJ to fulfill its missions in this dynamically changing period.

5. Conclusions

As discussed earlier, several scholars of distance education have argued the generations of distance education from the perspectives of technology, pedagogy, and, to some extent, organization. It is obvious that distance education has been evolving and changing in many different ways. The three factors: technology, pedagogy and organization, are so intertwined that it is actually very difficult to discuss each of the factors separately. Scholars should look at all of those factors in theorizing the evolution of distance education. In addition to those three factors, distance education is oftentimes also a matter of governmental regulation and the direction and strategy an institution will take can be severely limited by the ways the government imposes regulations upon them.

Though higher education institutions in many countries have started to seamlessly blend online and offline teaching and learning for better education that caters to differing students' needs, in Japan such practices are still rarely seen in regular classrooms as well as in distance education programs. Distance education programs in Japan are still mostly in the first or second generation of distance education in terms of its technological use, are cognitive-behavioristic in their pedagogy, and are industrial in their organizational structures. Though many distance education programs that are offered by on-campus institutions may have more flexibility in terms of innovating their practices of teaching and learning, few programs have a strong incentive to do so as distance education programs and on-campus programs are separately regulated by the government and distance education programs usually do not enjoy the status the on-campus counterparts have. In on-campus programs, still the classes in which teachers and students remotely or asynchronously participate are not officially recognized in Japan.

Education is the area where the governmental policy significantly influences. However, the governmental leaders who are in charge of setting those policies are rarely experts or practitioners in the field of education. In order for distance education to move on to a right direction and be competitive, scholars have to examine the issues of distance education from multiple perspectives and give proper advice to the policy makers.

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6. References

[1] Peters O. Distance education and industrial production: A comparative interpretation in outline (1973). Otto Peters on distance education: The industrialization of teaching and learning. 1994:107-27.
[2] Moore M. Recent contributions to the theory of distance education. Open Learning. 1990;5(3):10-5.
[3] Garrison DR. Understanding distance education: A framework for the future: Routledge London; 1989.
[4] Bates T. Technology, e-learning and distance education: RoutledgeFalmer; 2005.
[5] Taylor JC. Fifth generation distance education. e-Journal of Instructional Science and Technology (e-JIST). 2001;4(1):1-14.
[6] Anderson T, Dron J. Three generations of distance education pedagogy. The International Review of Research in Open and Distance Learning. 2010;12(3):80-97.
[7] Evans T, Haughey M, Murphy D. International handbook of distance education: Emerald Group Publishing; 2008.

Chapter 9

Locational Dynamics Influencing the Information Environment of Distance Learners in Botswana

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Additional information is available at the end of the chapter

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1. Introduction

The standard practice in any open and distance learning (ODL) progamme is the attraction of students from various locations – metropolitan and non-metropolitan areas, where they live or work. It is also not uncommon to have students drawn from across the border of the country where the distance institution is located. With only one public university operating limited distance education programmes, the space was wide open for the encroachment of a number of other trans-national or cross-border teaching institutions to operate their distance courses in Botswana. The operation of distance education in Botswana like any other country has ensured that learning cannot be restricted to any particular place or time, even as learners undertake their studies from various remote locations. While distance teaching institutions would expect the students to have access to some degree of information resources and services for the advancement of their programme, whether provision is adequately made for them is another matter. It then stands to reason the extent to which the home-based distance teaching institution in Botswana make provision for the library and information needs of its students. The issue may become compounded when cross-border education is involved. This study attempts to establish and provide a holistic understanding of the information environment where distance learners operate in Botswana. In other words, the study is undertaken to investigate the information environment under which distance learners and, or cross-border students operate in Botswana.

As distance learners go about their studies by distance mode in various scattered locations across the country, it is assumed that accessibility to appropriate information resources and services would reduce the effect of distance and isolation that can be experienced in this type of learning mode. This therefore brings about the idea of the information environment in which the distance learners operate. In this respect a number of questions can be raised:

what constitutes the information environment of distance learners in their remote locations? What are their information needs? What information resources and channels are available for them? How do they go about obtaining the required information and thus meeting their information needs even in their remote locations? How is their environment like in terms of available, accessible and reliable information services and infrastructures? While library may be a major source, it should be understood that information environment in this new age of information goes beyond the library. In any case a library may not be available everywhere the learners are located. What other sources of information are available and can be utilised in such locations? It is assumed there are other sources of information like the Internet, email, mass-media, etc. Indeed, there is a hybrid information environment capable of being utilised by distance learners irrespective of how far they may live from their institutions. While the (hybrid) information environment is considered, the issue of digital divide, which is capable of further marginalizing the "info-poor" particularly in Africa, cannot be overlooked.

In reference [1] Joint Information Systems Committee of the United Kingdom observes that "the information environment of users should aim to allow discovery, access and use of resources for research and learning irrespective of a user's location". Information environment in this study is viewed as the type of environment which individuals interact with either for purposes of providing or obtaining information for use in day-to-day living or to perform a task. The task is seen as distance learning. Information environment can also refer to the context in which information is sourced, accessed, managed, utilised and generally made available for the use of people (distance learners) for various purposes. The components of the information environment include: the information needs, information seeking behaviour and information **sources**. How do distance learners being students in remote locations and far away distances from their institutions fair in relation to the above? Information support services are known to be part of higher education programmes that add to the value and quality of learning. Distance learners are known to suffer from failure, low pass rate and indeed, withdrawal from or discontinuance of participation in distance education. Part of the reasons for this is lack of adequate academic assistance. In a study cited in [2] some reasons are highlighted on students drop out at the United Kingdom Open University – a foremost distance teaching institution in the United Kingdom. It was established that two-thirds of those who had dropped out indicated lack of adequate academic assistance as one of the main reasons for dropping out. This paper believes that academic assistance can be found in making good information resources and library services available to distance learners, and that the absence of this vital academic assistance is envisaged as constituting part of the learners' dilemma. It is an established fact that there is a significant presence of a number of distance teaching institutions in Botswana offering variety of courses and programmes to people in the country. At variance with this is the seemingly perceived evidence of absence of quality information resources and services to enhance distance learners motivation, learning process and learning success in various locations that the students live.

Library and information service has always been of great value in educational and research institutions as well as other environments where learning takes place. In a technological age, library and information service to distance learners cannot be limited to what is obtainable within the four walls of a physical library. Thus other sources and channels of information such as computer-mediated or electronic devices like the Internet and email, telephone, mass-media (radio and television), print materials and even friends or colleagues and lecturers are paramount to distance learners. In Botswana, apart from a sizeable number of government-owned libraries established all over the country including rural areas, the ICT policy of Government creates a conducive information environment for the people. Since 1998 when Botswana Government liberalized the telecommunications services in the country, a lot of development has been witnessed in communication industry. There has been the provision of mobile telephony service when licence was awarded to two private companies and later the third mobile telephony (license) issued to Botswana Telecommunication Corporation (BTC). An increasing growth to the sector was witnessed with the addition of other service providers such as the Internet service providers (ISPs), data service providers (DSPs) and private telecommunications networks (PTNs). Of course, there has also been the institution of Maitlamo National ICT policy in Botswana, which ensured that some giant steps were taken to implement the provision of ICTs across the country. The implementation of ICT policy is aiding the work of library, information service and information dissemination in the country.

This paper examines the information seeking behaviour of and information sources used by the distance learners of four tertiary level institutions in meeting their information needs in their various locations. It attempts to determine if the distance learners are well motivated in their various remote locations? Do the students receive adequate academic assistance to forestall high failure rates? Is the learning process of the cross-border distance teaching institutions appropriately developed to ensure the learning success of the ubiquitous learners in various locations in Botswana? How does the location of students affect meeting their information needs?

2. Literature review

The review of literature will revolve around the identified three main components of information environment with distance learning/learner as a denominator. The components include the information needs, information seeking behavior and information sources. Some attempts have been made to explain or substantiate on the information needs of distance learners. Taking a peep into the views of authors on the information needs of distance learners, in reference [3], the categorization of distance students information requirements comprises *Need for materials and facilities,* where distance learners need several kinds of materials such as reference books, texts books, journals, reports, self-instructional materials (SIMs) etc. They require various facilities, viz. library reading room as well as stack room space with proper display of documents. Second is *Need for information services*: such as bibliographic instruction for print and non-print materials; information about distance

learning agencies, and support services. Third has been defined as *Need for user services*: Distance learners also need professional guidance and support from the library staff about using library collection, using equipment and facilities available at the library. In another submission in [4], the following requirements are said to constitute the basic information needs of distance learners: access to adequate facilities; core collections; professional library staff; reserve reading collections; and supplementary materials. In another submission in reference [5], it was argued that distance learners generally need some of the following types of … information services, namely the loan of a specific book/reference book usually one referred to in their self instructional materials (SIMs); a photocopy of a specific journal article or single chapter of a book; a photocopy of previous examination papers for their course; information/ material on a particular subject; SIMs; viewing and listening to audio-visual materials; using the different type of library collection; and using equipment and facilities available. Also in [6] that details establishing and managing distance librarianship, the Commonwealth of Learning notes that the basic information services distance learners need are access to information resources, such as texts, supplementary reading and reference services; learning how to find the information they need from the information that is available and developing ways to apply the information gleaned and to make sound, information-based decisions.

Considering the information seeking behaviour element of the information environment of distance learners, it is perceived as the manner individuals articulate their information needs, search, recognize, retrieve and use information. It is the mode an individual goes about to search for the information he needs to perform a task at hand or meet his/her needs. In this process the information sources or channels are consulted. In this respect some empirical studies conducted on distance learners to establish their information seeking behaviour are considered. In a survey on information use among distance learners associated with Western Colorado Graduate Center in the US in reference [7], it was found that majority of the survey participants borrowed materials from local academic and local public libraries. The result also revealed that more than half of the students did not use the main campus (distance education provider) library. Response by 71 students revealed that 37% borrowed materials from distance education provider libraries, 69% used the local academic library, 73% used the local public library and 20% used other resources, such as a library consortia, professional library, or personal material and online resources. Reasons given for using what they used include: ease of use, location and resources, among others. In Botswana, public libraries are known to enjoy more widespread than academic libraries as they are sited in several villages, towns and cities. It is another issue if the public libraries stock useful and relevant tertiary level materials that could be used by the distance learners found in various locations across the country.

An investigation conducted in [8] attempted to establish the information seeking behaviour of students involved in distance education for San Jose State University in the US. The investigator advocates that if the information needs of distance education students are to be met, information practitioners/librarians must understand the way and manner students

select a source for information when they do not have access to the main library of the sponsoring institution. In responding to the open-ended questions, there was evidence of huge reliance on the public library. It was noted that the frequency of selection of the public library probably reflects the fact that public libraries are more numerous and geographically accessible than academic libraries. Materials held at home are also very frequently used, indicating extensive home collections or the lack of time and/or library skills to search for materials. The inability of distance learners to have easy access to the main library of their institutions from various locations is seen as one of the major problems that gave rise to this study. Consequently, a number of research questions are drawn from this problem. These include: What information resources and services are available for the use of distance learners in their various remote locations in Botswana? What information sources/channels are (readily) available to distance learners in Botswana and how do they use the channels? Do they still have to travel long distances to have their library and information needs met?

The advent of the WWW/Internet, with its varied features, has universally added a new and profound dimension to the provision of open and distance learning (ODL) and information. It has demonstrated to be highly useful in bridging the distance between the school and its distance students and consequently altered the behaviour pattern of the students when seeking to meet their information needs. The key features of the WWW, which makes its application indispensable to the providers of open and distance education and information, are well articulated in [9]. These include: Information access, Interactive learning and Networked communication. Information access gives the description of materials that are used to deliver content. The key feature of the WWW documents that are primarily designed to carry information is that the materials and documents are usually electronic versions of existing paper-based information and courses. According to the author, the reasons for delivering such materials via the WWW appear to derive mainly from: Information accessibility, whereby teachers could post information that could be accessed by students across many locations; Reduced printing, which is possible when teachers provide electronic rather than printed documents for students; Information could be delivered in time, and teachers could post materials before lecture and workshop sessions for immediate access by students. The author notes that In an interactive learning environment it is possible to provide a series of documents rather than a page for students to read. This is done through the use of hyperlinks available on the WWW. Interactive learning is used in relation to WWW to describe application where feedback and responses are provided by technology in learning situations. Networked communication - The WWW, according to the author, supports and uses different forms of communication, which can be used in numerous ways in a student-centred learning environment. Some of these forms of communication are categorised as: E-mail enabling people to communicate directly with each other, and to send private or public messages to each other either in a one-to-one or one-to-many mode; Bulletin boards where information is posted for public viewing and their reactions or remarks invited; Chat sessions involving real-time text-based discussions between parties either privately and, or in public; Real-time online audio conferencing and videoconferencing where two parties can see or hear each other during interaction.

It is noted from the above features that the WWW or the Internet is an asset and a valuable tool in an information environment. In the same manner as the Internet is useful in conveying education to its adherents in their various distance learning locations, so it is a veritable vehicle used to take library and information to the distance learners in their homes, offices and other locations they may be found. All the features of the WWW discussed, namely, information access, interactive learning and networked communication, are the needed characteristics that can effectively bridge the gap between the students and the information world. In reference [10] the belief was established that the "emerging technologies have opened more opportunities to vary medium and methods, leading to significant changes in the way distance learning can be accomplished". These changes are typical of what the application of the WWW or the Internet is out to accomplish. From developed to developing countries, literature is replete of the development of websites by various institutions, libraries, information and resource centres, where catalogues, full-text databases, e-books, e-journals etc. are made accessible to users from their remote locations.

In a survey on distance learners at the University of Maryland University College (UMUC) in [11], the findings confirm other studies and observations suggesting that students prefer using online resources to physical library buildings and collections. In exploring some research questions about library and web usage, the investigators found that students ranked full-text library databases and off-campus access to the library catalog as the most useful library services provided. Respondents also indicated a preference for web-based delivery of library instruction over other methods of instruction, and found web-based information about library services more useful than other formats.

Possibly following the documented or oral guidelines at the University of Otago in reference [12], distance education in New Zealand was described as one of the most comprehensive, experienced and efficient systems in the world. It was revealed that the University Extension - distance education department, provides course materials required by the students, while the library remains a significant and extensive adjunct to students seeking further supportive literature or who have projects requiring in-depth bibliographies and referenced assignments. On the philosophy of the university on library service to distance learners, it was stated that the university takes the stance that students at a distance have full and equal right to access the more than 1.35 million volumes held in the various libraries located on the campus. The philosophy of maximizing library facilities to distance learners does not stop at books, but also includes access to journals – both abstracts and articles as well as recourse to a powerful national interlending network. The following challenges were noticed and dealt with at the University of Otago. First, *Time factors*: inequities are observed in loan periods as a result of handling and postal delays. In order to address this problem, the author says the library "automatically codes in an extended loan period to all students in a distance programme. Second, *Accessibility*: On-campus students have greater access to personal help and material within the framework of library operating hours. This disadvantage on the part of the distance learners was compensated for by being contactable via phone, fax, answering machine and mail. Third, *Photocopies*: off-campus students do not

have physical access to original articles and journals. In deference to this, the distance service organises photocopies of all that is required subject to normal copyright regulations.

A European perspective of library and information services to distance learners appears to have been added in [13]. In a paper on academic library services to non-traditional students in the UK, the author declares that enquiry services can be offered by post as is the practice at Northern College of Education in Aberdeen where students use "send me something on …". It was also noted that distance learners desire to have access to catalogues can be achieved by depositing a microform catalogues in local centres or by offering networked access via a modem. Performing an enquiry service for distance learners and sending results by post or by fax as obtained at Sheffield Hallam University library is another means. Promotion of library services to client groups through onsite visitations, correspondence, telephone access and library newsletter as obtained in many institutions in Europe (and America) is another method identified. Another means of providing access to materials in the distance students environment is by securing for them access to other academic libraries. The practice of sending book boxes to remote locations as practised in UK departments of continuing education is also recommended. The London Plus scheme and Dutch higher education system, which give all students the right to borrow from any academic library, are good examples of this method.

