**Masters Thesis** 

# Possibility of Asynchronous e-Learning for Teacher Training – a Case for Malawi.

A thesis submitted for the degree of Master of Instructional Systems (Educational Technology)

To the Graduate School of Instructional Systems

Graduate School of Social and Cultural Sciences Kumamoto University, Japan.

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Date: 11th February, 2010

# Acknowledgements

An effort as far-reaching as that taken on by the author could not have been possible without the invaluable assistance of many talented individuals. Mr. Austin Phiri, Mr. Staliko Chibwe and Mr. Ezekiel Kachisa provided continuous advice, support, and thoughtful expert review throughout the development and production of the e-Learning instructional material.

In addition, I wish to acknowledge the tremendous efforts of several others:

Web site expert, Mr. Kogure.

Dr. Tokumura Tomoaki for his technical advice and assistance on installing the e-Learning system and uploading the instructional material to web servers.

Mr. H. Kachale, Principal, Kasungu Teachers Training College, for his permission to use the students and facilities at his institution.

Professor Fujio Ohmori provided academic advice and support during the design and development of a research proposal paper, as well as before, during and after all research activities. Professor Katsuaki Suzuki and Dr. Junko Nemoto provided very useful comments about the draft copy of this thesis.

JICA Okinawa for their financial assistance towards the author's education.

Finally, the author is deeply grateful to all Kasungu Teacher Training College IPTE 5 teacher trainees that participated in the one and half month-long online studies, meetings, and proceedings; provided me with live and online testimony which assisted me in developing this comprehensive report.

# Abstract

The main purpose of this study was to investigate and examine the possibility of asynchronous e-Learning and its effectiveness for teacher training programs in Malawi. The research also focused on the benefits and limitations of asynchronous e-Learning in Malawi Teacher Training Colleges and if e-mails and forum facilities (asynchronous discussion board) would be a fair substitute for face to face interaction in Malawian setting. Hence, asynchronous e-Learning was studied and examined. In this study, 60 randomly selected pre-service teacher trainees were given an online Mathematics instructional material to study on their own without the assistance of an instructor. To have a complete study, three phases of formative evaluation, namely: one on one, small group and field trial phases, were implemented. The field trial phase was where the instructional material was put on a full implementation stage.

The study was carried out through online questionnaire surveys and face to face interviews with the subjects. Observations and participants' reports about asynchronous e-Learning were also part of data collection (refer to Appendices 13, 14, and 15). All these data collection instruments enabled the researcher to obtain the participants' impressions and satisfactions about asynchronous e-Learning, that is, participants were allowed to study the course online and consequently asked to give their views on the effectiveness of both the course and the asynchronous e-Learning mode of delivery.

During the research activities, all participants took a pretest, a midcourse test and a posttest for quantitative data collection. The research compared participants' tests (pretest, midcourse, and posttest) grade results in classes that were taught by the same instructor (the researcher) using face-to-face and online delivery modes. An analysis of differences in average net gains between pretest and posttest average grades was used to determine if a significant difference existed between the two modes of delivery. This also measured participants' learning achievements.

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Each learning unit in the asynchronous e-Learning instructional material had a set of questions which the participants were required to discuss through use of emails and a discussion board on Friendster bulletin board. This assisted in promoting and improving two way communications between and among participants. A discussion of online learners in relation to their satisfaction, asynchronous e-Learning effectiveness and faculty satisfaction has been presented in the following chapters below.

Currently, Malawi is using face-to-face mode of delivery to train her elementary school preservice teachers. Although the Malawian education system is encouraging and promoting learner centred education (Kachisa, 2006), teacher centred education is overshadowing the learner centredness philosophy. Classes are almost and traditionally devoid of active student-student or student-instructor communication. In addition to this problem, Malawi is failing to produce enough elementary school pre-service teachers through the conventional face to face mode of delivery to meet the ever growing enrolment of pupils in the elementary schools. This is largely due to inadequate classroom blocks in each teacher training college. There are only five teacher training colleges in Malawi. Each college has a capacity of 500 students. Hence, the need for asynchronous e-Learning as a means of promoting learner-centred education, improving learner-learner or learner-instructor communication during the learning process and increasing capacity for each college to enroll more teacher trainees than the case is as of now.

