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Technological Andragogy: Case of Computer Application Skills Development by Masters Students at a University of Technology in Zimbabwe

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ABSTRACT This study sought ways of enhancing computer application skills among post graduate students at Masters level. It was motivated by three factors which were the observation that adult students faced challenges with computer applications traced to their formal education curriculum which did not include computers contrary to their employment demands for proficiency in computer applications, the need to contribute to limited literature on andragogy rather than pedagogy for Masters students in Zimbabwe and the fact that it is the university of technology's mandate to develop a computer literate population including adult students. The study adopted a descriptive survey design in which data were solicited from a stratified sample of 210 Masters students at a University of Technology. Observation, a self-reporting questionnaire and focus group discussions were utilized to collect data. Lecturer evaluation forms completed by students were also analysed for students' expectations of course content and instructional methodology. The study revealed that students had more computer theory than practical application demanded by their jobs. There was a gap between what the university offered and what students expected. Findings suggest that adults develop proficiency when content is applied and hence the importance of having computer skills to enable them to carry out research projects in the studies. Students expected more hands-on rather than theory. The study recommends that the development of computer application skills should be every lecturer's task. This may be achieved by embracing information and communication uses in every area of teaching and learning by both lecturers and students.

INTRODUCTION

In Zimbabwe currently there is a big movement to address issues of technological application in all walks of life. The smartphones, automated teller machine (ATM), calculators, barcode readers and prepaid electricity are some of the day- to- day technology applications every citizen must understand. According to Thomas and Emereole (2002), computer literacy is the buzzword world over and indicator of being above the technological obsolete competence level at different work places. Collins (1991) summarized the role of computer technology in the modern world by stating that in the 21st century society most work is becoming computer-based. Unfortunately for Zimbabwe, Chetsanga (2002) reported a serious shortage of teachers with computer literacy skills as a result of the brain drain. This shortage is a blow to the computer technology educational base.

Efforts to address the computer literacy skills deficit at national level include the launching of the National Science and Technology Policy on 5th June 2002 (Muchena 2003; Government of Zimbabwe 2004). This Information and Communication Technology policy required all school and college students to be exposed to computer skills. Over 7300 computers were also donated to schools and universities through the President's computer program between 2004 and 2006. One university received more than 400 computers in 2005 (Herald 2006; Zengeya 2008:350). On the same note, there were recommendations by Chetsanga (2002) to upgrade Technical Colleges into degree awarding institutions in Zimbabwe. According to Nherera (2002), implementation of this recommendation enabled Chinhoyi Technical Teachers College which was opened in 1999, to graduate to Chinhoyi University of Technology in 2002. Another step was the implementation of the Science and Technology policy which resulted in all universities and colleges introducing computer appli-

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cation compulsory courses for Bachelors and Masters degree programs. The study sought to improve the teaching of computer skills to adult learners to facilitate the implementation of the national technology policy.

Efforts to understand and improve any teaching and learning situation demands a literature lens focused on three major components of the process which are the adult learner, the subject or discipline (computers) and the teaching and learning methods. The order places more emphasis on the student rather than on the discipline, and so the importance of a student who is an active learner and not a passive recipient.

Salih (2003) emphasises that adult learners are not big kids. They do not come to the classroom as blank slates (Resnick 1983). The adult learner brings in theories and concepts of computers and computer applications constructed from their previous encounters with computers and their everyday experiences. Marque et al. (2002) observed that elderly learners were less confident about computer work which manifests itself as computer anxiety or technophobia. Akintumi (2001) accepted computer anxiety as a common emotional response to computers. It tended to support negative learner attitude and repel adult interest in computers. Wlodkski (1993) explained that adults leaning to use computers often fear the unpredictability of computers, public exposure of ignorance and threat of failure. Therefore, techniques must be devised in the teaching process to reduce or eliminate computer anxiety by instructors. This is critical in Africa where the majority of adults grew up without a mouse in their hand.