In Africa the experience of library and information provision is probably a cause for concern. At the University of Nairobi, Kenya in reference [14] it is noted that the external (distance) degree students are entitled to the same facilities as other students. It is however noted with regret that this is only possible when the students are actually on campus during residential sessions. In order that they might use library facilities in their various locations, the students are to negotiate arrangements themselves to exploit all library resources located near them. A number of library facilities that the students could approach include the Kenya National Library Service, College libraries and British Council libraries. The reliance of the higher institution of learning on public library to provide support service to distance learners also manifests in the treatise. It is understood that the Kenya National Library Service is provided with a list of recommended reference books. Another researcher in [15] confirms the earlier report in his findings that the Faculty of Education of the University of Nairobi used part of the fees paid by the external students to buy essential books and distributed them to students. This procedure was soon discontinued as it proved unsustainable. The students are therefore encouraged to either buy their own books, borrow from public libraries, public university libraries or non-governmental institutions. At Kenyatta University, the study established that students had to visit the university library to access and borrow reading materials or make use of other relevant libraries in their locality. While some depressing picture is observed in the two institutions mentioned, a more encouraging scenario was found in the service to distance learners of African Virtual University (AVU). It was confirmed that AVU library has created a digital library consisting of e-journals, e-books and online archives to facilitate access to worldwide resources by students. Though the study confirms that all students obtain user identification, whether they are all able to access the facilities from their various locations as and when required is another matter.

Conversely, the care for the ODL students at Makere University, Uganda, leaves a lot to be desired. In a treatise in [16], student support was carefully outlined as referring to the culture of care accorded to students with the aim of ensuring that they accomplish their studies within the stipulated time. However, in what unquestionably can be regarded as a second rate service to a seemingly unwanted programme, the author asserts the consciousness of the authorities of Makerere University in not, among other support services, ensuring that all University service units provide all registered students on ODL programmes with access to libraries, computer laboratories, lecture rooms/theatres, laboratories and other learning resources. As if that position was not bad enough, the author reiterates that Makerere University does not also ensure that the University Library provides flexible policies and services unique to ODL learners at all ODL centres, for example longer borrowing periods.

The information needs and information seeking behaviour of distance learners at the Institute of Extra-Mural Studies, Maseru in Lesotho was also reported in [17]. The researchers reported that living long distances from their institution, among others, has made distance learners depend on easily available sources of information such as colleagues, personal collections, co-workers and family members, which may not necessarily be the best sources of information to meet their needs. The case of the University of Botswana (UB) that operates a dual mode system was reported in [18]. Operating under the Customers and Extension service unit, the UB Library maintains a small collection of some recommended materials in some regional centres where the students meet for occasional residential sessions. The entire library collection is also accessible through an *opac* system. Whilst books, on request, can be posted to the students in their various locations, it is required of them (the learners) to pay for the return postage. Further, electronic databases provide references to periodical articles in a wide variety of subjects. It thus means that the students with access to the Internet can access some of these databases and indexes, to which the University of Botswana Library subscribes. Such databases include EbscoHost, Emerald and SA ePublications. Students are also taught information skills in the general education course (GEC) 121 and 122 to search electronic resources. In another study on UB reported in [19], it was revealed that significant numbers of distance learners did not have access to a telephone (38%), facsimile (78%), a computer (89%), email (92%), or the Internet (97%). While nine out of ten indicated a need for materials beyond course readings, almost half (48%) had not used a library, a quarter used the University Library, and a quarter visited a public library. It was recommended that the university library should go into collaborative partnership with branches of the public library spread all over the country, establish more branches of its own, and install computers with Internet access in the identified regional centres across the country. In another work [20], a hypothesis that the *library and information needs of the University of Botswana students in satellite (off) campuses are not significantly adequately met was tested.* Within the limit of the materials or resources available for their use, including public library facilities, the students were asked to indicate whether *all, most, some* or *none* of their information needs were met by the resources available. A significant majority

(72.5%) of respondents indicated that only some of their information needs were met. Only one respondent (1.3%) indicated that all his or her information needs were met, while another insignificant four respondents said that most of their information needs were met. Going by the established result, ($\chi^2 = 103.500$; $p < 0.05$), the considered view is that the library and information needs of the students in satellite campuses of the University were not met. Hence, the hypothesis was accepted.

Information sources or channels are the means used to transfer information to a target population or audience. These constitute one of the major components of information environment. In order to have access to the information needed or required, there are a number of possible channels, sources or resources that may be explored by distance learners. These channels/sources, among others, include the electronic databases and dial-in access to computer catalogues, remote or modem access to CD-ROM, emailing system, facsimile and telephone. Other information sources or channels that are generally open to distance learners include: radio and television, the Internet, the library, book store, lecturers or tutors, peer group, friends or colleagues etc.

The problem of location is of paramount importance to the present study as it is assumed that those in urban areas might have greater opportunities to access ICTs and other information resource carriers than the rural dwellers. Thus far, the information and communication technologies (ICTs), for reasons of diversity of use, constitute one of the largest chunks of channels or sources through which distance learners may obtain their information needs. The ICTs have a central role to play because of their capacity to support teaching and learning process as well as assisting the dispensation of information services to the distance learners in their virtual locations.

3. Research methodology

Research design for the study was both qualitative and quantitative and the method used was survey. The study was conducted on four distance teaching institutions that were firmly rooted in Botswana: one local (home-based), and three cross-border institutions. The local or home based institution was the University of Botswana (UB), the three cross-border institutions were the University of Derby (UD), the University of South Africa (UNISA), and the Management College of Southern Africa (MANCOSA). The empirical element of the study was conducted using the questionnaire as instrument. A 20% sample size was randomly selected from the University of Botswana and University of South Africa, the institutions with 500 or more students, while the census method was applied to the UD and MANCOSA, which had 100 or fewer students in Botswana. A total of 519 of 1,996 (total population) became the sample size. A total of 364 copies of the questionnaire were returned. This gave the response rate of 70.1%. Data abstracted were analysed using the *SPSS* programme. Cross-tabulations and chi-square, non-parametric statistical significance tests were developed to test the relationship of one variable to groupings of others.

4. Findings

4.1. Characteristics of respondents

4.1.1. Location

The respondents significantly fall into different locations in terms of where they lived. Majority (225 or 61.8%) of the respondents lived in the city, 58 (15.9%) indicated they were living in towns and 81 (22.3%) respondents said they lived in villages. In other words, a total of 283 (225 and 58) or 77.7 percent respondents lived in metropolitan/urban areas which offer a much better and richer information environment and 81 (22.3%) of them lived in rural locations where information environment can be considered poor and cannot be favourably compared with those in urban areas. In crosstabulating gender with location, the result further shows that more females were also located in the city and town (considered as urban or metropolitan areas) as well as village (rural areas) than their male counterparts. Table 1 below gives further details.

			Location			
			City	**Town**	**Village**	**Total**
Gender	Male	Count	90(24.7%)	27(7.4%)	38(10.4%)	155(42.6%)
	Female	Count	135(37.1%)	31(8.5%)	43(11.8%)	209(57.4%)
Total		Count	225(61.8%)	58(15.9%	81(22.3%)	364(100.0%)

Table 1. Gender and **Location** Distribution of Study Sample: Crosstabulation

4.1.2. Social role

Distance education learners are usually involved in other major social roles, which is often one of the reasons why such learners opt for distance education. Distance learners may have full- or part-time jobs, or could be community leaders, (single) parents, etc. The responsibilities and circumstances of such roles might affect their access to and use of information resources either positively or negatively. The study therefore investigated the nature of the major social roles played by the respondents. Figure 1 shows the percentages of the respondents engaged in social roles. A total of 280 or 77% respondents indicated they were working and 203 (55.8%) were parents, and 24 (6.6%) were community leaders. The social roles of distance learners are capable of impacting on the time at their disposal to access and use information resources and services. A traditional full time student, for instance, would have more time to access and use information resources and services in an information-rich environment than a distance learner who is not only a part time (distance education) student, but also a full-time worker and, or a community leader who hardly lives in an information-rich environment.

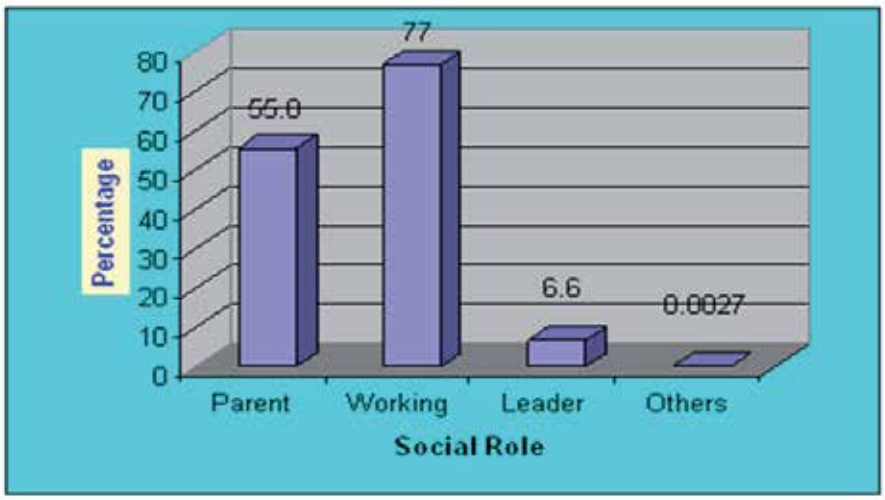

Figure 1. Respondents' social roles

Arising from the objectives designed, five research questions were raised to provide some guidance and driving force for this study. The research questions are treated in this section with necessary allusion made to the objectives as deemed appropriate. For reasons of convenience, the object of discussion relating to the objectives of study is applied as the basis to compartmentalize the findings.

The first objective of the study was to identify the information needs of the distance learners. As such, the objective generated the research question which asked: "*What are the information needs of distance learners in Botswana"*. In addressing the question, some options were made available in the questionnaire for the respondents to choose from. From the reaction of respondents, it is obvious but not surprising to note that 'subjects relating to their course of study' was topmost in the area of their information needs. The option attracted 273 (75%) respondents. The thirst to acquire greater skill in the use of information and communication technologies e.g. the Internet, was seen as the second priority area. A total of 218 (60%) respondents indicated this option as an information need area. The remaining information need areas indicated by about half of respondents include information on Tests, examinations and residential sessions/periods (51.6%) and the Development of information searching skills (50.8 percent).

In trying to further ascertain the information needs of the distance learners, another question to determine the reasons the respondents would require information was raised. With the options provided, 283 (77.7%) respondents indicated they would require information to write assignment, 80 of them (22.0%) said 'no'. To study and prepare for test and examination, 273 (75%) responded in the affirmative, 90 of them (24.7%) in the negative. For coursework-related information needs, 244 (67%) respondents indicated 'yes', while 119 (32.7%) said 'no'. Another 152 (41.8%) indicated 'yes' to the option of borrowing books, whilst 211 or 58% indicated 'no'. Figure 2 gives the breakdown of the 'yes' and 'no' responses of the respondents.

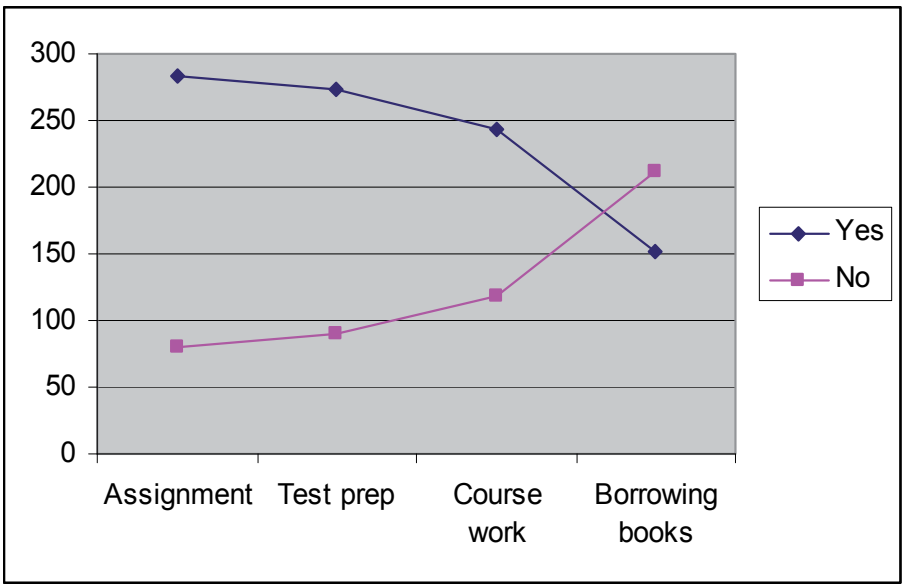

Figure 2. Reasons to require information

Can the respondents' locations affect their information needs? An attempt was made to establish the relationships by cross-tabulating the variables and performing chi-square tests. Table 2 indicates that location was significantly related to information needs in the areas of "writing tests, examinations and doing residential sessions" ($X^2 = 11.026$, df = 2, $p < .05$) and "making information-based decisions" ($X^2 = 6.867$, df = 2, $p < .05$). No significant difference was found between the locations (urban and rural areas) in the other information needs areas.

Information Needs Areas	Chi-square	Df	Asymp. Sig. (2-sided)	Remark
Subjects relating to their course of study	2.315	2	.314	Not significant
Development of information search skills	.727	2	.695	Not significant
Tests, examinations and residential sessions/periods	11.026	2	.004	Significant
Use of ICT	1.296	2	.523	Not significant
Need for specialized info	4.986	2	.083	Not significant
Access to a help line	1.261	2	.532	Not significant
Making info based decisions	6.867	2	.032	Significant
Others	4.650	4	.325	Not significant

Table 2. Relationship between Location and Information needs

Table 3 shows the observed and expected counts in the cross-tabulation of the location and the information need area of doing "Tests, examinations and residential sessions. Comparison of the observed with the expected counts shows that the observed values are significantly different from the expected values. More respondents from the village (rural area) than expected indicated 'Yes' information on tests, examinations and residential sessions was a need area for them; whereas less respondents from the metropolitan areas (city and town) than expected said 'no' to information on tests, examination and residential sessions as a need area. The finding seems to suggest that respondents in the village are somewhat disadvantaged about information on tests, examinations and residential sessions than respondents in urban areas who have better access to information on the need area. Similarly, a comparison of the observed and the expected counts (in Table 4) shows that the expected values are significantly different from the observed values. While more respondents than expected in urban areas would say 'yes' to information-based decisions, less respondents than expected in the village would say 'yes'. This seems to corroborate the theory of 'information-rich and information-poor' and that, more often than not, possibly because they have easy accessibility to information, those in urban centres take information based decisions than those in rural locations.

			Information needs area - Tests, examinations and residential sessions/periods			
			Yes	No	Total	% of Total
Location	City	Observed Count	**106**(47.1%)	**119**(52.9%)	225	61.8
		Expected Count	**116.2**(51.6%)	**108.8**(48.4%)	225.0	61.8
	Town	Observed Count	**27**(46.6%)	**31**(53.4%)	58	15.9
		Expected Count	**30.0**(51.7%)	**28.0**(48.3%)	58.0	15.9
	Village	Observed Count	**55**(67.9%)	**26**(32.1%)	81	22.3
		Expected Count	**41.8**(51.6%)	**39.2**(48.4%)	81.0	22.3
Total		Observed Count	**188**(51.6%)	**176**(48.4%)	364	100
		Expected Count	**188.0**(51.6%)	**176.0**(48.4%)	364.0	100.0

Table 3. Relationship between location and information needs - Tests, examinations and residential sessions/periods

			Information needs area - Making info based decisions			
			Yes	No	Total	% of Total
Location	City	Observed Count	**71**(31.6%)	**154**(68.4%)	225	61.8
		Expected Count	**70.5**(31.3%)	**154.5**(68.7%)	225.0	61.8
	Town	Observed Count	**25**(43.1%)	**33**(56.9%)	58	15.9
		Expected Count	**18.2**(31.4%)	**39.8**(68.6%)	58.0	15.9
	Village	Observed Count	**18**(22.2%)	**63**(77.8%)	81	22.3
		Expected Count	**25.4**(31.4%)	**55.6**(68.6%)	81.0	22.3
Total		Observed Count	**114**(31.3%)	**250**(68.7%)	364	100
		Expected Count	**114.0**(31.3%)	**250.0**(68.7%)	364.0	100.0

Table 4. Relationship between Location and Information needs: Making info based decisions

The study also attempted to check if the location of distance learners has any relationship with how the respondents obtained information using such sources like modules, colleagues, experts, internet, subject librarian, radio/television and coordinator. Respondents' locations and information sources were cross-tabulated and Chi-square tests were performed on the cross-tabulations. Table 5 shows that location was significantly related only to the use of the Internet as an information source ($X^2 = 10.052$, df = 2, $p < .05$). No significant difference was found between the location and the remaining information sources.