Both a descriptive and quasi experimental research designs were employed because data collection methods involved observations, interviewing of and giving tests to both face to face and online participants. The quasi-experimental design was used for the purposes of measuring and determining the effectiveness of asynchronous e-Learning in terms of students' performance.

The first stage of this research project had been to analyse and review the current teacher training Mathematics curriculum. Then, a Mathematics e-Learning instructional material

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was designed and developed. Later, it was tested, evaluated, revised (ADDIE Model in Suzuki, 2004) and then used by a large group of participants.

A total number of 100 randomly selected teacher trainees (subjects) participated in this research. These were selected from one (out of five) teacher training colleges in Malawi. The data collected was organized, processed and then analysed to draw conclusions.

The research findings revealed strong support and approval for asynchronous e-Learning as being effective in teacher training programs. In other words, the results of the research has shown that the majority of both students and Mathematics instructors at Kasungu Teachers Training College hugely positive about the usefulness and overall advantages of asynchronous e-Learning use in teacher training programs. This was mixed with serious concerns about the impact of regular black outs, high IT illiteracy rate and slow internet on self-learners.

In ideal conditions, the research participants needed to be exposed to equal conditions and opportunities such as; equal study time, and other learning resources, but this was not the case. The online participants had a lot of experimental problems such as power and internet failures, inadequate computers (10 computers to be shared by 60 participants), limited study time in the computer laboratories and slow internet. This meant that the face to face participants had a lot of advantages over online participants in terms of study time, and learning resources. For example, when there was no electricity or internet, face to face participants continued learning yet both groups were supposed to finish at the same time.

Despite the experimental challenges outlined above for online participants, the findings of this research show that both online and face to face participants had almost the same achievements in terms of performance. This demonstrates that there is no significant difference in learning achievements and performances between asynchronous e-Learning and face to face delivery modes (refer to Appendices 10, 11, and 12). The findings also indicate that the participants perceived the asynchronous discussion board and emails as

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important tools in the learning process because they promoted situated learning, facilitated a social construction of knowledge, and afforded customized learning experiences.

The evaluation case study has been arrived at based on participants' performance and perceptions of the impact of asynchronous e-Learning use on student learning and engagement. The research fell under the main themes of Instructional Design and Information Technology. The uniqueness of this research is that it was the first time in Malawi to try to find out if asynchronous type of e-Learning could be possible for training elementary school pre-service teachers. Besides, the participants were real pre-service teacher trainees unlike in other studies where simulations are used.

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# Chapter 1

# **Background and Purposes of this Research**

# **1.1 Introduction**

This research was carried out at Kasungu Teachers Training College in Malawi. In Malawi there are five teachers training colleges where pre-service elementary school teachers are trained. Kasungu Teachers Training College has a total student capacity of 500 as is the case with the other four colleges. In Malawi, no e-Learning is done in teacher training colleges despite the availability of computers and internet connections. Therefore, training elementary school pre-service teachers through asynchronous e-Learning would be a new approach and a very big challenge to both the teacher trainees and instructors. In this study, I intended to investigate and examine if asynchronous e-Learning could be possible and desirable for teacher training programs in Malawi. I was interested in this research because it was directly related to my job. My job is to train pre-service elementary school teachers in Science and Mathematics. I am very sure that the results of the research will be very useful to me as an individual, my institution as well as the whole country in determining the way forward in the area of teacher training through asynchronous e-Learning.