A look at Knowles' (1984) andragogical model shows that there are a number of assumptions on adult learners and one of them is that they need to know the purpose of their learning before they can invest effort and resources in the learning process. This implies that the lecturer should spell out the objectives of the course and provide the course outline on the first encounter with students. Adults are used to making their decisions in everyday life hence require self direction over the nature, content and approach to their learning. Adults learn best when dealing with tasks and problems they perceive to be related to and arising from the demands of their everyday lives. This calls for the use of real life contexts for examples. Kerka (1994) also underlines the importance of self-directed learning as an important element in adult learning.

Rogers (2002) classified adult learners into four categories as activists, observers, theorists and experimentalists. As activists adult learners learn directly by involving themselves in various learning activities and this often evidenced by a more hands on approach in working on projects. In observing, adult learners often prefer to wait and watch what is going on before they decide to act. Lecture presentations and program evaluation become ideal activities for such students. Rogers (2002:15) further observes that as theorists adult students have a tendency to generalize from their experiences and apply what they learn in different but similar situations. In this sense, there is transfer of learning to solve problems. On the other hand, as experimentalists adult learners also enjoy devising new ways of doing things as well as trying them out to ascertain their workability. Similarly, knowledge in computer application packages could be used to solve problems.

This grouping implies that one group of masters students can be composed of adult learners at different points of the spectrum. There are those who require to be taught everything and those who wish to find everything for themselves. Lecturers can administer a questionnaire or pre-test to find what they know about computers and use the first few lessons to classify them. Use of group tasks could also be appropriate for adult learners. Bell and Gilbert (1996) in Bean (2003) classified adult learners' learning strategies into two main groups which are surface and strategic levels. The surface level includes students with no background knowledge of computers and they learn by memorization with a view to reproduce the content taught whereas students at the strategic level have background knowledge of content and application. In dealing with computers such students are concerned with appropriate computer package application, evaluation and synthesis, Such students are able to apply skills and have the expertise acquired.

A critical eye can notice that the main variable determining the student's style of learning is the student's background of computers. This seem to support Kennedy (2000) who found that the more general knowledge of computers that learners have, the more likely they are able to master new computer networking knowledge.

Other factors influencing adult learners' performances in computers include gender and age. Green (2000) reports that male adult students show greater ability and interest in computer related technology courses than female adult students. A study by Meyer and Talbot (1998) reveals that age is a variable to be seriously considered for a computer class of adult learners. They explained that generally as the complexity of tasks increases, the abilities decline with increasing age. Howard (2002) added that adults have problems with computer language. He/ she noted that the greatest obstacle to adult language learning is the doubt in their minds of their ability to learn a new language and the multiple meanings of one word such as mouse virus. From a biological perspective, Bean (2003) suggested that older eyes are more susceptible to glare and adapt more slowly to changes in light or dark. This implies that changes in vision may affect comfortable use of a computer monitor. The current study is comforted by Rogers (2001) who proposes that well- designed learning makes age differences less important. The use of andragogical skills more than pedagogical ones is important to enhance learning for adult learners.

The Computing Course

This study defines a computer as any electronic device capable of accepting input data, processing it and providing output. Since no subject is neutral, computing imposes its unique challenges to adult learners. Bernstein (1997) suggests that the computer proficiency involves the mastery of procedural skills in computing as it involves learning new concepts and terminology, which students may find difficult to understand. The danger noted by DeJoy (1991) is that when the learning experience lacks precedent, adults have no personal images. It affects concept formation, communication and computer application.

Since computers are programmed, learning to use them entails thinking along the lines of the programmer. It makes computing a rigid discipline (Howard 2002). DeJoy (1991) noted that rather than the computer teacher modifying his teaching, learners may be forced to adapt and harmonize with the computer (style flex) in order to attain desired learning goals. According to Agre (1994), adult learners prefer a computer teacher who possesses a high level of ICT skills and confidence, has extensive literacy teaching/ training experience, has background experience in working with adult learners and an understanding of the principles of adult learning and has the ability to identify and understand the needs of the learners and adapt sessions and courses to these needs. Agre (1994) further concludes by suggesting that the best way to learn computer skills is through apprenticeship. An implication for computer lecturer recruitment policy is that he/she should have andragogical skills, theories of helping adults learn.