How information is obtained	**Chi-square**	**Df**	**Asymp. Sig. (2-sided)**	**Remark**
I use my modules	.784	2	.676	Not significant
I discuss with colleagues	1.004	2	.605	Not significant
Ask for assist from expert	.127	2	.938	Not significant
I use Internet	10.052	2	.007	Significant
I speaks/write subject librarian	3.312	2	.191	Not significant
I listen to radio/television	.444	2	.801	Not significant
I approach coordinator	.118	2	.943	Not Significant

Table 5. Relationship between Location and how information is obtained by respondents

Table 6 shows the expected and observed counts in the cross-tabulation of Location and the use of the Internet to obtain information. The expected counts in the cells of the table are based on the assumption that the row (Location) and the column (Information source: how I obtained information) variables do not depend on one another (i.e. have no relationships between them). Comparison of the observed with the expected counts indicates that the observed values are significantly different from the expected values, and that less

respondents than expected said 'yes' to using the Internet in the village (rural areas), whereas in the city/town (urban areas) more respondents than expected said 'yes'. It is therefore concluded that a significant relationship exists between location and use of the Internet as a means of obtaining information. The finding seems to confirm that urban dwellers use and have better access to the Internet than rural-based people.

			How info is obtained - I use internet			
			Yes	No	Total	% of Total
Location	City	Observed Count	**157**(69.8%)	**68**(30.2%)	225	61.8
		Expected Count	**147.1**(65.4%)	**77.9**(34.6%)	225.0	61.8
	Town	Observed Count	**40**(69%)	**18**(31%)	58	15.9
		Expected Count	**37.9**(65.3%)	**20.1**(34.7%)	58.0	15.9
	Village	Observed Count	**41**(50.6%)	**40**(49.4%)	81	22.3
		Expected Count	**53.0**(65.4%)	**28.0**(34.6%)	81.0	22.3
Total		Observed Count	**238**(65.4%)	**126**(34.6%)	364	100
		Expected Count	**238.0**(65.4%)	**126.0**(34.6%)	364.0	100.0

Table 6. Location of distance l earners * How info is obtained - I use internet

The second objective of the study was to determine how the information needs of distance learners are met. Consequently, the second research question was formulated. *How do distance learners meet their information needs?* In addressing the question, some questions were raised.

In their response to how they obtained the information needed to prepare their assignment, test or examination etc, majority of them (341) constituting 93.7% indicated that they used their modules and study packages. The use of the Internet came a distant second with 238 respondents (65.4%). This was followed by "I discuss with colleagues" option with 229 respondents (62.9 percent) subscribing to it. Other options used to obtain information needed to prepare their assignment etc include: asking for assistance from expert or knowledgeable people 41.8% (n = 152); approaching the coordinator or agent of the institution 19.8% (n = 72); listening to radio/television 14.3% (n = 52); and speaking to or writing subject librarian 8.8% (n = 32). While Figure 3 provides at a glance details of the responses, it is important to note that 8 respondents specified 'Others' in their responses. Five of them indicated they would borrow books from the library or from past and present students, 2 said they would buy prescribed books and 1 respondent said he/she obtained information needed "through email to and from the lecturer".

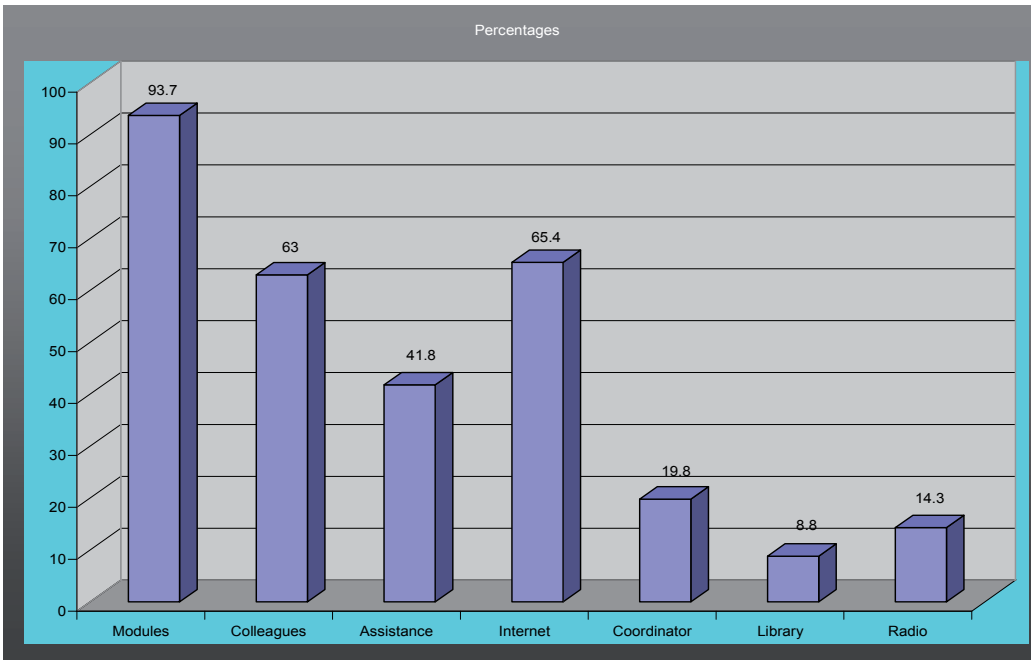

Figure 3. Meeting Information Needs

In yet another bid to determine how distance learners meet and satisfy their information needs, another question raised was to determine which of the information sources used satisfied their information needs. From the reaction of the respondents, the information source that satisfied majority of distance learners was the Internet (57.4%). This was followed by the University (of Botswana) Library (51.6%). Other information sources that satisfied them include Colleagues (37.1%); E-mail (31.9%); online databases/sources (28.8%); WebCT (27.7%); Public Library (27.5%); Coordinators (18.7%); Radio/TV (16.8%) and 'None' (those that indicated no information source satisfied their information needs) (6.1%). Other information sources which some respondents indicated satisfied their needs include books/modules/study guide (n = 3); tutors (n = 1) and past question papers (n = 1). Figure 4 gives further details.

It has been said that distance learners are ubiquitous students. They are found both in the rural as well as urban areas. The relationships between these locations where they live and each of the information sources that satisfied their needs were cross-tabulated and Chi-square tests performed on the cross-tabulations. Table 7 shows that location was significantly related only to the University Library (X^2 = 10.778, df = 2, p <.05) and the Internet (X^2 = 8.933, df = 2, p <.05) as satisfying sources of information.

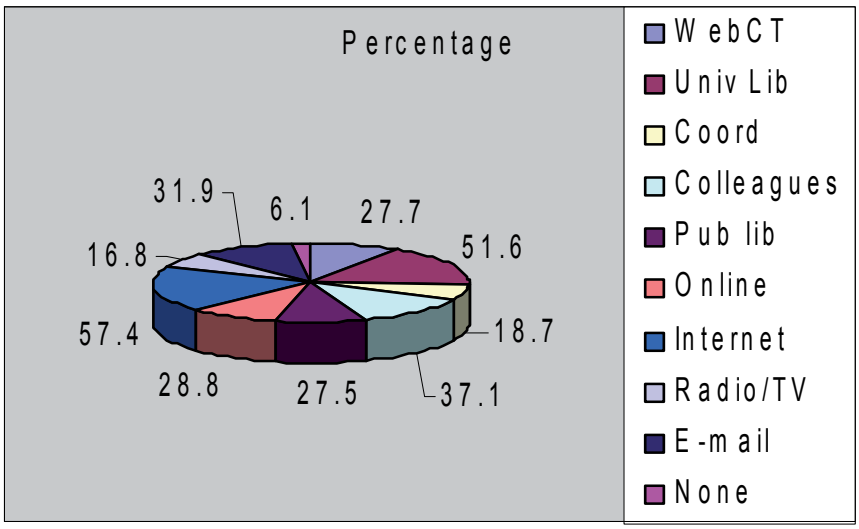

Figure 4. Satisfying Information Sources

Info sources satisfying needs -	Chi-square	Df	Asymp. Sig. (2-sided)	Remark
WebCT	.171	2	.918	Not Significant
Univ Library	10.778	2	.005	Significant
Coordinator	.296	2	.862	Not significant
Colleagues	1.112	2	.573	Not Significant
Public Library	5.826	6	.443	Not Significant
Online databases/sources	4.359	2	.113	Not significant
Internet	8.933	2	.011	Significant
Radio/Television	.764	2	.683	Not Significant
Email	1.928	2	.381	Not significant

Table 7. Relationship between Location and information sources satisfying needs of respondents

Tables 8 and 9 show the expected and observed counts in the cross-tabulation of Location and the use of the University Library and the Internet as sources of information that satisfy the information needs of distance learners in Botswana. The expected counts in the cells of the table are based on the assumption that the row (Location) and the column (Information sources that satisfy needs) variables do not depend on one another (i.e. are not associated with one another). Comparison of the observed with the expected counts indicates that the observed values are significantly different from the expected values, and that less respondents than expected in town and village said 'yes' to the University Library as an information source was satisfying to their information needs. By contrast, more respondents than expected in the city said 'yes'. The conclusion therefore is that there is a significant relationship between location and use of the University Library as a satisfying information source. The finding seems to be in tandem with the reality that the university library has

presence and effect in the two cities in Botswana where it is located and that the towns and villages feel the impact of the absence of the university library. The same impact is observed in the city as well as in the towns and villages on the use of the Internet as a satisfying information source. It is noted in Table 9 that more respondents than expected in the city said 'yes' to the Internet as satisfying their information needs, while in town and village, less respondents than expected said yes. This serves to confirm that Internet facilities are more available and possibly cheaper and easily accessible in the city than in town and village in Botswana.

			Info sources satisfying needs – Univ. Library			
			Yes	No	Total	% of Total
Location	City	Observed Count	**131**(58.2%)	**94**(41.8%)	225	61.8
		Expected Count	**116.2**(51.6%)	**108.8**(48.4%)	225.0	61.8
	Town	Observed Count	**26**(44.8%)	**32**(55.2%)	58	15.9
		Expected Count	**30.0**(51.7%)	**28.0**(48.3%)	58.0	15.9
	Village	Observed Count	**31**(38.3%)	**50**(61.7%)	81	22.3
		Expected Count	**41.8**(51.6%)	**39.2**(48.4%)	81.0	22.3
Total		Observed Count	**188**(51.6%)	**176**(48.4%)	364	100
		Expected Count	**188.0**(51.6%)	**176.0**(48.4%)	364.0	100.0

Table 8. Relationship between Location of respondents and Info sources that satisfy their needs - Univ Library

			Info sources satisfying needs - Internet			
			Yes	No	Total	% of Total
Location	City	Observed Count	**142**(63.1%)	**83**(36.9%)	225	61.8
		Expected Count	**129.2**(57.4%)	**95.8**(42.6%)	225.0	61.8
	Town	Observed Count	**31**(53.4%)	**27**(43.4%)	58	15.9
		Expected Count	**33.3**(57.4%)	**24.7**(42.6%)	58.0	15.9
	Village	Observed Count	**36**(44.4%)	**45**(55.6%)	81	22.3
		Expected Count	**46.5**(57.4%)	**34.5**(42.6%)	81.0	22.3
Total		Observed Count	**209**(57.4%)	**155**(42.6%)	364	100
		Expected Count	**209.0**(57.4%)	**155.0**(42.6%)	364.0	100.0

Table 9. Relationship between Location of respondents and Info sources that satisfy their needs - Internet

In order to determine the extent to which the information needs of distance learners are met, a question was raised for them to indicate whether all, most, some or none of their information needs were met by the resources available to them. Unfortunately, only 17 respondents (4.7%) indicated that *all* their information needs were met. Only about one third of the respondents 121 representing 33.2% indicated that *most* of their information needs were met. Majority of them 59.1% (n = 215) said only *some* of their information needs were met, while 11 (3.0%) said *none* of their information needs were met. The result of a cross-tabulation with location of respondents reveals $X^2 = 24.055$: $p < 0.05$. With the established result, the position is that the information needs of the distance learners in Botswana are significantly unmet.

The third objective of the study aimed at exploring the information resources and services available to distance learners in Botswana. Thus the third research question "W*hat information resources and services are available to distance learners in Botswana?"* was raised to address the objective. In order to elicit information and respond to the issue, some questions were put across to the respondents. First, they were asked their preferred information format from three options of *print*, *electronic* and *audio visual* that were presented to them. The result showed that majority of them 216 (59.3%) would prefer print format, 123 respondents (33.7%) preferred electronic and 24 (6.6%) audio-visual. The findings here would hopefully shed light on the information format the distance learners desired. Table 10 shows the significance level of X^2 value was 0.021 which is less than 0.05. It then means that the distance learners in Botswana significantly have preferred information format from the three available choices (print, electronic and Audio-visual formats).

		Most Preferred info format			Total	Location	
		Print	Electronic	Audio Visual		X^2	Sig.
Location	City	129	80	15	224	11.610	.021
		59.7%	65.0%	62.5%	61.7%		
	Town	27	26	5	58		
		12.5%	21.1%	20.8%	16.0%		
	Village	60	17	4	81		
		27.8%	13.8%	16.7%	22.3%		
Total		216	123	24	363		

$p < 0.05$

Table 10. Location and Most Preferred information format

Second, the respondents were asked to authenticate the available information resources in their location from the list made available to them. In the event that the list was not exhaustive, provision was made for them to add to the list. From all indications, the majority of the respondents (76%) indicated that the Internet was available in their locations. Apart from the Internet, only 3 other information resources were regrettably said to be available by half or more of the total respondents. These include email (60.9%), radio/television (59.6%);

telephone (59.2%); In a descending order, other resources said to be available to respondents in their locations include photocopying (47.4%); Library resources (47.1%); Web search materials (38.8%); catalogue (28.4%); Reference (27.8%) and Lecturer (26.4%). The remaining resources are as shown in Figure 5 below. In addition, 35 other respondents indicated 'other' resources available in their locations. Such resources comprise the libraries of some institutions ranging from BIAC, Bank of Botswana, British Council, and Company to Hospital Libraries. Other libraries that are said to be available include IDM, BNPC, IHS and UNDP Libraries, Maun and other Technical College libraries, MANCOSA online library, as well as 'office' and village libraries.