# **1.2 Asynchronous e-Learning**

Asynchronous e-Learning occurs when the teacher and the learner interact in different places and during different times. Asynchronous e-Learning lets people learn at anytime. It is thus a key component of flexible e-Learning. Students enrolled in asynchronous courses are able to complete their work whenever they please. Asynchronous e-Learning often relies on technology such as message boards, emails, pre-recorded video lectures, threaded discussion boards, e.t.c. Asynchronous e-Learning, commonly facilitated by e-mail and discussion boards, supports work relations among learners and with teachers, even when participants cannot be online at the same time (Erkan, 2006).

Often, asynchronous e-Learning is preferred by students with complicated schedules because of their asynchronous nature, combining education with work, family, and other commitments. For instance, some pre-service teacher trainees in this study indicated in their pre-treatment survey that they left their previous jobs in order to receive basic pedagogical training; others indicated they had family commitments (as parents, wives/husbands). Asynchronous e-learning makes it possible for learners to log on to an e-Learning environment at any time and download documents or send messages to teachers or peers (Erkan, 2006). Students may spend more time refining their contributions, which are generally considered more thoughtful compared to synchronous communication.

For a successful asynchronous e-Learning, there is need to institute a discussion forum, also known as a bulletin board. A discussion forum is a collection of conversations that occur over time. A discussion group might start out as a question from an individual creating a thread. Some time later, another individual responds to that question. Others can respond to the question or they can start their own conversation (forming another thread). A threaded discussion might also start with a teacher asking an open-ended question that leads to a class discussion. Discussion groups can be used to support a group of people taking the same class or can be used to support people performing similar tasks. Distinctive features of asynchronous e-Learning are:

- Intermittent access to or interaction with the instructional material, fellow learners and the instructor.
- Self-paced
- Individual, or intermittently collaborative
- Independent learning
- Usually available any time
- Recorded or pre-produced (Erkan, 2006).

Asynchronous e-Learning tends to work well for self-motivated learners who do not need direct guidance to complete their assignments. A major benefit of students studying through asynchronous e-Learning is the promotion of learner independence and autonomy while also challenging them to experience and learn using technology. A Friendster asynchronous bulletin board was implemented in this study. Emails were also used. Johnson (2006) in Ajayi (2009) argues that students experience learning events

independently when they use asynchronous discussion board because each learner can work at his or her own pace.

As opposed to asynchronous e-Learning, synchronous learning is live, real-time (and usually scheduled), facilitated instruction and learning- oriented interaction. It is distinguished from self-paced asynchronous learning, which students access intermittently on demand (Erkan, 2006). Synchronous e-Learning, commonly supported by media such as videoconferencing and online chat, has the potential to support e-learners in the development of learning communities. It goes by a variety of names: virtual classrooms, Web conferences, Webinars, and online presentations, to list just a few of them (Erkan, 2006). A virtual classroom duplicates the capabilities found in a real classroom. A virtual classroom thus provides:

- A place to meet: Students and teachers use their computers to go to a virtual meeting place instead of a classroom.
- Take attendance: A list of students is recorded.
- Lecture: Teachers can choose from a variety of synchronous technologies including:
  - Slide presentation
  - Audio and video conferencing
  - Application sharing
  - o Shared whiteboard
- Interaction with students: Students can indicate when they want to speak by virtually raising their hand. Teachers can let students speak through audio and video conferencing. Teachers and students can use instant messaging and chat.

Learners and teachers experience synchronous e-Learning as more social and avoid frustration by asking and answering questions in real time. Synchronous sessions help elearners feel like participants rather than isolates. Synchronous e-Learning lets teachers conduct classes over the Internet. The use of Web conferencing software supports live, more or less interactive learning events delivered on the World Wide Web. Common features of synchronous e-Learning are:

- Real-time
- Live
- Usually scheduled and time-specific (but can be impromptu)
- Collective and often collaborative
- Simultaneous virtual presence (with other learners and facilitators or instructors)
- Concurrent learning with others (Hrastinski, 2008)

In this study, participants were exposed to a Mathematics asynchronous e-Learning course which was supposed to be covered in about 15 hours. The instructional material was similar (in content, pictures, diagrams, tests, quizzes) to the one offered through face to face in pre-service teacher training programs. However, the difference was that the e-Learning instructional material had both audio and video clips. Before full implementation of the e-Learning course, one to one and small group formative evaluations were carried out so as to improve the quality and effectiveness of the instructional material (Suzuki, 2002). The e-Learning instructional material had quizzes for practice, pictures, diagrams and videos for clarification of new concepts. All participants took an entry test, a pretest, a mid course test and a posttest.