The study was motivated by the observation that adult students for Research Methods and Statistics and Qualitative Methods at masters levels struggle to use computers and laptops reflecting handicaps from a technologically deprived primary and secondary school curriculum. It is also encouraged by Smith (1999) who called for the implementation of technology policies in education for three reasons. First, the increasing development and availability of new technology in the home and work place. Second is the outcry by today's student (tomorrow's productive citizen) to be technologically literate. Last but critical, is the perceived rising comfort level of adults who use technology in life.

The University of Technology at which the study was conducted offered several undergraduate degree programs and one postgraduate Master of Science in Strategic Management degree program which started in August 2005. The Master of Science in Strategic Management degree has two main admission requirements: a first degree pass in any recognized discipline from any approved university and at least two years experience in a managerial post. All students for the masters in strategic management degree are working adults managing different sectors of Zimbabwe economy. The programme is offered on a block release basis to reduce interruptions of their work-place schedules. These entry qualifications are silent on computer literacy although strategic management activity requires accurate data analysis and interpretation. One can safely conclude that these students bring different computer literacy skills hence require andragogical skills more than pedagogical skills.

One of the compulsory courses done during the first semester is Strategic Management In-

formation Systems. The main focus of the course is on how the computer is used to enhance strategic business and organizational management. Specific focus is on writing business proposals using Ms Word, internet and e-mail for communication, the web and presentation graphics for marketing. The average class has 120 adult students. Teaching and learning is done in the lecture room using lecture method and power point presentations. Students are given assignment tasks to research in groups and present. There are limited hands on computer operations for students. The argument being that the students are managers whose role is to make decisions on data provided. The class is too big for hands on lessons in one computer lab with 27 computers. The course duration is 36 hours done within a two week block. The course is assessed by assignment presentations and a three hour pen and paper written examination.

Statement of the Problem

The study was motivated by the observation that the majority of the masters in strategic management students were unable to use the computer for typing their assignments. They resorted to paying commercial typists creating an extra expense for themselves. Some of their assignments had serious typographical errors reflecting a lack of proof reading. All these resulted in poor quality work and a low mark for the student.

Research Questions

The study sought to specifically answer the following questions;

1. What were students' expectations from the Strategic Information Systems course?
2. How could the university develop computer application skills to satisfy students at a university of technology?

Significance of the Study

The study is important for the following reasons:

1. It is intended to improve computer instruction for adult learners in Zimbabwe.
2. It contributes to limited literature on technological andragogy with a Zimbabwe context. This was encouraged by Ludlow et al. (2002) who state that there is need for closer research and understanding of adult learning.
3. It is a source of instructional activities to meet adult learners' expectations.
4. Data provides agenda for instructional policy meetings at university level
5. Other researchers will find insights for further research on technology and adult learners.

METHODOLOGY

Research Design: The study adopted a descriptive survey research design. It is concerned with describing and portraying the current position of Masters students' expectations and strategies to enhance computer application skills development. The study benefits from descriptive survey's application of a variety of data gathering methods. This study also made use of documentary analysis, observation, focus group discussions and surveys.

Instruments: The main instrument was the questionnaire. It was designed by the researchers to gather masters' students' demographic data, their expectations and strategies for enhancing computer application skills. This was found appropriate for collecting individual views from a large literate population within a short time. The second set of instruments for documentary analysis was students' assignment scripts. These reflected the student's ability to use Ms-Word, the Web and Internet for research. Lecturer evaluation forms completed by students revealed students rating of computer lecturer and suggestions for improvement. Focus Group Discussion guides captured group views. Observation schedules designed by researchers identified students' behaviours such as seeking help from laboratory assistant or peers during practical lessons in the university computer laboratory.

Sample and Sampling: The population of this study was composed of 305 adult learners registered for the Masters in Strategic Management Degree in 2011. This is a finite population hence probability sampling techniques appropriate. All the students had done the computer course hence had the required variable although it was expected to depend on the student's level. Table 3 shows students distribution and sample. To raise a representative sample from this

population stratified sampling was applied. First was proportional sampling from semester to semester in the ratio of 4:3:3. Since expectations of students in the same semester are expected to be uniformly distributed, simple random sampling was done in which students' registration numbers were matched with random numbers generated by a computer. This was continued to raise a sample of 210 participants.