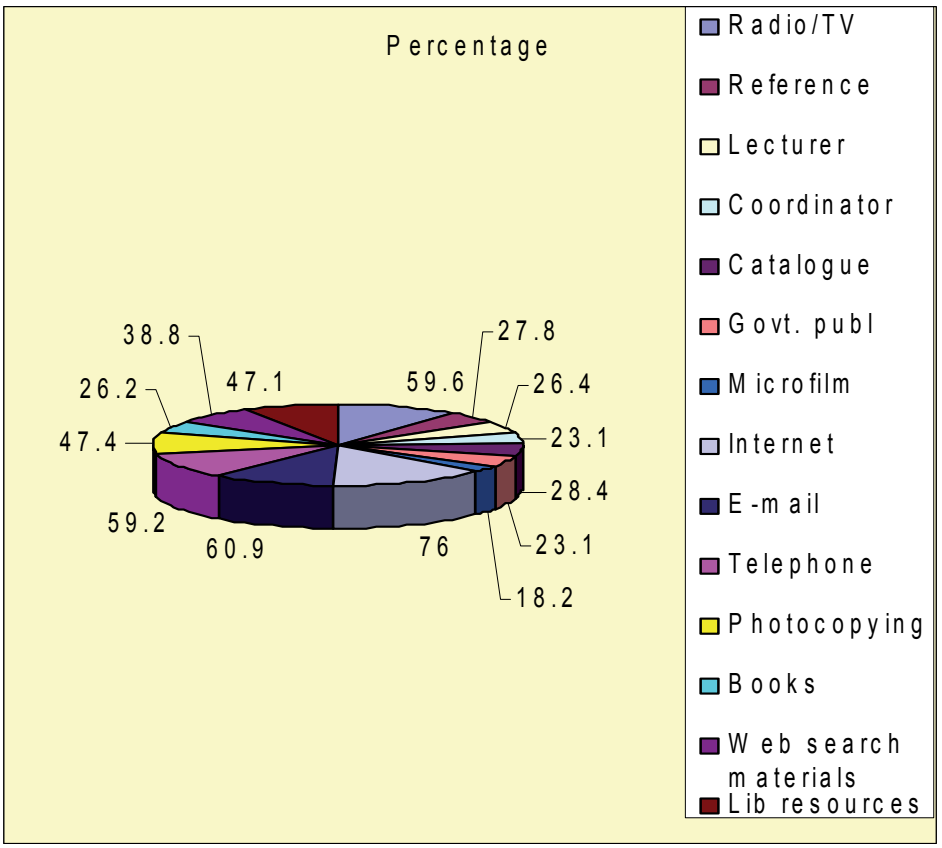

Figure 5. Available Resources at Locations

The relationships between location and each of the major information resources available to the respondents were cross-tabulated and Chi-square tests were performed on the cross-tabulations. Table 11 shows that location was significantly related to a few of available information resources including the: lecturer ($X^2 = 6.752$, df = 2, $p < .05$); Course Coordinator ($X^2 = 6.746$, df = 2, $p < .05$); Government Publications ($X^2 = 13.697$, df = 2, $p < .05$); Internet ($X^2 = 19.885$, df = 2, $p < .05$); Email ($X^2 = 14.718$, df = 2, $p < .05$) and Library resources ($X^2 = 15.512$, df = 1, $p < .05$).

Information Resources	Chi-square	Df	Asymp. Sig. (2-sided)	Remark
Radio/Television	.170	2	.919	Not significant
Reference	.858	2	.651	Not significant
Lecturer	6.752	2	.034	Significant
Course Coordinators	6.746	2	.034	Significant
Online catalogue	8.812	6	.184	Not Significant
Government publications	13.697	4	.008	Significant
Microfiche/microfilm	2.956	2	.228	Not significant
Internet	19.885	2	.000	Significant
Email	14.718	2	.001	Significant
Telephone	3.448	4	.486	Not significant
Photocopying	3.068	2	.216	Not significant
Check out (book) materials	3.069	2	.216	Not significant
Web search materials	7.891	2	.019	Significant
Library resources	15.512	2	.000	Significant

Table 11. Relationship between Location and available information resources

Table 12 to Table 18 below reveal the expected and observed counts in the cross-tabulation of location and the available information resources as lecturer, course coordinator, Government publications, Internet, email, web search materials and library resources.

			Resources available - Lecturer			
			Yes	No	Total	% of Total
Location	City	Observed Count	**70**(31.1%)	**155**(68.9%)	225	61.8
		Expected Count	**59.5**(26.4%)	**165.5**(73.6%)	225.0	61.8
	Town	Observed Count	**10**(17.2%)	**48**(82.8%)	58	15.9
		Expected Count	**15.3**(26.4%)	**42.7**(73.6%)	58.0	15.9
	Village	Observed Count	**16**(20%)	**64**(80%)	80	22.0
		Expected Count	**21.2**(26.5%)	**58.8**(73.5%)	80.0	22.0
Total		Observed Count	**96**(26.4%)	**267**(73.6%)	363	100
		Expected Count	**96.0**(26.4%)	**267.0**(73.6%)	363.0	100.0

Table 12. Location and Resources available (Lecturer)

			Resources available - Course coordinator			
			Yes	No	Total	% of Total
Location	City	Observed Count	**62**(27.6%)	**163**(72.4%)	225	61.8
		Expected Count	**52.1**(23.2%)	**172.9**(76.8%)	225.0	61.8
	Town	Observed Count	**8**(13.8%)	**50**(86.2%)	58	15.9
		Expected Count	**13.4**(23.1%)	**44.6**(76.9%)	58.0	15.9
	Village	Observed Count	**14**(17.5%)	**66**(82.5%)	80	22.0
		Expected Count	**18.5**(23.1%)	**61.5**(76.9%)	80.0	22.0
Total		Observed Count	**84**(23.1%)	**279**(76.9%)	363	100
		Expected Count	**84.0**(23.1%)	**279.0**(76.9%)	363.0	100.0

Table 13. Location and Resources available (Course coordinator)

			Resources available - Government publications			
			Yes	No	Total	% of Total
Location	City	Observed Count	**61**(27.1%)	**164**(72.9%)	225	61.8
		Expected Count	**52.1**(23.4%)	**172.3**(76.6%)	225.0	61.8
	Town	Observed Count	**14**(24.1%)	**43**(75.9%)	58	15.9
		Expected Count	**13.4**(23.1%)	**44.4**(76.9%)	58.0	15.9
	Village	Observed Count	**9**(11.3%)	**71**(88.8%)	80	22
		Expected Count	**18.5**(23.1%)	**61.3**(76.9%)	80.0	22.0
Total		Observed Count	**84**(23.1%)	**278**(76.9%)	363	100
		Expected Count	**84.0**(23.1%)	**278.0**(76.9%)	363.0	100.0

Table 14. Location and Resources available (Government publications)

			Resources available - Internet			
			Yes	No	Total	% of Total
Location	City	Observed Count	**185**(83.1%)	**40**(16.9%)	225	61.8
		Expected Count	**171.1**(76%)	**53.9**(24%)	225.0	61.8
	Town	Observed Count	**45**(77.6%)	**13**(22.4%)	58	15.9
		Expected Count	**44.1**(76%)	**13.9**(24%)	58.0	15.9
	Village	Observed Count	**46**(57.5%)	**34**(42.5%)	80	22
		Expected Count	**60.8**(76%)	**19.2**(24%)	80.0	22.0
Total		Observed Count	**276**(76%)	**87**(24%)	363	100
		Expected Count	**276.0**(76%)	**87**.0(24%)	363.0	100.0

Table 15. Location and Resources available (Internet)

			Resources available – E-mail			
			Yes	No	Total	% of Total
Location	City	Observed Count	**150**(66.7%)	**75**(33.3%)	225	61.8
		Expected Count	**137.0**(60.9%)	**88.0**(39.1%)	225.0	61.8
	Town	Observed Count	**37**(63.8%)	**21**(36.2%)	58	15.9
		Expected Count	**35.3**(60.9%)	**22.7**(39.1%)	58.0	15.9
	Village	Observed Count	**34**(42.5%)	**46**(57.5%)	80	22
		Expected Count	**48.7**(60.9%)	**31.3**(39.1%)	80.0	22.0
Total		Observed Count	**221**(60.9%)	**142**(39.1%)	363	100
		Expected Count	**221.0**(60.9%)	**142.0**(39.1%)	363.0	100.0

Table 16. Location and Resources available (E-mail)

			Resources available - Web search materials			
			Yes	No	Total	% of Total
Location	City	Count	**100**(44.4%)	**125**(55.6%)	225	61.8
		Expected Count	**87.4**(38.8%)	**137.6**(61.2%)	225.0	61.8
	Town	Count	**18**(31%)	**40**(69%)	58	15.9
		Expected Count	**22.5**(38.8%)	**35.5**(61.2%)	58.0	15.9
	Village	Count	**23**(28.8%)	**57**(71.2%)	80	22
		Expected Count	**31.1**(38.9%)	**48.9**(61.1%)	80.0	22.0
Total		Count	**141**(38.8%)	**222**(61.2%)	363	100
		Expected Count	**141.0**(38.8%)	**222.0**(61.2%)	363.0	100.0

Table 17. Location and Resources available (Web search materials)

			Resources available - Library resources			
			Yes	No	Total	% of Total
Location	City	Observed Count	**122**(54.2%)	**103**(45.8%)	225	61.8
		Expected Count	**106.0**(47.1%)	**119.0**(52.9%)	225.0	61.8
	Town	Observed Count	**26**(44.8%)	**32**(55.2%)	58	15.9
		Expected Count	**27.3**(47.1%)	**30.7**(52.9%)	58.0	15.9
	Village	Observed Count	**23**(28.8%)	**57**(71.2%)	80	22
		Expected Count	**37.7**(47.1%)	**42.3**(52.9%)	80.0	22.0
Total		Observed Count	**171**(47.1%)	**192**(52.9%)	363	100
		Expected Count	**171.0**(47.1%)	**192.0**(52.9%)	363.0	100.0

Table 18. Location and Resources available (Library resources)

The expected counts in the cells of the Tables are based on the assumption that the row (Location) and the column (Resources available) variables are independent of one another (i.e. there is no relationships between them). Comparison of the observed with the expected counts shows that the observed values are significantly different from the expected values, and that in virtually all of them more respondents than expected said 'yes' they had the resources in the city; while in virtually all of them too, less respondents than expected said 'yes' in the village. In the town less respondents than expected also said 'yes' in four of the seven variables. The conclusion, therefore, is that there is a significant relationship between location and available information resources. The finding seems to corroborate the fact that more information resources are available in the city than in the town or village and that the more rural a location is the less the chances of having adequate information resources in Botswana.

According to the literature, one of the ways the distance learners can access information resources and services is through information and communication technology. In order to address the fourth objective of the study a research question "*To what extent do distance learners use ICTs in meeting their information needs in Botswana?"* was raised. This also culminated in a series of questions addressed to the respondents. First, they were asked if they had access to computer with Internet facilities. A total of 287 (78.8 percent) respondents indicated that they had access to computer with Internet facilities, whilst the remaining 77 respondents (21.2 percent) indicated they had no access to the Internet facilities. The relationships between location of respondents and access to computer with Internet facilities were cross-tabulated and Chi-square tests performed on the cross-tabulations. The test shows that location was significantly related to Access to computer with Internet facilities ($X^2 = 21.681$, df = 2, $p < .05$).

Table 18 shows the expected and observed counts in the cross-tabulation of location and the Internet accessibility by distance learners. Comparison of the observed with the expected counts shows that the observed values are significantly different from the expected values, and that more respondents in the city and town than expected said 'yes' to having access to the computer with Internet facilities, while less respondents than expected said 'yes' in the village. Therefore the conclusion is that there is a significant relationship between location and access to the Internet. A number of subsequent tests also confirmed the prevalence of the Internet facilities accessibility in the city and town as against what obtains in the village. The findings obviously substantiate the fact that the village is shortchanged when the use and accessibility of information and communication technology in Botswana is considered. This consequently affects the learners located in the rural areas. It therefore implies that adequate arrangement has to be made on the provision of ICT facilities like the Internet in some strategic locations including the villages if distance learners working or living in such locations are to maximally benefit from ICTs.

A follow up question attempted to establish where respondents would have access to the Internet if the response was in the affirmative. Those that indicated they had access to the Internet at work and on their own computer made up to 45.6%, on their own machine at home (22.5%); at work on shared machine (20.9%); and at home on shared machine (6.3%). In addition to the above, 28 other respondents specified other Internet access points they used. These include: Internet café (6.0%); Friend's office (0.3%) and Other Libraries (1.6%).

			Access to computer with internet facilities			
			Yes	No	Total	% of Total
Location	City	Observed Count	**187**(83.1%)	**38**(16.9%)	225	61.8
		Expected Count	**177.4**(78.8%)	**47.6**(21.2%)	225.0	61.8
	Town	Observed Count	**51**(87.9%)	**7**(12.1%)	58	15.9
		Expected Count	**45.7**(79.8%)	**12.3**(21.2%)	58.0	15.9
	Village	Observed Count	**49**(60.5%)	**32**(39.5%)	81	22.3
		Expected Count	**63.9**(78.9%)	**17.1**(21.1%)	81.0	22.3
Total		Observed Count	**287**(78.8%)	**77**(21.2%)	364	100
		Expected Count	**287.0**(78.8%)	**77.0**(21.2%)	364.0	100.0

Table 19. Location and Access to computer with Internet facilities

Another objective of the study, which was the fifth, aimed at identifying the challenges faced by distance learners in Botswana. In examining the question, a number of probing issues were raised with the respondents. These include the distance they had to travel before getting to the nearest University Library or Information Centre, the source of light used where they lived, their fears and the barriers that affect their use of information sources, among others.

With respect to the distance they had to travel before getting to the nearest University Library or Information Centre to meet their information needs, 62.9% of them indicated they travelled between 1-10 kms, 12.9% lived in a distance of 11-30 kms, 4.1% would need to cover a distance that ranged from 301 to 500 kms and another 3.8% travelled a distance of 501 kilometres and above to get to the nearest university library and information centres to meet their information needs. Since distance education is a self-directed learning and not face-to-face of the conventional system, it was considered necessary to probe into the source of light used by respondents in their homes and invariably to study as they self-direct their studies. The type of light used might have some impact on their accessibility to and use of information resources and services for their studies. The findings to this query indicate that majority of them (97.5%) used permanent electricity supply; only 3.6% claimed they used cylinder gas; 2.2% used battery power and 1.9% specified using candles and/or paraffin lamps. Only 1 respondent ticked 'other' as source of light without clearly specifying it. The relationships between location and each of the sources of light used (electricity, battery power, cylinder gas and candles/paraffin lamps) were cross-tabulated and Chi-square tests performed. Table 19 shows that location was significantly related to electricity ($X^2 = 10.862$, df = 2, $p < .05$) as respondents source of light; and battery power ($X^2 = 13.324$, df = 2, $p < .05$) as a source of light. No significant difference was found between location and other two sources of light.

Tables 20 and 21 show the expected and observed counts in the cross-tabulation of location and the electricity and battery power as sources of light. Comparison of the observed with

the expected counts shows that the observed values are significantly different from the expected values. Table 20 shows that in the city and town more respondents than expected said 'yes' to using electricity as a source of light in their homes, whereas in the village, less respondents than expected said 'yes'. The conclusion, therefore, is that there is a significant relationship between location and the use of electricity as a source of light. The finding clearly establishes the fact that people in the city and town enjoy the electricity utility than people in the village.

Sources of Light	**Chi-square**	**Df**	**Assym. Sig. (2-sided)**	**Remark**
Permanent electricity	10.862	2	.004	Significant
Battery Power	13.324	2	.001	Significant
Cylinder Gas	2.305	2	.316	Not significant
Candle/paraffin lamps	2.524	2	.283	Not significant

Table 20. Relationship between Location and different sources of light used by respondents

			Source of light - Permanent electricity supply			
			Yes	No	Total	% of Total
Location	City	Count	**222**(98.7%)	**3**(1.3%)	225	61.8
		Expected Count	**219.4**(97.5%)	**5.6**(2.5%)	225.0	61.8
	Town	Count	**58**(100%)	**0**(0.0%)	58	15.9
		Expected Count	**56.6**(97.6%)	**1.4**(2.4%)	58.0	15.9
	Village	Count	**75**(92.6%)	**6**(7.4%)	81	22.3
		Expected Count	**79.0**(97.5%)	**2.0**(2.5%)	81.0	22.3
Total		Count	**355**(97.5%)	**9**(2.5%)	364	100
		Expected Count	**355.0**(97.5%)	**9.0**(2.5%)	364.0	100.0

Table 21. Location and Source of light (Permanent electricity supply)

Table 21 also shows that in the city and town less respondents than expected said 'yes' to using Battery power as a source of light in their homes, whereas in the village, more respondents than expected said 'yes'. The conclusion, therefore, is that there is a significant relationship between location and the use of battery power as a source of light. The finding clearly gives the confirmation that people in the village are more likely to use battery power as a source of light than those in the city and town.