# 1.3 Why Research on Asynchronous e-Learning

Asynchronous e-Learning was chosen in this study basing on the following reasons: its interactivity elements, it can be implemented using a number of options such as emails, voice mails, CD ROMs, etc., and the Malawian learner's characteristics such as slow typing speed, IT illiterate, large numbers of learners, etc. Another reason is that despite the Malawian education system encouraging and promoting learner centred education, teacher centred education has been and is still overshadowing the learner centredness philosophy. Classes are almost and traditionally devoid of active student-student or student-instructor communication. Large classes further compound the difficulty of engaging students and enabling viable student-instructor or student-student feedback. It is argued that learning afforded by new technologies is increasingly becoming important in pre-service teacher education (Schellens & Valcke, 2006, in Ajayi, 2009). Therefore, Malawi needs to move

forward technologically in training its school pre-service teachers. The sociocultural theory of learning posits that learning is interactive, discursive, technology-mediated, and situated (Ajayi, 2009). Gee 2003, in Ajayi 2009, extends this perspective to suggest that human learning is fully embedded in (situated within) a material, social, and cultural world and that the affordances of tools and technologies (e.g. computer and the Internet) can enhance learning.

Table 1 below shows some of the factors which were used to consider whether asynchronous type of e-Learning would be possible and desirable for teacher training in Malawi.

criterion	question	asynchronous
who	Learner's level of autonomy	Learners are autonomous
who	Learners typing ability	If learners do not type well
what	Learners need to learn	Learners have diverse needs
when	Learners are available	At various times
where	Learners are located	Located in diverse places
How	Learners prefer to learn or instructor prefer to teach	Discovering new information and progressing at their own pace
How many	Number of learners	Large numbers

Table 1: Factors that were considered in choosing asynchronous type of e-Learning.

In summary, learning to teach requires a new way of learning by pre-service teachers. This new way requires teacher educators to use technology to engage pre-service teacher trainees in learning (Schellens et al. 2005 in Ajayi, 2009). It also requires pre-service teacher trainees to construct knowledge through active participation in discussions and knowledge sharing with their peers (Schellens et al. 2005). Schellens et al. (2005) in Ajayi (2009) aptly argue that an asynchronous discussion board facilitates active engagement in learning processes as students collaboratively work on a learning task, and by mutually explaining the learning content, giving feedback to other group members, asking and answering questions. In this way, the dialogue they engage in (through the use of discussion board) provides an understanding of the nexus between how students

understand a phenomenon belonging to a learning task and what they actually do in undertaking the task (Johnson, 2007 in Ajayi, 2009).

### 1.4 Why Research Not on Synchronous e-Learning

Synchronous e-learning was not chosen in this research based on the following factors: resource limitations- all participants had very slow typing speed since they were beginners in the use of ICT. Therefore, they needed more time to type a question as well as responses for posting to their learning mates and/or instructor. This was compounded by the limited time during which the research was supposed to be conducted. The slowness in typing speed would obviously have a negative impact on participants' instant messaging as well as chats. Another problem was that, apart from computers, there would also be need for other tools such as Skype software, head phones, and cameras to allow for both audio and video conferencing. Unfortunately, in Malawi, one internet line is usually shared by many subscribers leading to very slow internet provision with small band width. Therefore, downloading and using Skype software for purposes of synchronous e-Learning would not be possible. At the same time it was felt that synchronous e-Learning is more demanding than asynchronous e-Learning both in terms of operation as well as acquiring the necessary tools for its implementation.