Data Collection: Questionnaires were administered and analysed for students' expectations. Findings were included in the observation guides for verification during practicals and focus group discussions. Computer lecturer evaluation forms completed by students for the previous two semesters were analysed for the scores awarded and suggestions given. These were readily available secondary data sources. Since the comments were not intended for this study, they were considered objective.

One focus group discussion session was held for each semester group. Each group of participants was focused by two open ended questions:

1. What are your expectations from computer application course?
2. How can the university develop students' computer application skills?

Each group had an hour brain-storming session followed by group presentations per semester group then a group report of semester group expectations and strategies.

Data Analysis: Quantitative data from questionnaires were analysed by use of frequencies and ordinary percentages. Qualitative data from focus group interviews and observations were analysed through content analysis from emerging themes.

Ethical Issues: Permission to conduct the study was sought and granted by the university authorities at the institution in which the study was conducted. Informed consent was sought from the adult participants who filled in consent forms after the purpose of the study was explained to them. Anonymity and confidentiality were assured.

RESULTS

Biographical Details

Table 1 shows that the majority of students who participated in the study were drawn from the first semester of their first year. As Table 2 shows, masters students' ages are positively skewed with the majority (41%) being in the (40 - 50) years group. The youngest student was 26, a clear outlier for the group. The distribution can be accounted for by the recruitment requirement of two years in a managerial position. One can also assume that these students have a vast array of computer application experiences which can be exploited for the benefit of them all.

Table 1: Student distribution and sample

Semester	*Number registered*	*Ratio sample size*	
1.1	128	4	84
1.2	93	3	63
2.1	84	3	63
Total	305	10	210

Table 2: Participants age distribution N=210

Age group	*25-30*	*31-40*	*41-50*	*51-60*	*61-70*	*71 -80*
	1		87	79	41	2

Knowledge of Different Computer Software

Table 3 shows students responses of their knowledge of different computer software. The majority of the students reported being proficient in the use of e-mail and internet whilst advanced computer software packages such as Desktop publishing and Auto CAD were generally unknown to most students. Findings suggest that adults develop proficiency in computer programs which they apply in everyday situations.

Table 3: Students' knowledge of computer software (N= 210)

Computer software	*Frequency*
Internet	118 (56%)
Ms –Word	93 (44%)
Power –point	74 (35%)
Ms Excel	55 (26%)
SPSS	33 (17%)
E-mail	146 (69%)
Spread sheets	21 (10%)
Desktop Publishing	17 (8%)
Auto CAD	5 (2%)

Students' Expectations from Computer Application Programs

Students' responses on their expectations from computer application programs are shown

Table 4: Students' expectations of computer application programs priority (N = 210)

Management task	*Application program*	*Frequency*	*Rank*
Typing	MS-Word	181	1
Communication	E-mail or MS Outlook	150	2
Web-searching	Internet	143	3
Statistical data analysis	MS-Excel, SPSS, SAS	100	4
Report presentation	Powerpoint	98	5
Graphical presentation	MS-Excel, Auto-CAD	83	6
Invoice and accounting	Spreadsheet, MS-Excel	62	7
Data base management	MS-Access	57	8
Newsletters and magazines	MS-Publisher	43	9

on Table 4. Results on Table 4 can form a computer application curriculum for masters' students. Aspects (1 to 5) can be done by every student and (6 – 9) as options depending on students work requirements, for example MS – Publisher is important for public relations officers while MS Access is good for database managers. Findings also, show a discrepancy between what is on offer and what the student requires. This is a source for curriculum review with a view towards including what is needed to make the program valid in the eyes of the consumer.

Learning Approach Preferences

Students also indicated that they:

1. Preferred learning in smaller groups of a similar age.
2. Preferred learning in an informal environment probably with a low music background
3. Needed slower paced, low intensity training which can be self –paced.
4. Valued highly peer support, mentoring and tutoring.
5. Wanted clear and explicit instructions with print and web-based resources designed to accommodate age affected sight and hearing.
6. Expected a lot of hands on learning opportunities.