			Source of light - Battery power			
			Yes	No	Total	% of Total
Location	City	Observed Count	**2**(0.9%)	**223**(99.1%)	225	61.8
		Expected Count	**4.9**(2.2%)	**220.1**(97.8%)	225.0	61.8
	Town	Observed Count	**0**(0.0%)	**58**(100%)	58	15.9
		Expected Count	**1.3**(2.2%)	**56.7**(97.8%)	58.0	15.9
	Village	Observed Count	**6**(7.4%)	**75**(92.6%)	81	22.3
		Expected Count	**1.8**(2.2%)	**79.2**(97.8%)	81.0	22.3
Total		Observed Count	**8**(2.2%)	**356**(97.8%)	364	100
		Expected Count	**8.0**(2.2%)	**356.0**(97.8%)	364.0	100.0

Table 22. Location and Source of light (Battery power)

Attention was also shifted to what could be the fears of distance learners with regard to their distance education programme. A number of likely options were considered as possible challenges. These include: how to get materials to write their assignments, read for test and examinations, how to get time to study, how best to plan their time and how to get suitable/conducive place to study, among others. How to get *time* to study constituted the greatest challenge or fear of distance learners as 185 (50.8%) of them indicated. How to get *materials* to write their assignments, read for test and examinations was another fear indicated by 184 (50.5%) respondents. Other factors include how best to plan their time (*planning*) with 176 (48.4%) respondents; how to cope with *exam*inations 107 (29.4%); and how to get a suitable/conducive place to study - 81 (22.3%) respondents.

The relationships between location and each of the major areas of fear of the respondents were cross-tabulated and Chi-square tests were performed on the cross-tabulations. Table 22 shows that location was significantly related only to the fear of how they would get materials to write their assignments, read for test and examinations ($X^2 = 12.697$, df = 2, $p < .05$). No significant difference was found between the location and other possible areas of fear.

Possible areas of fear	**Chi-square**	**Df**	**Assym. Sig. (2-sided)**	**Remark**
Getting materials	12.697	2	.002	Significant
Getting time to study	.549	2	.760	Not significant
Planning their time	.490	2	.783	Not significant
Getting suitable study place	3.632	2	.163	Not significant
Coping with Examinations	.425	2	.809	Not significant

Table 23. Relationship between Location and different possible areas of fear of distance learners

Table 23 shows the expected and observed counts in the cross-tabulation of location and the fear of getting materials to write assignments, read for tests and examination. Comparison of the observed with the expected counts shows that the observed values are significantly different from the expected values, and that in the city and town less respondents than expected said 'yes' to having fear of getting materials to write their assignments, read for test and exams, whereas in the village more respondents than expected said 'yes'. The conclusion, therefore, is that there is a significant relationship between location and the fear of getting material. The finding seems to confirm the dearth of information resources and services in the village as compared to what obtains in the city and town.

			What are your fears? - Getting materials			
			Yes	No	Total	% of Total
Location	City	Observed Count	**108**(48%)	**117**(52%)	225	61.8
		Expected Count	**113.7**(50.5%)	**111.3**(49.5%)	225.0	61.8
	Town	Observed Count	**22**(37.9%)	**36**(62.1%)	58	15.9
		Expected Count	**29.3**(50.5%)	**28.7**(49.5%)	58.0	15.9
	Village	Observed Count	**54**(66.7%)	**27**(33.3%)	81	22.3
		Expected Count	**40.9**(50.5%)	**40.1**(49.5%)	81.0	22.3
Total		Observed Count	**184**(50.5%)	**180**(49.5%)	364	100
		Expected Count	**184.0**(50.5%)	**180.0**(49.5%)	364.0	100.0

Table 24. Location * What are your fears? (Getting materials)

5. Discussion

The results have shown that the information needs of distance learners in Botswana are specifically in tandem with the information needs espoused by the Commonwealth of Learning in reference [6] as against the ideas discussed in reference[3], [4], and [5] of the literature reviewed. It is observed that with 75 percent, distance learners will first go for 'subjects relating to the students course of study'. Acquisition of greater skill in the use of information and communication technologies e.g. the Internet, was the second choice with 60 percent. The results show that distance learners would not give high premium to the need for specialized information or even access to a help line in as much as they could have materials in subjects/courses of study and how to use the ICT. The influence of location however seemed conspicuous when it was established that location was significantly related to information needs in the areas of "writing tests, examinations and doing residential sessions" ($X^2 = 11.026$, df = 2, $p < .05$) and "making information-based decisions" ($X^2 = 6.867$, df = 2, $p < .05$). The result seems to suggest that respondents in the rural areas are somewhat disadvantaged about information on tests, examinations and residential sessions than respondents in urban areas who have better access to information on the need area**.** This also seems to confirm the existence of information inadequacy in the rural areas as against what obtains in the urban areas where there is preponderance of information resources and

services. This is further confirmed in respect of more respondents in urban areas affirming 'yes' to information-based decisions and less respondents than expected in the village would say 'yes'. This corroborates the locational factor of easy accessibility to information by the students in urban centres and the reason they can take information based decisions than those in rural locations

With respect to the information seeking behavior of the learners, the results revealed some variation with what obtained in the literature reviewed, especially in Western Colorado and San Jose State Universities. In these two institutions, there was evidence of reliance of distance learners on public libraries. Majority of the survey participants borrowed materials from local public libraries. Just like in the US, it can be said that in Botswana, public libraries are also more numerous and geographically accessible than academic libraries. The major area of departure is that the public libraries in Botswana hardly keep stock of tertiary level materials. Hence majority (341) of distance learners constituting 93.7% showed that they used their modules and study packages. The use of the Internet came a distant second with 238 respondents (65.4%). Just a little over a quarter (27.5%) of respondents indicated public libraries satisfied them when further asked how they meet and satisfy their information needs. The result revealed in Colorado that more than half of the students did not use the main campus (distance education provider) library. In Botswana, the results showed that a little above half (51.6%) of the respondents indicated they used the main campus library. In another study at the University of Botswana cited in reference [19] only about a quarter of respondents used the University Library. The literature confirmed that majority of distance learners at the University of Maryland University College (UMUC) prefer using online resources to physical library buildings and collections, only (28.8%) found online databases/sources satisfying in Botswana. This is probably due to lack of adequate orientation on how to use the facilities. On the contrary, it was confirmed in the literature that the African Virtual University (AVU) Library created a digital library consisting of e-journals, e-books and online archives to facilitate access to worldwide resources by the students. Whilst the study found that with 57.4% of respondents, Internet was the information source that satisfied majority of distance learners, it is regrettable to note that 'colleagues 'are found as a satisfying information source by as high as 37.1 percent respondents. This is similar to the findings at the Institute of Extra-Mural Studies, Maseru in Lesotho - another African institution, where some researchers in [17] reported that living long distances from their institution, among others, has made distance learners depend on easily available sources of information such as colleagues, personal collections, co-workers and family members, which may not necessarily be the best sources of information to meet their needs. The results also revealed a significant relationship between location and use of the University Library ($X^2 = 10.778$, df = 2, $p < .05$) and the Internet ($X^2 = 8.933$, df = 2, $p < .05$) as satisfying information sources.

In exploring the information resources and services available to distance learners in Botswana, the result showed that majority of them 216 (59.3%) would prefer print format, as against (33.7%) who preferred electronic and 6.6% who preferred audio-visual. The adducible reason for the preference could be that distance learners had been using print

format all their lives. Besides, the application of the other two formats (electronic and audio-visual) involves the use of electricity which may not be significantly available in the homes of some of the students, particularly as some of them live in villages and settlements where electricity supply is not reliable. While authenticating the available information resources in their location majority of the respondents (76%) indicated that the Internet was available in their locations. Apart from the Internet, only 3 other information resources were regrettably said to be available by half or more of the total respondents. These include email (60.9%), radio/television (59.6%); telephone (59.2%). The use of the Internet and email seems to confirm the statement of the author in reference [9] that WWW or the Internet is an asset and a valuable tool in an information environment. It also tallies with a survey on distance learners at the University of Maryland University College (UMUC) in [11], that students prefer using online resources. The test on the relationships between location of respondents and access to computer with Internet facilities conducted shows that location was significantly related to Access to computer with Internet facilities ($X^2 = 21.681$, df = 2, $p < .05$). It is confirmed that more respondents in the city and town than expected said 'yes' to having access to the computer with Internet facilities, while less respondents than expected said 'yes' in the village.

6. Conclusion

The operation of open and distance education has ensured that learning can no longer be restricted to any particular place or time. As such, learners undertake their studies with institutions from various remote locations all over the world to the extent that geographical barriers between and among countries seem to have no relevance in the system. This manifests not only in the established institutions of higher learning diversifying to accommodate distance programes, but also in cross-border education where students register for courses or programmes produced and maintained in a different country from where they live. But then it has also been accentuated that library and information service is of great value in educational and research institutions as well as other environments where learning takes place. The palpability of this is found in the pride of place given to information resources and services in institutions of higher learning. Unfortunately, for reasons of their remote locations from their institutions, distance learners hardly enjoy the information resources and services located in their institutions. This study has established that distance learners, like their conventional face-to-face counterparts, have information needs and that they exploit various means to meet their needs. The learners' information need areas are seen to be varied, with information on subjects relating to their courses of study and the use of information and communication technologies, emerging as their greatest need areas. But then, there are other notable information needs areas such as: the development of information searching skills and information on tests, examinations and residential sessions/periods. It is needless to say that the distance learners' quest for information on the use and application of ICTs and the development of information searching skills is an admission of the existence of skills gap that could enable them to function effectively and efficiently. In other words, with the acquisitions of the skills, they are better able to function and bridge the existing gap between them and their institutions, in relation to their studies.

The reality of the disadvantage suffered by the rural-based, as well as the opportunities and, or advantages available to the urban-based distance learners have been demonstrated in the study. The existence of the information-rich and information-poor, technology-rich and technology-poor environments in which distance learners live and may define the types of decision the distance learners make and information resources and services they use. In other words, the locational characteristics of distance learners tend to affect the type of information resources available, with metropolitan-based learners being more advantaged than the rural-located learners. While almost all the required information resources and services were available and with some effort, accessible to the urban-based learners, the semi-urban or rural-based learners were not found within the cutting edge.

Among others, the study findings indicate that: more urban-based distance learners and less rural based (village) respondents than expected affirmed that they make information-based decisions; the modules/study package, the Internet, and colleagues were the three major information sources used by distance learners to prepare their assignment, test or examination; location was significantly related to the use of the Internet as an information source - more urban-based and less rural-dwelling respondents than expected used the Internet; the information needs of the distance learners in Botswana are significantly unmet; there was a significant relationship between location and available information resources; there was no evidence to suggest that ICTs such as toll-free telephone line, cell-phone, help desk, facsimile, telephone answering machine etc were available for use of distance learners; distance learners would like to use fast resources like the Internet but their location had some significant impact on their accessibility to the facility – hence, the traditional library types of services are predominantly still being used in Botswana; two major issues i.e. how to get time to study and how to get materials to write their assignments, read for test and examinations, constituted the greatest fear and challenge to distance learners in Botswana; more than one third of distance learners lived outside the cities and in scattered distances that ranged from 11 – 500+ kilometers; there was dearth of information resources and services in the village as compared to what obtains in the city and town; location was significantly related to isolation and lack of well equipped library as barriers to using information sources with more respondents in the village and less in the city and town than expected indicated the above two variables were barriers to them.

In the light of the above, the following recommendations are offered:

- Distance teaching institutions should take into cognizance the spread of their students in the country and create opportunities for them to access information resources and/or services
- Establishing study centres in a number of strategic places across the country and equipping the centres/offices with appropriate information materials and other necessary facilities including books (such as reference and recommended materials), relevant journals, and computers with Internet connection.

- Collaborative partnership could be worked out between and among institutions running distance degree programmes, in such a way that resources could be pooled together to make the information environment of their learners rich or richer.
- Collaborative partnership can also be worked out by distance teaching institutions with some institutions like public libraries, secondary schools, Technical Colleges and Education Centres, etc. across the country.
- Computing and information literacy skills training should be given priority to distance learners.
- Use of ICT gadgets like cellular phone and its functionalities; Instant Messaging (IM) and Live Chat with a Librarian; Emailing system; Electronic Alerts and Electronic Bulletin; e-counseling and mentoring should be encouraged

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7. References

[1] Joint Information Systems Committee (JISC) (2009) Information Environment Programme 2009-11. Available: http://www.jisc.ac.uk/whatwedo/programmes/inf11.aspx/ Accessed 2012 February 12

[2] Cookson, P. (1990) Persistence in Distance Education. In M. G. Moore and others, editors. Contemporary Issues in American Distance Education. Oxford: Pergamon Press. Available: http://www1.worldbank.org/disted/Teaching/Design/kn-01.html Accessed 2009 October 4.

[3] Jagannathan, N. (1998) Libraries in distance teaching University. In: Jain, M.K. et al. editors. 50 Years Library and Information Services in India, Delhi: Shipra Publications. pp. 139-140

[4] Kascus M. and. Aguilar W. (1988) Providing library support to off-campus programmes. College and Research Libraries 49, (1) 29 - 37.

[5] Singh, B. K. (2004). Library Services to Distance Learners: A Study of Kota Open University. Paper presented at the AAOU Pre-Conference Seminar on Outreach Library Services for Distance Learners. Available: http://cemca.org/disted/Singh_BK__0231.pdf Accessed 2012 January 20.

[6] Commonwealth of Learning (COL) (2003). Developing library and information services for distance education. Available at http://www.col.org/colweb/site/pid/3131 Accessed 2009 August 5

[7] Sutherland, J. (2000) Distance education: Library use among adult distance learners: its implications for local public and academic libraries. A Capstone project. MLIS Thesis presented to University of Denver. Available:

http://www.du.edu/lisa/capstone/Capstone_Projects/j_sutherland.pdf Accessed 2012 February 4, 2012.

[8] Stasch, M. (1994) A survey of information sources used by students involved in distance education. Master's Thesis. Paper 954. San Jose State University http://scholarworks.sjsu.edu/etd_theses/954. Accessed 2012 February 21

[9] Oliver, R. and Omari, A. (1997) Using the WWW to support distance education and open learning. In: Osborne, J., Roberts, D. and Walker, J. (Eds.) Open, flexible and distance learning: education and training in the 21st Century. 13th Biennial Forum of Open and Distance learning Association of Australia held from 29 September – 3 October 1997. Launceston: University of Tasmania.

[10] Berge, Z. L. (1996) Where interaction intersects time. The journal of academic media librarianship, Vol. 4 No. 1, summer 1996. Available: http://wings.buffalo.edu/publication/mcjrnl/v4n1/berge.html Accessed 2010 March 10

[11] Kelley, K. B. and Orr, G. J. (2003) Trends in Distant Student Use of Electronic Resources: a survey. College & Research Libraries 64, no. 3 (May 2003): pp. 176-191.

[12] Solomon, H. (1997) Library services to students at a distance: a case study of the University of Otago Library, Dunedin, New Zealand. In Watson, E.F. & Jagannathan, N. (eds.) Library services in the Commonwealth: a reader. Vancouver: The Commonwealth of Learning, pp.213-220

[13] Heery, M. (1996) Academic library services to non-traditional students. Library Management, Vol.17 No. 5, pp.3-13.