#### **1.5 Pre-service teacher training in Malawi**

In Malawi, elementary school pre-service teacher training course commonly known as the Initial Primary Teacher Education (IPTE) or One plus one mode is a two year teacher training programme and has two components (Chiwaya, M. et.al, 2007). These are college phase and field phase. Each of these phases is one year long. During the college phase, the pre-service teacher trainees learn about both the elementary school classroom pedagogy and the content of each respective subject. In this phase no teaching practice is done.

All trainees spend their time in class with their instructors. It is this part of their studies from which I developed the instructional material. During this phase, all pre-service teacher

trainees are expected to acquire knowledge and necessary skills which they will use when preparing and planning lessons. They will also use the knowledge and skills gained at the time of teaching and assessing their elementary school learners. The teacher trainees go through continuous assessment which forms part of their final grade. At the end of the year, all teacher trainees are expected to sit for a national examination based on theoretical knowledge about classroom pedagogy. 40% of continuous assessment and 60% from national examinations results form their final grade (Chiwaya, M. 2007). In Malawi, an average mark of 40% is considered a pass for pre-service teacher trainees.

During the field phase, each teacher trainee is attached to an elementary school where he/she is expected to practise teaching and assessment of pupils in a given class. The trainee also practises writing of lesson plans and schemes of work which he/she learnt in college. Each teacher trainee is attached to a mentor, who advises on all matters pertaining to successful teaching. The mentor is supposed to do some grading of the teaching practice activities and compiles reports on teacher trainees' progress. Beside a mentor, the school head teacher, primary school methods advisors, and college tutors supervise the trainees. At the end of the year, the teaching practice is moderated by Malawi Ministry of Education and Malawi National Examinations Board. During the moderation exercise, sampled teacher trainees have their lessons observed and graded. This is done as a proof of thorough and proper preparation of the teacher trainees. Finally, all teacher trainees' grades are compiled and submitted to the national examinations body by the college assessment committee. A teacher trainee who passes the teaching practice is certified to teach elementary school children and consequently given a teaching job by the Malawi Ministry of Education.

Of late, Malawi has been changing its systems of training elementary school teachers due to limited capacity for provision of quality pre-service and in-service teacher training (Chiwaya, M. et.al, 2007). For example, there has been teacher training programs like the Malawi Integrated In-service Teacher Education Project (MIITEP), Secondary School Teacher Education Project (SSTEP), one year program, One plus one mode of training, etc.

Under the MIITEP project, pre-service teacher trainees got initial training about teaching skills for about two weeks. Then they were sent to elementary schools to start teaching. The program proved a failure as there was a public outcry that education standards went down since the teachers could not deliver as expected. As for the SSTEP project, elementary school teachers with some teaching experience were recruited to undergo a training course through paper based distance education leading to an award of a Diploma in Education. This project succeeded. However, few students get recruited every year because only one college is involved in this program. The one year program was thought to be an improvement of the MIITEP project. Under this system, the government recruited pre-service teacher trainees, allocated them to elementary schools to teach for some years before they got training and then sent them to teacher training colleges for a one year training course. Again this program did not work as the public complained against it.

Finally, the government started a new project called the one plus one mode of training, also known as Initial Primary Teacher Education (IPTE). Under this program, the government recruits pre-service teacher trainees, and send them to teacher training colleges for one year for pedagogical skills. In the second year of training, the pre-service teachers are sent to elementary schools for teaching practice. This is the mode of training which is currently being used. However, the problem with this mode is limited space as all students have to be accommodated in the colleges. So it is practically impossible to meet the graduating numbers which the government wants every year. As a result, the Government of Malawi is still looking at ways which will assist in increasing the number of teacher trainees to be recruited every year to meet the current rising demand of pre-service teachers in elementary schools. Currently, plans are underway to start paper based distance education in all teacher training colleges in order to reduce the problem of teacher shortage in Malawi. Therefore, the implementation of asynchronous e-Learning may greatly assist the learners due to its high interactivity component as opposed to paper based distance education. Besides, asynchronous e-Learning will ensure two way communications between learner and teachers and even among the learners themselves. This means asynchronous e-Learning will still be important in the event that paper based