DISCUSSION

The study found that the majority of students were computer literate and proficient in the use of different computer programs. This finding ties well with observations by Sonn et al. (2011) that not only computer literacy but computer competence was important for all professionals in modern-day economies. Computer proficiency is the knowledge and ability to use specific computer applications such as spreadsheet and word processors. Grant et al. (2009) are also agreeable that students in universities are both computer literate and proficient though the degrees could vary from student to student. Of importance is for universities to develop from what students already know.

In terms of students' expectation from Computer Application Programs, the study found that students had diverse expectations from basic typing to data base management skills. The findings are consistent with observation by Grant et al. (2009) that students' expertise should be extended from mere word processing skills to more advanced computer application skills. (Johnson et al. 2006) observe that when preparing students for employment there is need to go beyond the current needs for industry and equip such students to be productive and adaptive.

The study found that students preferred learning in smaller groups with peers of more or less the same age. The finding is consistent with findings by Johnson et al. (1994) that small group learning ensures collegiate instruction and has many benefits for students in that there is tolerance and positive interactions of students from different backgrounds and the exchange and processing of information is heightened. Johnson et al. (1994) further observe that in small groups a cooperative learning environment is provided.

The study further found that adult learners expected to learn by doing. Such a finding corroborates an observation by Wlodkowski (1993) that adult learners enjoy learning by doing and that the most appropriate way of learning a computer skills is by being involved practically. Centre for Learning and Teaching (2005) also states that through learning by doing students become

reflective of their practice and develop important critical thinking skills.

The finding in the study that students also valued support in form of tutoring and mentoring is also consistent with views by Agree (1994) who suggests that the best way to learn computer skills is through mentoring. Bierema and Merriam (2002) acknowledge the importance and usefulness in learning information technology skills and further suggest a new type of mentoring called the e-mentoring in which is defined as;

…. a computer mediated, mutually beneficial relationship between a mentor and a prot´eg´e which provides learning, advising, encouraging, promoting, and modeling that is often boundaryless, egalitarian, and qualitatively different than traditional face-to-face mentoring (Bierema and Merriam 2002:219).

The advantage of e-mentoring over the traditional face to face mentoring is that it transcends space and time hence the mentor and mentee are always in touch despite the physical separation in distance.

CONCLUSION

Students enrolled for Masters degree at the university of technology in which the study was conducted were computer literate and proficient in basic computer programmes. Students expected to be taught various computer application skills ranging from the basic ones to more advanced ones. They also expected to be taught using a variety of ways that included small groups and mentoring.

RECOMMENDATIONS

The study recommends a number of strategies to that could be employed to enhance development of computer application skills which include that the development of computer application skills should be everybody's task in a university.

The development of computer application skills could be achieved by holding workshops for lecturers on the application of computers in their respective courses. This will ensure that the lecturers' themselves have the necessary computer skills that they can also impart to students.

The university could ensure that that each student brought their own laptops or i-Pads to classes all the time. It is only when each and every student has their own equipment to use that they can effectively learn through constant practice in and out of class.

The university should also invest in wireless internet systems to ensure that all; students have access to internet from any part of the university. Limiting students' access to designated computer laboratories and libraries stifles learning.

Students should also utilise online programs as well as social network facilities to enhance exchange of information and the learning of computer application skills. It becomes imperative for lecturers to embrace *facebook* and *twitter* social networking systems into teaching and learning.

Universities should also ensure that all lecturers attend Management Information Systems courses or familiarize themselves with its content as a basis for students' computer content. Lecturers will then be in a position to ably assist students.

Universities should also revolutionize the whole teaching, learning, research and assessment components of the programming by incorporating information and communication technologies in all areas. Embedding the whole university business in computer application practices bridges the gap between institutions and what is happening in wider society.

LIMITATIONS OF THE STUDY

The study was conducted at on University of Technology in Zimbabwe hence findings may not be generalized to other universities.

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