[14] Kamau, J.W. (1997) Providing support services for the external B.Ed. distance learners programme at the University of Nairobi. In Watson, E.F. & Jagannathan, N. (eds.) *Library services in the Commonwealth: a reader*. Vancouver: The Commonwealth of Learning, pp.165-174

[15] Kavulya, J. M. (2004) Challenges in the provision of library services for distance education: a case study of selected universities in Kenya. African Journal of Library, Archives and Information Science, 14 (1) Apr 2004, pp.15-28

[16] Muyinda, P.B. (2012). Open and Distance Learning in Dual Mode Universities: A Treasure Unexploited. In Joi L. Moore and Angela D. Benson (Eds.), International Perspectives of Distance Learning in Higher Education. Available: http://www.intechopen.com/books/international-perspectives-of-distance-learning-in-higher-education/open-and-distance-learning-in-dual-mode-universities-a-treasure-unexploited

[17] Boadi, B.Y. & Letsolo, P. (2004) Information needs and information seeking behaviour of distance learners at the Institute of Extra-Mural Studies in Lesotho. Information Development, Vol. 20, No. 3, 189-199. Available on http://idv.sagepub.com/content/20/3/189.full.pdf+html Accessed 2012 March 28.

[18] Oladokun, O.S. (2002) The practice of distance librarianship in Africa. Library Review, Vol. 51 No. 6 pp. 293-300.

[19] Oladokun, O.S. (2002) Distance education and the role of the library: a case study at the University of Botswana. MIS dissertation: University of Pretoria. Available: http://upetd.up.ac.za/thesis/submitted/etd-10202005-160127/unrestricted/00front.pdf

[20] Oladokun, O. (2010) Information Seeking Behavior of the Off-Campus Students at the University of Botswana: A Case of Two Satellite Centers. Journal of Library Administration, Vol. 50, (7-8), pp. 883-898

Chapter 10

Study Mode Does Not Matter: MLearning Can Support Internal and Distance Learners

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Additional information is available at the end of the chapter

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1. Introduction

It is no longer news that the permeation statistics for mobile phones in developing countries of Africa has surpassed industry analysts' predictions. Also research is increasingly showing that mobile devices can be used to provide learning support services. The use of mobile devices for accomplishing learning activities has been termed mobile learning (mLearning). Since owners of mobile devices move with them wherever they go, mLearning offers anytime anywhere learning. Mobile devices, among others may include: mobile phones, smart phones, PDAs (personal digital assistants), BlackBerries, GPS (global positioning system) receivers, clickers, tablet PCs, as well as iPods and MP3 players (Kukulska-Hulme & Traxler, 2005).

Anytime anywhere learning has been associated with a study mode referred to as distance learning (Commonwealth of Learning, 2004). The phrase 'study mode' conjures several meanings. In this paper, the phrase is used to connote two different ways of delivering tuition to learners, namely: campus-based and distance-based study modes.

In the campus-based study mode, also known as the conventional study mode, learners are required to attend a fulltime education at their main campuses. Campus-based learners here in this paper referred to as 'internal' learners, are obliged to adhere to an orchestrated timetable of study in the classrooms and partake of the same learning activities at the same time. In majority of instances, internal learners are faced with similar learning conditions, can meet and interact with their lecturers and fellow learners in a face to face fashion and have limited roles and responsibilities outside schooling.

On the other hand, in the distance-based study mode, learners are separated by time and space from their lecturers and campuses (Aguti, 2009, Commonwealth of Learning, 2004). The communication and interaction between the learners themselves and the learners and their lecturers is bridged using print or electronic media (Commonwealth of Learning, 2004). Mobile devices can form part of the electronic media to be used in bridging the gap

(Traxler, 2007). People choose to study at a distance because they can not afford to attend a fulltime education at campus due to the multiple roles and responsibilities they hold in society. The multiple roles and responsibilities dictate the need to move from one place to another so as to accomplish societal demands. Consequently, distance learners are inherently 'mobile'.

For the reason that distance learners are 'mobile', some authors have tended to draw a conclusion to the effect that mLearning is only suited for distance learners or learning that occurs outside class (Sharples, Taylor & Vavoula, 2005). In support of this conclusion, Brown (2005) conceptualized that mLearning is subset of electronic learning (eLearning) which in-turn is a subset of distance learning. Electronic learning is learning using an "educational environment which utilizes any electronic media tool as a part of the instruction" (Caudill, 2007, p.3). Thus mLearning is part and parcel of eLearning.

As a learning model, mLearning is still in its infancy and not many educational institutions in developing countries of Africa have integrated it in their learning management systems. Consequently, there is a vacuum in research to show that mLearning is not suitable for in-the-classroom activities for internal learners. In this paper, evidence is adduced to show that distance and internal learners in Uganda are faced with similar learning conditions that favor or constrain the uptake of mLearning and that both categories of learners have equally partaken or not partaken of mLearning. This evidence is inline with the prediction made at the end of 2009 that in 2010, the classroom would not escape the phenomenon of mLearning.

> … smart phones would [permeate] the classroom… Most would agree that trying to keep mobile technology out of the classroom is impossible, so the best approach is that of constructing channels to direct mobile technology usage in constructive directions.
>
> (Brown & Diaz, 2010, p.3).

This means that mLearning will creatively be used to support both distance and internal learners. These two learner categories operate from different learning contexts whose significance on mLearning uptake is little understood. The goal of this paper is to establish the association between study mode with different learning contexts including: the type of the learner's location (urban, semi-urban or rural), noise levels of the learner's usual learning environment and availability of mobile and Internet connectivity and power supply with a view of determining their significance on uptake of mLearning by the two categories of learners in Uganda. To achieve our goal we hypothesized as follows:

H_o: Unlike internal learners, distance learners are majorly located in rural and semi-urban areas where the main communication device is the mobile phone.

H_o: Internal learners live in noisier urban environments than distance learners who live in less noisier rural or semi-urban locations that are conducive for audio mLearning.

H_o: Internal and distance learners operate in conditions of similar mobile network connectivity and hence none of them has leverage over the other in as far as mobile network connectivity for mLearning is concerned.

H_o: Internal and distance learners operate in conditions of similar tethered Internet connectivity and hence none of them has leverage over the other in as far as tethered Internet connectivity for mLearning is concerned.

H_o: Internal and distance learners operate in conditions of similar electric power supply and hence none of them has leverage over the other in as far as electric power supply for mLearning is concerned.

H_o: Both internal and distance learners have learning activities that can be ported onto mobile devices.

This paper is organized in six sections. The first section introduces the paper. The second section provides a review of related literature. The third section provides the methodology we employed. Results of the study are presented and discussed in fourth and fifth sections of the paper respectively. Our concluding remarks and areas for future research are given in the sixth section.

2. Related literature

2.1. Study modes

To provide a clear understanding of the study modes focused on in this article, we briefly review the concepts of distance and internal learning.

Distance learning is a study mode where learning takes place away from one's mother institution using print-based and electronic learning materials (Aguti, 2009; Commonwealth of Learning, 2004). Distance learners are separated by time and space from their lecturers and mother institutions. Sometimes, distance learners may or may not have any face-face contact with their fellow learners and lecturers (ibid). Distance learners have multiple roles and responsibilities and thus learning forms just part of their daily activity cocktail (Commonwealth of Learning, 2004). Because of the multiple roles and responsibilities, they are usually not confined in one place. They move from one learning context to another. Distance learning can be partaken of in a synchronous or asynchronous form (Keegan, 1990). The major problem in distance learning is learner isolation (ibid). With introduction of strong support services entailing use of virtual interaction and collaboration, learner isolation can be overcome (Commonwealth of Learning, 2004). At Makerere University in Uganda, distance learning is sometimes referred to as external learning with the opposite being internal learning (Aguti, 2009).

Internal learning can variously be expressed. Phrases such as classroom-based learning, campus-based learning, conventional learning, intra-mural learning, traditional learning, and so on, can all be used to refer to internal learning (Aguti, 2009). Internal learners have large segments of time to dedicate to their studies while distance learners distribute their time in multiple social, economic, political and academic obligations. Internal learners are not as varied as those of distance learners (Traxler, 2007). Just like in distance learning mode, technology supported learning has also found its way in internal learning (Aguti & Fraser, 2007). Indeed, soon or later the boundary separating internal and distance learning in

terms of technology supported learning will blur. Dual mode universities in developing countries of Africa have installed learning management systems to be used by both internal and distance learners. Likewise, mLearning apps are being developed for distance and internal learners. Both distance and internal learners can partake of mLearning though using different blends of mobile technologies (Brown & Diaz, 2010). Distance learners are likely to have a mobile phones and a desktop computer in their offices. Internal learners on the other hand are likely to have a mobile phone and a laptop computer (ibid). This technology blend makes mLearning possible in either group.

3. MLearning and study mode

MLearning is a form of eLearning that has usually been associated with supporting on-the-go learners (Brown, 2005; Sharples, Taylor & Vavoula, 2005). However, this view point is becoming null and void "given the great interest in using mobile devices to improve learning within all learning settings, including the classroom, in the field and in informal adult learning settings" (Dyson *et al*., 2009, p.251). Even if this is the case, the magnitude of use of mLearning by learners other than distance learners in their authentic contexts is not well studied. MLearning is majorly being implemented through projects supporting out-of-class learning activities with little mainstreaming of those projects into the conventional educational practice (Traxler, 2007). Conventional educational practices are influenced by prevailing environmental contexts (Uden, 2007). Similarly, mLearning supporting conventional educational practices is likely to be influenced by different environmental contexts.

MLearning among internal learners can be used in the provision of summaries of classroom discussions, reminders/alerts to various learning events and requirements, information about lectures and examinations venues, motivational messages, reference lists and hints on approach to questions, requirements for attending a given lecture, self evaluation via sequenced multiple choice quizzes and reflective learning using simulated classroom/laboratory activities recorded as MP3 files or video clips (Naismith *et al*. 2006). These same services can be enjoyed by distance learners on their mobile phones.

In Dyson *et al*. (2009), four case studies for embedding mLearning into conventional educational practices, namely: 1) mobile supported fieldwork, 2) interactive mLearning in large lectures, 3) using mobile technology to learn about mobile technology and 4) Podcasts of lecture summaries have been reported. These and other similar projects face several challenges. According to Dyson *et al*. (2009, p.251), a key challenge is the "feasibility of mLearning from the lecturer's viewpoint in terms of the effort required to introduce and then maintain the activity". Another challenge is the cost of mLearning. According to Traxler (2007), many mLearning projects have failed to live beyond the lifespan of their initial funding. Other challenges include: invasion of faculty's privacy at will and at anytime, changing the mindsets of education stakeholders to believe in mLearning and increased workload to the faculty (Brown & Diaz, 2010). Mobile devices still have technological limitations that may constrain their use in mLearning. Highly mobile devices

have tiny keyboards, limited screen sizes, inadequate storage capacities and are multi-varied in terms of their models and operating systems (Grant *et al*. 2007). Research from the pedagogical and technical angles is going on to mitigate many of these challenges (Brown & Diaz, 2010).

4. Theorizing about learning and learning context

Learning occurs in different contexts. Context is information which describes the situation of a learner in a given location (Uden, 2007). It "… is typically the location, identities of nearby people, objects and changes to objects" (Zhang, 2003. p.7). When students fully understand their learning contexts, they are likely to achieve more learning experiences than if they did not (Prosser & Trigwell, 1999). They will be able to learn from their own experience of action in the real world, reflect on those experiences to achieve abstract conceptualization of concepts and later experiment with the concepts derived (Kolb, 1984).

Learning context can further be theorized around the situated (Lave & Wenger, 1991) and constructivist (Bruner, 1966) learning theories. The situated learning theory provides a framework for understanding how learning occurs in different learning environments. It posits that "learning is not merely the acquisition of knowledge by individuals, but instead a process of social participation" (Naismith *et al*., 2006, p.13) and interaction with ones existing environment. The learning process is thus influenced by the learner's environs, learning resources and tools at their disposal and communities of practice (Lave & Wenger, 1991).

The situated learning theory concurs with the socio-cultural theory which permits learners to work collaboratively in groups so as to share learning experiences in their communities of practice (Nie, 2007). It is also inline with the constructivist learning theory (Bruner, 1966) which permits learners to actively build new knowledge by incorporating into their existing knowledge-base concepts derived from their educational experience. However, critiques of the constructivist learning theory such as Prawat and Floden (1994) have advocated for social constructivist learning theory (Vygotsky, 1978) because it recognizes that learning occurs in communities of practice. Prawat and Floden (1994) posit that knowledge creation is shared rather than an individual experience. This implies that knowledge is a social product generated through interplay of several minds. Tools and raw materials for creating this social product can arise from technologies that encourage interaction and collaboration. Mobile devices are good examples of such technologies. With mobile devices such as smart phones, learners can construct their own knowledge and share it freely with peers at anytime in anyplace. This, in mLearning, is referred to as "participatory simulations" (Naismith *et al*., 2006, p.2). Participatory simulation encourages learners to actively participate in the learning process.

Collaborative assignments completed by distance learners located in different contexts tend to be rich in content because they are built based on information collected from different contexts. Collaborative engagements enable learners to co-create new knowledge (Doos *et al*., 2005). Just pushing content onto learners' mobile devices without ensuring interactive and collaborative engagement, would be similar to putting old wine in new bottles because

it would entrench the transmission model of education (Brown & Diaz, 2010). The learner's authentic context determines the level of interaction and collaboration (Lehsten *et al*., 2010).

In developing countries, the role of authentic context or location related context such as the type of learner's usual learning locations, the noise levels of learner's usual learning location, availability of mobile network connectivity, availability of tethered Internet connectivity and presence of electric power supply need to be studied to ascertain their role in uptake of mLearning amongst distance and internal learners. Location aware learning can be used to characterize the situation of different learners (Lehsten *et al*., 2010). Characterization of distance and internal learners for mLearning based on the location context is studied in this paper.

5. Methodology

This paper is drawn from part of the data collected by the corresponding author for his PhD research titled '*Deploying and Utilising Learning Objects on Mobile Phones*'. In this PhD, guidelines for developing and evaluating mLearning environments are espoused. Since Design Research (Wang & Hannafin, 2005) was the main methodology used in undertaking the PhD research, the data used in this paper was collected to provide an initial understanding of the problem in the *Awareness of the Problem* process step. Design researchers follow five iterative process steps when developing or evaluating artefacts, including: *Awareness of the Problem, Suggestion, Development, Evaluation* and *Conclusion* (Wang & Hannafin, 2005). Design research is; "… a systematic but flexible methodology aimed [at improving] educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories" (Wang & Hannafin, 2005, p.6). Design Research combines research, design and practice (ibid).

The research part of the Design Research methodology underpinned the *Awareness of the Problem* process step which in-turn underpinned the data collection for this paper. Data was collected through a survey. A survey approach was preferred because the target population could not be found in a single location. The study population was undergraduate distance and internal learners of Makerere University in Uganda. Makerere University delivers its programmes through internal and distance learning modes; hence it is a dual mode University (Aguti, 2009).

The sample size (n) was determined using Calder's (1998) sample size determination formula.

$$n = \frac{(desired\ confidence\ level)^2 * (s\tan dard\ deviation)^2}{(desired\ level\ of\ precision)^2}$$

At a confidence level of 95 Percent ($p<0.05$) or a value of 1.96 in normally distributed data, standard deviation of 4 (derived from an earlier study on the same population with regard to the standard deviation of the time used to complete a research report) and a level of

precision of 0.5, a minimum sample size of 246 was determined. Due to the high rate (80.0 Percent) of non-response in surveys (Burgess, 2001) the minimum sample size was multiplied by five (5) so as to cater for the 80.0 Percent non-response. The survey was therefore distributed to 1,230 respondents who were selected using multi-stage sampling method involving cluster sampling at stage one and stratified random sampling at stage two. The population was clustered along the study mode characteristic. Distance learners formed cluster one while internal learners formed cluster two. After the survey, 446 responses were returned representing a response rate of 36.3 Percent. Hence the total number of responses (N) was 446. In instances where there was non-response, N was less than 446.