distance education is implemented. According to Malawi's education system, teachers are supposed to follow learners learning progress regardless of the mode of delivery. The learners are supposed to send assignments, and tasks to their respective colleges. At the end of the year, each learner is supposed to take an examination at the college. With asynchronous e-Learning in place, it will be easy for both the teachers and learners to carry out their expected roles effectively. Instead of learners going to their respective colleges to sit for an examination, they can simply do it on the computer.

# 1.6 Problems of face-to-face mode of training in Malawi.

There are many problems which hamper the delivery of quality education through the face to face mode of delivery. Some of the problems faced are as follows:

- Most of the times reading materials (books, handouts) delay due to some logistical problems- each college receives books and other paper based reading materials for an academic year only. Unfortunately, Malawi has little ability and capacity to print books and other reading materials. As such most paper based reading materials are printed from outside the country.
- Frequent instructor movements for other official engagements (e.g. setting and marking of national examinations, supervising teaching practice for previous preservice teacher trainees, etc.) and duties, - besides teaching, college instructors get involved in other activities outside their duty stations. During the period when an instructor is away, the teacher trainees have no lessons till the time when their instructor comes back.
- Presence of few classroom blocks and number of teacher training colleges- in Malawi there are five teacher training colleges only against a population of about 14 000 000. Each college admits and recruits about 500 teacher trainees every year despite a large number of applicants for the teacher training programs.
- Big teaching load- many college instructors have many classes to teach due to inadequate staffing. Consequently, continuous assessment is not done as expected.

- Large classes- in most cases one class will have not less than 50 teacher trainees. This translates into limited freedom for learners to participate in all class activities. Two way communications between trainees and their instructor or among the trainees during lessons is limited.
- Lack of any solid policy and clear strategic plan for teacher education.
- Less than optimal output from teacher training institutions. [Report produced by Kairi, (2003),for the Malawi Ministry of Education]

Beginning in 1987, in response to strong growth in elementary school enrolment and to reduce teacher shortages, the Malawi Ministry of Education, Science and Technology began experimenting with alternative forms of delivery of primary teacher education in order to increase trained teacher output from the teacher training colleges [Report written by Kairi, (2003) for the Malawi Ministry of Education]. Most of the experiments/initiatives on teacher training programs failed as outlined in the previous page. The current system (known as one plus one mode) of teacher training which seems successful has problems of producing inadequate pre-service teachers every year. Therefore, the Malawi Government made recommendations as strategies to be addressed in order to meet the demand for primary school pre-service teachers. Some of the recommendations are the use of information and communication technology to support delivery of the teacher training programmes; and lay the foundation for future implementation of ICT in the general school system. Use of distance education as a modality for delivering both pre-service and inservice education and to assist in meeting the emergency demand for teachers at primary level [Report produced by Kairi, (2003) for the Malawi Ministry of Education]. Therefore, my research conforms to government's initiatives and recommendations to try out various ways of training teachers in order to reduce the shortage of pre-service teachers in the elementary school sector. The results of this research can be used to determine whether asynchronous e-Learning would be one of the possible means of teacher training programs.

# 1.7 Research problems

In Malawi, teacher training is done through face-to-face only. As a result, there is high dependency by the learners on the few existing teacher trainers in the colleges. This promotes passive learning with very little or no learner activeness. Classes are almost and traditionally devoid of active student-student or student-instructor communication. Large classes further compound the difficulty of engaging students and enabling viable student-instructor or student-student feedback. Research findings indicate that the constructivist perspective points to the importance of students creating their own knowledge in an individual and personal way. This learning theory emphasizes the need for activity and engagement by the student in order for learning to take place (Stephenson, ed., 2001; Heinich, Molenda, Russell & Smaldino, 2002).