Using comparative analysis approach, the hypotheses in the study were tested through variable cross-tabulation in which the Pearson Chi-Square was run to generate the phi-value (p-value) for determining level of association. When $p > 0.05$, the null hypothesis was accepted, meaning that there was no significant association between the variables being compared. When $p<0.05$, the null hypothesis was rejected, meaning that there was a significant association between the variables cross-tabulated.

6. Results

The study was scoped within five location-based learning context variables/conditions, namely: type of learner's usual learning locations, the noise levels of learner's usual learning location, availability of mobile network connectivity, availability of tethered Internet connectivity and presence of electric power supply. We describe the five aforementioned learning context variables before associating each of them with the study mode variable so as to determine which mode would best be suited for mLearning under the location context in question.

7. Describing the location-based learning context variables

Type of Learners' Usual Learning Locations: The learner's usual learning location connoted a place where a learner resided and undertook their usual learning activities. The study showed that 78.0 Percent of the learners resided and undertook their usual learning activities in urban areas. Semi-urban and rural areas, hosted 11.4 Percent and 10.5 Percent respectively of the learners.

Noise Levels of Learners' Usual Learning Locations: Noise pollution is said to have a negative effect on audio-based mLearning. The study showed that a big proportion of learners (59.4 Percent) were located in areas that were sometimes noisy. A few learners (2.2 Percent) lived and undertook their learning activities in contexts that where always noisy while a moderate number (38.3 Percent) enjoyed very quiet contexts.

Mobile Network Connectivity: MLearning mainly hinges on the mobile network connectivity. When asked to indicate their views on the statement, 'mobile network connectivity is present to you at all times', 28.4 Percent and 42.7 Percent of the learners strongly agreed and agreed respectively to it. Only 18.7 Percent and 10.2 Percent

respectively disagreed and strongly disagreed to the statement. This implies that 71.1 Percent of the respondents did not experience any intermittence in mobile network connectivity as opposed to 28.9 Percent who did.

Tethered Internet Connectivity: Inadequacies presented by lack of tethered Internet connectivity can be bridged by mobile Internet. Indeed, tethered Internet was scarce amongst respondents. About 42.4 Percent and 34.5 Percent of the respondents disagreed and strongly disagreed respectively to the statement that 'tethered Internet is available to you at all times'. Only 17.2 Percent and 6.9 Percent agreed and strongly agreed respectively to the latter statement. Even if mobile Internet comes in handy as a solution for bridging the digital divide created by lack of or limited tethered Internet connectivity, only 7.8 Percent of the learners used their mobile phones to access the Internet.

Electric Power Supply: Electric power supply is needed to power communication infrastructure such as transmission masts and computers and charging mobile device batteries. Whereas about 97.0 Percent of the learners owned mobile phones, not all of them had national electric power supply in their usual learning environments. A good proportion of learners (62.8 Percent) contended that power supply was not available to them at all times. Only 37.2 Percent of the learners had constant power supply.

8. Study mode, learning contexts and mLearning

In another paper, we have studied the significance of the learning environment (context) on mLearning (Muyinda *et al., in press*). In the present paper, we have extended that study by establishing the significance of learning environment (context) on study mode with a view of determining the interplay of the two variables on mLearning uptake. This is done by testing the six hypotheses stated in this study.

H_0: Unlike internal learners, distance learners are majorly located in rural and semi-urban areas where the main communication device is the mobile phone.

This hypothesis was tested by cross-tabulating study mode variable with the type of learner's usual learning environment and generating the Pearson Chi-Square statistic (phi = p-value) from the association. The results are shown in *Table 1* below.

	Type of Usual Learning Environment			
Study Mode	**Rural**	**Urban**	**Semi-urban**	***Total***
Distance	21.1% (n=46)	55.5% (n=121)	23.4% (n=51)	n=218
Internal	4.4% (n=10)	75.0% (n=171)	20.6% (n=47)	n=228
Total	12.6% (n=56)	65.5% (n=292)	22.0% (n=98)	N=446

Percentages are calculated row wise and p=0.532

Table 1. Study mode and Location of Learners' Usual Learning Environment

Whereas it has always been the general belief that most distance learners in Uganda are based in rural areas, findings in *Table 1* above have proved otherwise. The majority of

distance learners (55.5 Percent) were based in urban settings and only 21.1 Percent were based in rural areas. Semi-urban areas such as trading centers were a base for 23.4 Percent of the distance learners. The study having been conducted in an urban setting of Makerere University, which is located in the city of Kampala, Uganda, explains the large proportion of internal learners (75.0 Percent) who were based in urban settings. The 20.6 Percent and 4.4 Percent of internal learners who reported as having been in semi-urban and rural environments respectively are a case of students who commuted to Makerere University on a daily basis from surrounding districts and suburbs of Kampala. A p-value of 0.532 shown in *Table 1* above indicates that there was no significant association between study mode and the type of learners' usual learning environment. We therefore reject the null hypothesis and conclude that distance learners in Uganda are not necessarily located in rural and semi-urban areas where the main communication device is the mobile phone. They are also to be found in urban areas where other ICTs other than the mobile phone are commonly found. This shows that Uganda is not meeting the goal of distance learning which is to extend learning to learners in their homes and workplaces. It is apparent that as soon as students are admitted to the distance education programme, they relocate from their different areas of aboard to Kampala. For instance, one of the distance learners said, "I do not have a job, so I relocated to Kampala to concentrate on my studies".

H_0: Internal learners live in noisier urban environments than distance learners who live in less noisier rural or semi-urban locations that are conducive for audio mLearning.

A cross-tabulation of study mode and noise levels of learners' usual learning environment generated the p-value for testing this hypothesis. As has already been established, about 61.6 Percent of the learners experiences some form of noise pollution in their usual learning environments. The magnitude of this noise pollution among distance and internal learners has been determined in *Tables 2* , *3* and *4* below.

	Noise levels of learners' usual learning environment			
Study mode	**Is always quiet**	**Is sometimes noisy**	**Is always noisy**	***Total***
Distance	39.0 (n=85)	59.2 (n=129)	1.8 (n=4)	n=218
Internal	37.7 (n=86)	59.6 (n=136)	2.6 (n=6)	n=228
Total	38.3 (n=171)	59.4 (n=265)	2.2 (n=10)	N=446

Percentages are calculated row wise and p=0.029

Table 2. Study Mode and Noise Levels of the Learners' Usual Learning Environments

Learning concentration often requires quiet learning environments. Moreover, voice communication via mobile phones is greatly hindered in contexts with high noise levels. In *Table 2* above, a p-value of 0.029 was generated in a cross-tabulation of study mode with noise levels of the learners' usual learning environment. This p-value (0.029) indicates that the study mode is significantly associated with the noise levels in the learners' usual learning environment. It is evident from *Table 2* above that there were slightly more internal students (62.2 Percent) in sometimes noisy or always noisy locations than distance learners

(61.0 Percent). This was because the majority (95.6 Percent) of internal learners were based in urban or semi-urban areas (*See Table 1*) that tend to be noisier than rural areas as is depicted in *Table 3* below.

Location of learners' usual learning environment	*Noise levels of learners' usual learning environment*			*Total*
	Is always quiet	**Is sometimes noisy**	**Is always noisy**	
Rural	48.9% (n=23)	51.1% (n=24)	0.0% (n=0)	n=47
Urban	39.1% (n=136)	58.0% (n=202)	2.9% (n=10)	n=348
Semi-Urban	23.5% (n=12)	76.5% (n=39)	0.0% (n=0)	n=51
Total	38.3% (n=171)	59.4% (n=265)	2.2% (n=10)	N=446

Percentages are calculated row-wise

Table 3. Location of Learners' Usual Learning Environments and Noise Levels

From *Table 3* above, the truism that urban or semi-urban settings are noisier than rural areas is echoed. No respondent from a rural setting reported having a usual learning environment which was always noisy. There was an almost equal distribution of respondents from rural areas who reported having an environment which was always quiet (48.9 Percent) or sometimes noisy (51.1 Percent). The majority of learners (60.9 Percent) from urban settings reported that their environment was sometimes noise (58.0 Percent) and always noisy (2.9 Percent). Similarly the majority (76.5 Percent) of learners who hailed from semi-urban settings sometimes experienced noisy learning environments. Urban or semi-urban settings are nosier than rural settings. This conclusion is justified by the Pearson Chi-Square test results obtained from a cross-tabulation of the location of learners' usual learning environments and noise levels in those environments as is seen in *Table 4* below.

Test Statistic	**Value**	**Degrees of Freedom**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	10.318[a]	4	0.035
Likelihood Ratio	12.643	4	0.013
N of Valid Cases	446		

[a] 2 cells (22.2 Percent) have expected count less than 5. The minimum expected count is 1.05.

Table 4. Location of Learners' Usual Learning Environment and Noise Levels

A p-value of 0.035 at 4 degrees of freedom in *Table 4* above indicates that noise levels are significantly associated with the location of the learners' usual learning environments. This finding is collaborated with findings in *Table 3* above which also indicate that urban settings are noisier than rural ones. This could be attributed to the more traffic, people and economic activities found in urban settings than rural settings.

The findings in *Tables 2, 3* and *4 above* justify acceptance of the null hypothesis that internal learners live in noisier environments than distance learners. This implies that distance learners are well suited to partake of mLearning based on audio-based learning objects than their counterparts the internal learners because audio-based learning objects are suitable for quiet contexts.

H_0: Internal and distance learners operate in conditions of similar mobile network connectivity and hence none of them has leverage over the other in as far as mobile network connectivity for mLearning is concerned.

MLearning thrives best in environments with mobile network connectivity conditions. Whether internal or distance learners lived and operated in areas with or without mobile network connectivity conditions formed a research question that is answered in *Tables 5* and *6* below.

Study mode	*Mobile network connectivity is present at all times*				*Total*
	Strongly disagree	**Disagree**	**Agree**	**Strongly agree**	
Distance	9.8% (n=21)	20.5% (n=44)	43.7% (n=94)	26.0% (n=56)	n=215
Internal	10.5% (n=24)	17.1% (n=39)	41.7% (n=95)	30.7% (n=70)	n=228
Total	10.2% (n=45)	18.7% (n=83)	42.7% (n=189)	28.4% (n=126)	N=443

Percentages are calculated row-wise and Chi-Square p=0.062

Table 5. Study Mode and Availability of Mobile Network Connectivity

From *Table 5* above, 69.7 Percent and 71.4 Percent of distance and internal learners respectively agreed or strongly agreed that mobile network connectivity was present at all times in their usual areas of aboard. It means that distance and internal learners are almost equally served with mobile network connectivity. This is also evidenced by a p-value of 0.062 in *Table 5* above which indicates that learners' study mode did not have significant association with availability of mobile network connectivity. This means that both internal and distance learning students can equally be reached through mLearning.

The permeation of mobile network connectivity in rural, semi-urban and urban settings was also studied. Whereas the urban-based learners reported slightly higher availability of mobile network connectivity, *Table 6* below indicates that there was an almost equal level of agreement among rural (41.3 Percent) and urban (42.8 Percent) based learners to the question that mobile network connectivity was available at all times in their areas of aboard.

Location of learners' usual learning environment	*Mobile network connectivity is present at all times*				*Total*
	Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	
Rural	15.2%(n= 7)	23.9% (n=11)	41.3% (n=19)	19.6% (n=9)	n=46
Urban	9.5% (n=33)	16.8% (n=58)	42.8% (n=148)	30.9% (n=107)	n=346
Semi-urban	9.8% (n=5)	27.5% (n=14)	43.1% (n=22)	19.6% (n=10)	n=51
Total	10.2% (n=45)	18.7% (n=83)	42.7% (n=189)	28.4% (n=126)	N=443

Percentages are calculated row-wise and Chi-Square p=0.136

Table 6. Learners' Usual Learning Environment and Mobile Network Connectivity

A p-value of 0.136 in *Table 6* above indicates that there was no significant association between location of the learners' usual learning environment and availability of mobile network connectivity. We can conclude then that mobile network connectivity has permeated almost equally in urban, semi-urban and rural areas of Uganda. Thus we accept the null hypothesis that internal and distance learners experience similar mobile network connectivity conditions which have a significant influence on mLearning uptake.

H_0: Internal and distance learners operate in conditions of similar tethered Internet connectivity and hence none of them has leverage over the other in as far as tethered Internet connectivity for mLearning is concerned.

MLearning can be integrated into online learning management systems which are usually deployed through tethered Internet backbones. Availability of tethered Internet connectivity can thus be a necessary condition for the installation of mLearning. Do internal and distance learning students experience similar tethered Internet connectivity conditions? *Tables 7*, *8* and *9* below provide an answer to this question and hence test the hypothesis above.

	Tethered Internet connectivity is present at all times				
Study mode	Strongly disagree	Disagree	Agree	Strongly agree	Total
Distance	43.3% (n=93)	38.6% (n=83)	14.0% (n=30)	4.2% (n=9)	n=215
Internal	26.3% (n=60)	46.1% (n=105)	20.2% (n=46)	7.5% (n=17)	n=228
Total	34.5 %(n=153)	42.4% (n=188)	17.2% (n=76)	5.9% (n=26)	N=443

Percentages are calculated row-wise and Chi-Square p=0.329

Table 7. Study Mode and Availability of Tethered Internet Connectivity

From *Table 7* above, it is evident that Internet connectivity was present at all times to just a few learners. Only 14.0 Percent and 4.2 Percent of distance learners agreed and strongly agreed respectively to the statement that tethered Internet connectivity was present to them at all times. Similarly, a small proportion of 20.2 Percent and 7.5 Percent of internal learners agreed and strongly agreed respectively to the statement that tethered Internet connectivity was present to them at all times. Generally speaking, Internet connectivity was always available to only 23.1 Percent of the learners. When this is compared with mobile network connectivity in *Table 6* above, it can be concluded that mobile network connectivity was more readily available to learners than tethered Internet connectivity. However, neither distance nor internal learners were advantaged over the other in terms of access to tethered Internet. This is evidenced by the p-value of 0.329 in *Table 7* above which indicates that there was no significant association between study mode and availability of tethered Internet connectivity. Since mobile network connectivity is more pervasive than tethered Internet connectivity, mLearning applications are more likely to permeate to many learners in Uganda than those based on online learning based learning management systems which heavily depend on tethered Internet for connectivity.

Just like in the case of mobile network connectivity, it was important to compare the location of the learners' usual learning environment with availability of tethered Internet

connectivity so as to determine the type of location where tethered Internet connectivity is most prevalent. The results are presented in *Table 8* below.

Learners' usual learning environment	*Tethered Internet connectivity is present at all times*				*Total*
	Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	
Rural	76.1% (n=35)	10.9% (n=5)	10.9% (n=5)	2.2% (n=1)	n=46
Urban	28.0% (n=97)	47.4% (n=164)	17.3% (n=60)	7.2% (n=25)	n=346
Semi-urban	41.2% (n=21)	37.3% (n=19)	21.6% (n=11)	0.0% (n=0)	n=51
Total	34.5% (n=153)	42.4% (n=188)	17.2% (n=76)	5.9% (n=26)	N=443

Percentages are calculated row-wise and Chi-Square p=0.329

Table 8. Learners' Usual Learning Environments and Availability of Internet Connectivity

Contrary to the common belief that urban based learners have readily available Internet connectivity, the statistics in *Table 8* have indicated otherwise. A p-value of 0.329 in *Table 8* above indicates no significant association between location of learners' usual learning environment and availability of tethered Internet connectivity. Thus rural, semi-urban and urban based learners experienced similar availability or non-availability of Internet connectivity. We accept the null hypothesis that internal and distance learners experience similar tethered Internet connectivity conditions which have a significant influence on mLearning uptake.

About 78.0 percent of the learners either strongly disagreed (34.5 Percent) or disagreed (42.4 Percent) to the statement that Internet connectivity was available to them at all times. For those who had Internet connectivity, it was skewed more towards urban and semi-urban settings, that is to say, areas with electricity. This is explained by the strong association (p = 0.000) between electric power supply and Internet connectivity as seen in *Table 9* below.

H_0: Internal and distance learners operate in conditions of similar electric power supply and hence none of them has leverage over the other in as far as electric power supply for mLearning is concerned.

Electric power is necessary for powering the telecommunication infrastructure and charging mobile device batteries. As can be seen in *Table 9* below, electric power supply was significantly associated with tethered Internet connectivity (p = 0.000).

Test Statistic	*Value*	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	119.913[a]	9	0.000
Likelihood Ratio	96.788	9	0.000
N of Valid Cases	442		

[a] 1 cells (6.3 Percent) have expected count less than 5. The minimum expected count is 2.71.

Table 9. Power Supply and Internet Connectivity

Interestingly, when a Chi-Square test was undertaken between availability of electric power supply and mobile network connectivity, a non-significant result (p=0.301) was returned. This result concurs with results in our earlier study in which we found that mLearning could overcome the constraints that lack of electricity imposes on eLearning (Muyinda *et al*., 2010). This is because telecommunication companies have setup transmission masts in rural areas that are powered by diesel generators and mobile device users in areas with no electricity can charge them using solar power, car chargers, batteries and generators. But which of the different modes of study is more privileged than the other in terms of electric power supply? This question is answered in *Table 10* below.

Study mode	Power supply is availability all the time				Total
	Strongly Disagree	Disagree	Agree	Strongly Agree	
Distance	30.2 % (n=65)	40.5 % (n=87)	20.5 % (n=44)	8.8 % (n=19)	n=215
Internal	15.8 % (n=36)	39.5 % (n=90)	32.9 % (n=75)	11.8 % (n=27)	n=228
Total	22.8 % (n=101)	40.0 % (n=177)	26.9 % (n=119)	10.4 % (n=46)	N=443

Percentages are calculated row-wise and p=0.199

Table 10. Study Mode and Availability of Electric Power Supply

From *Table 4.10* above, there was no significant association (p=0.199) between study mode and availability of electric power supply. This means that both internal and distance learners faced similar conditions in as far as electric power supply was concerned. Power load shedding in Uganda was a common phenomenon. Rosters of power load shedding were published daily in local newspapers. However, intermittence or complete lack of electric power supply was more common in rural or semi-urban areas than urban ones. This is evidenced by the significant association between location of learners' usual learning environment and availability of power supply in *Table 11* below.

Location of learners' usual learning environment	***Electric power supply is availability all the time***				***Total***
	Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	
Rural	58.7% (n=27)	15.2% (n=07)	15.2% (n=07)	10.9% (n=05)	n=46
Urban	17.6% (n=61)	42.8% (n=148)	28.3% (n=98)	11.3% (n=39)	n=346
Semi-urban	25.5% (n=13)	43.1% (n=22)	27.5% (n=14)	3.9% (n=02)	n=51
Total	22.8% (n=101)	40.0% (n=177)	26.9% (n=119)	10.4% (n=46)	N=443

Percentages are calculated row-wise and p=0.000

Table 11. Location of Learners' Usual Learning Environments and Availability of Power Supply

From *Table 11* above, a p-value of 0.000 was generated in a cross-tabulation of location of learners' usual learning environment with availability of electric power supply. This p-value (0.000) indicates that the location of the learners' usual learning environment is strongly significantly associated with availability of power supply. The results show that power

supply was more available in urban (39.6 Percent) and semi-urban (31.4 Percent) settings than rural (26.1 Percent) areas. However, even where power supply was available, its supply was intermittent as 62.8 Percent of the learners surveyed either strongly disagreed (22.8 Percent) or disagreed (40.0 Percent) to the statement that power supply was available to them at all times.

From findings in *Tables 9, 10* and *11,* both distance and internal learners experienced similar electric power supply connectivity conditions which effectively affirm the hypothesis that internal and distance learners operate in conditions of similar electric power supply and hence none of them has leverage over the other in as far as electric power supply for mLearning is concerned.

H_0: Both internal and distance learners have learning activities that can be ported onto mobile devices.

There exists a host of possible mLearning activities that can be ported onto mLearning. According study revealed that the number one candidate mLearning activities were those that learners accomplished while they were outside the classroom. These activities were either direct learning activities or activities meant to plan and support direct learning activities.

While outside the classroom, both internal and distance learners participated in collaborative and interactive learning (41.0%), co-curricular/extra-curricula activities (20.0%) and independent research (16.0%). They also completed theoretical, practical and field course works and assignments (8.0%) and watched/listening to educative and entertaining music, news and movies (6.0%). Some learners engaged in work related activities (4%), consulted their lecturers (7.0%), acquainted themselves with the university environment (1.0%) and took computer lessons (1.0%). All these activities can be variously supported through mLearning.

Other learning activities suggested in the study for possible porting in mLearning were: provision of summaries of classroom discussions, reminders/alerts to various learning events and requirements, information about lectures and examinations venues, motivational messages, reference lists and hints on approach to questions, requirements for attending a given lecture, self evaluation via sequenced multiple choice quizzes and reflective learning using simulated classroom/laboratory activities recorded as MP3 files or video clips. Other classroom-based mLearning examples include: sharing of files using Bluetooth, anonymous voting and playing short demonstrations of experiments.

9. Discussion

9.1. Distance learning in Uganda

The purpose for which the distance learning programmes were started in Uganda was "… to provide access to a cross-section of clients, including adults working and living in the countryside" (Aguti, 2009, p.219). This study has established that only 21.1 percent of the

distance learners where resident in the countryside (rural areas). The majority 55.5% lived in the capital city of Kampala while 23.4 Percent lived in semi-urban areas. Distance learners preferred to live in Kampala because, "this is where I will get easy access to reading materials and my professors at Makerere University", said one of the distance learners. This shows that the distance learning student support system in Uganda is not decentralized. This forces the students to relocate to Kampala hence turning distance learning programmes into 'on-campus-based' distance learning programmes. The recommendations here would be to put in place systems that permit decentralization of student support systems. MLearning is one such support systems.

9.2. Study mode and MLearning

Since both internal and distance learners live and operate mainly from urban based environments, they experience noise pollution associated with urban environments. From this study, it was established that noise pollution has a significant effect on mLearning based on audio-based learning objects. This presents the need to design multiple learning objects for mLearning so as to cater for different noise levels in different study environment. Since a good proportion of internal (75.0 Percent) and distance (55.5 Percent) learners live in urban areas which tend to be noisier than rural or semi-urban areas, mLearning based on audio learning objects would not be suitable for them. MLearning based on text or video learning objects will be appropriate. Our reasoning is inline with the requirements of location-based learning as is espoused in Lehsten *et al*. (2010). According to Lehsten *et al*. (2010, p.269), "the approach for the place limit [would be] to integrate the location into the learning process". Location aware mLearning systems come in handy.

Wherever they were located, distance and internal learners were almost equally served with mobile network connectivity because it had permeated almost equally in urban, semi-urban and rural areas of Uganda. Mobile network connectivity was more readily available to both internal and distance learners than tethered Internet connectivity. Since mobile network connectivity is a necessary condition for mLearning, both distance and internal learners can equally be supported through mLearning. Similarly, since tethered Internet connectivity is not readily available to both internal and distance learners, applications based on tethered Internet connectivity are not readily accessible by both internal and distance learners. For example, mLearning applications which are integrated within online learning management systems (whose connectivity backbone is mainly tethered Internet) can not easily be partaken of by both internal and distance learners.

The study has revealed that both internal and distance learners experience similar electric power supply connectivity conditions. They both experience intermittence in power supply or complete lack of it. Whereas electric power supply based on the national grid is very critical to conventional eLearning, this study and others (Muyinda *et al*. 2010) have established that it is not very critical to mLearning. Mobile phone batteries can easily be charged using alternative power sources.

9.3. MLearning activities

Internal and distance learners can all be supported through mLearning. Both internal and distance learners interact and collaborate with each. mLearning abets interactive and collaborative learning. When learners collaborate and interact with each other, they create new knowledge (Fisher & Baird, 2007; Uden, 2007; Vygotsky, 1978). In Doos *et al*. (2005), workers collaboratively engaged each other to co-create new knowledge for new product development. Likewise, in this study, it was established that learners collaboratively accomplished group assignments, which indicates that there was collaborative and interactive learning.

The study further revealed that several learning support activities could be ported onto mLearning for distance and internal learners. These include: provision of summaries of classroom discussions, reminders/alerts to various learning events and requirements, information about lectures and examinations venues, motivational messages, reference lists and hints on approach to questions, requirements for attending a given lecture, self evaluation via sequenced multiple choice quizzes and reflective learning using simulated classroom/laboratory activities recorded as MP3 files or video clips. Studies such those in Brown & Diaz (2010), Dyson *et al*. (2009), Lehsten *et al*. (2010), Traxler (2007) and others give these and many more as possible mLearning activities. The common thread in many of the mLearning activities is that they are mainly teaching and learning support activities. For that reason, mLearning is also underpinned by the learning and teaching support theory (Naismith *et al*., 2006). The learning and teaching support theory (Naismith *et al*., 2006), posits that learning is not only about providing learners with content but is coupled with a great deal of learner and learning resources coordination. This necessitates support systems in learning and teaching not only for distance learners but also for internal learners. Just like any other technology use in the classroom, for example use of laptop in the classroom, negotiated use mLearning devices in the classroom by internal learners need to be negotiated (Brown & Diaz, 2010). This will dispel fears accruing from disruption caused by the devices to classroom learning.

Generally speaking, mLearning activities tend to be of short durations (Brown & Diaz, 2010). This augurs well with on-the-go learners who do not have enough time for sustained long duration checks on their mobile devices. The short duration of mLearning dictates the need to devise appropriate "pedagogies and learning opportunities that are unique to this type of technology rather than attempting to translate what is currently done with laptops onto the mobile device" (Brown & Diaz, 2010, p.9).

10. Conclusion and future work

Although there has been a claim that mLearning is mainly suited for distance learners, this study has disputed this claim. MLearning is capable of supporting both distance and internal learners. All that matters is a consideration for the different contexts that each of these two categories of learners experience before appropriate mLearning pedagogies can be designed for each of them. We disclaim however, that not all context variables have been

considered in this study. There exist other context variables such as government and institutional policy on mLearning, public and learners' opinions towards mLearning, cost, available resources, societal ethics, age, etc. that could influence uptake of mLearning by internal and distance learners. Futures studies should explore these.

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11. References

Aguti, N. J. (2009). University Education for National Development: Makerere University's Dual Mode Experience. In S. Marshall, W. Kinuthia, W. Taylor (Ed.), *Bridging the Knowlegde Divide. Educational technology for Development* (pp. 215-229). Charlotte, NC: Information Age Publishing.

Aguti, N. J., & Fraser, J. W. (2006). Integration of Information Communication Technologies (IICTs) in The Distance Education Bachelor of Education Programme, Makerere University, Uganda. *Turkish Online Journal of Distance Education -TOJDE, 7*(3), Article: 7.

Brown, H. T. (2005). Towards a Model for m-Learning in Africa. *International Journal on E-learning, 4*(3), 299-315.

Brown, M. & Diaz, V. (2010). Mobile Learning: Context and Prospects. A Report on the ELI Focus Session. Retrieved June 28, 2011, from http://net.educause.edu/ir/library/pdf/ELI3022.pdf

Bruner, J. (1966). *Toward a Theory of Instruction.* Cambridge, MA: Harvard University Press.

Burgess, F. T. (2001). *A general introduction to design of questionnaires for survey research*. Leeds: University of Leeds.

Calder, J. (1998). Survey research method. *Medical Education, 32*(1998), 638-652.

Caudill, G. J. (2007). The Growth of m-Learning and the Growth of Mobile Computing: Parallel developments. *International Review of Research in Open and Distance Learning, 8*(2), 1-13.

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Commonwealth of Learning (2004). *Planning and implementing open and distance learning systems: A handbook for decision makers*. Vancouver: Commonwealth of Learning.

Doos, M., Wilhelmson, L., Backlund, T. & Dixon, N. (2005). Functioning at the edge of knowledge. A study of learning processes in new product development. *Journal of Workplace Learning, 17*(8), 481-492.

Dyson, E. L., Litchfield, A., Lawrence, E., Raban, R. & Leijdekkers, P. (2009). Advancing the m-learning research agenda for active, experiential learning: Four case studies. *Australasian Journal of Educational Technology Research and Development, 25*(2), 250-267.

Fisher, M., & Baird, E. D. (2007). Making mLearning Work: Utilizing Mobile Technology for Active Exploration, Collaboration, Assessment, and Reflection in Higher Education. *Journal of Educational Technology Systems, 35*(1), 3-30.

Grant, J., Lynch, K., & Fisher, J. (2007, October 10-12). *Looks Can Cost; Especially On A Small Screen.* Paper presented at the 7th IFIP International Conference on e-Business, e-Services, and e-Society (I3E2007), Wuhan, China

Keegan, D. (1990). Open learning: concepts and costs successes and failures In Atkinson, R. & McBeath, C. (Ed.), *Open Learning and New Technologies* (pp. 230 - 243). ASET: Murdoch University Perth.

Kolb, D. (1984). *Experiential learning: Experience as the source of learning & development*. Englewood Cliffs: Prentice-Hall.

Kukulska-Hulme, A. & Traxler, J. (2005). *Mobile learning: A handbook for educators and trainers.* London: Routledge.

Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. English: Cambridge University Press.

Lehsten, P. Z., R., Lucke, U. and Tavangarian, D. (2010). A Service-oriented Approach towards Context-aware Mobile Learning Management Systems. *IEEE, 978-1-4244-5328-3*, 268-273.

Muyinda, B. P., Lubega, J., Lynch, K. & van Der Weiden, T. (in press). Learning Context of University Students in Africa: A Propeller or Inhibitor for MLearning?, *International Journal of Computing and ICT Research (IJCIR).* ISSN 1996-1065.

Muyinda, B. P., Lubega, J., & Lynch, K. (2010). Unleashing mobile phones for research supervision support at Makerere University, Uganda: the lessons learned. *International Journal of Innovation and Learning (IJIL), 7*(1), 14-34.

Naismith, L., Lonsdale, P., Vavoula, G., & Sharples, M. (2006). *Literature Review in Mobile Technologies and Learning* (No. 11). Birmingham: University of Birmingham.

Nie, M. (2007). The Pedagogical Perspectives of Mobile Learning. Retrieved March 2008, from https://lra.le.ac.uk/bitstream/2381/407/1/The%20Pedagogical%20Perspectives%20of%20Mobile%20Learning%20-%20A%20Literature%20Review.pdf

Prawat, S. R., & Floden, E. R. (1994). Philosophical perspectives on constructivist views on learning. *Educational Psychology, 29*(1), 37-48.

Prosser, M. & Trigwell, K. (1999). *Understanding learning and teaching: The experience in higher education*. Buckingham: Open University Press.

Sharples, M., Taylor, J., & Vavoula, G. (2005, October 25 - 28). *Towards a Theory of Mobile Learning*. Paper presented at the 4th World conference on m-learning (MLearn 2005), Cape Town, SA.

Traxler, J. (2007). Defining, Discussing, and Evaluating Mobile Learning: The moving finger writes and having writ. *International Review of Research in Open and Distance Learning, 8*(2), 1-12.

Uden, L. (2007). Activity theory for designing mobile learning. *International Journal of Mobile Learning and Organization, 1*(1), 81-102.

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*, Cambridge: Harvard University Press.

Wang, F., & Hannafin, J. M. (2005). Design-Based Research and Technology Enhanced Learning Environments. *ETR&D, 53*(4), 5-23.

Zhang, D. (2003). Delivery of personalized and adaptive content to mobile devices: a framework and enabling technology. *Communication of the Association for Information Systems, 12*, 183-202.

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Education has become the number one demanded commodity for social and economic transformation for both developing and developed economies. Thus the number of persons going and returning to school has become too big to be handled by existing brick and mortar learning institutions. Besides, the majority of lifelong learners do not have the time to become full-time students. Distance education is becoming the solution to the aforementioned challenges. It has been defined as the mode of study where the learner is separated in time and space from the institution and tutors providing the tuition.

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