Two other theories also support the importance of student activity and engagement, although with a slightly different perspective than constructivism. The social-psychological approach emphasizes the importance of learning in a cooperative, learner-centered environment. The cognitivist perspective postulates how the processing of information occurs. One important part of this processing is assimilation, which results from the active experiences of the student (Heinich et al., 2002). One way that this activity, deemed vital to learning based on all the three learning perspectives, takes place is through the interaction of the student with peers and instructor. Thus, the importance of faculty knowing how to foster this kind of learning in an online environment is essential to the success of the online learning experience. Hence, the need for asynchronous e-learning in Malawi's teacher training programs.

Despite the presence of computers and other e-Learning technologies in the teacher training colleges, most students and trainers do not see the need for ICT and e-Learning because of high dependency on printed material. In this study, therefore, I investigated and examined:

 If asynchronous e-Learning could be possible and desirable for teacher training programs in Malawi.

- The effectiveness of asynchronous e-Learning in teacher training programs in Malawi.
- The benefits and limitations of asynchronous e-Learning in Malawi's elementary school pre-service teacher training programs.

It was expected that the research results would show that:

- Asynchronous e-learning could be possible and suitable type of e-Learning for Malawi based on factors on the ground, and
- Asynchronous e-Learning could be more effective than face-to-face training.

In other words, a learner in asynchronous e-learning can achieve higher grades than in face to face mode. This would be proved by setting the passing mark at 65% for the online participants rather than the traditional 40% passing mark for face-to-face training. I chose 65% as a passing mark in order to set high standards for e-Learning.

# Chapter 2

# Literature Review

The literature on the importance of asynchronous e-Learning in the context of education reform is growing.

#### 2.1 Current research on teacher training through asynchronous e-learning.

Biesenbach-Lucas (2003) in Ajayi (2009) investigated students' perceptions of the efficacy of asynchronous discussion board as a teaching and learning tool in teacher training courses. His findings were mixed. On one hand, students in the study suggested that discussion board offers greater social interaction with other class members (Biesenbach-Lucas, 2003, p. 24) and promote understanding of course content. Conversely, others noted that asynchronous discussion board fails to provide opportunities for additional practice. Piskurich, G.M. (2003, p.266), in the American Management Association (AMA) Handbook of e-Learning, indicates that using asynchronous tools might slow down collaboration although it does not certainly eliminate it, nor does it eliminate the value that working with other people can create. Biesenbach-Lucas (2003) summarizes his findings: "For all students, the two main issues perceived as negative related to their perceptions of forced, unnatural interaction promoted by the asynchronous discussions and lack of topic prompts, the requirement to make connections to prior postings, and the frequency of required contributions to discussions".

#### 2.2 Asynchronous e-Learning and self learning

In this research, more attention has been focused on asynchronous e-Learning. This was based on the time and resources limitations during research activities. Besides, the nature of pre-service teacher trainees (such as holding many responsibilities) was also taken into consideration. Malawi recruits and admits teacher trainees whose age range is between 18 to 40 into the training programs. Some of these trainees are married, working class people and hold various family responsibilities. Tom Kelly in Allison Rossett (2002) observed that people like to argue that e-learning isn't as effective as classroom teaching. But he argues that classroom teaching produces only about 25% retention rate in the first ten days, with a

decline in skill if one doesn't use it. Kelly adds that research findings show equal or better retention with e-Learning. Research findings also show that some e-learners have always troubles with the fact that in e-Learning, all of the instructional material and activities are delivered and performed online (Allison, 2002). They further indicate that these learners would have preferred a paper based manual to go along with the online course (Allison, 2002).

The following are the types of interaction in a learning situation: interaction between participants and learning materials, interaction between participants and instructors/experts, interaction among participants, and management/feedback communication (Allison, 2002). Social interaction is a key element in online courses (Allison, 2002). All these three elements were taken care of during the design and development of the instructional material for my research. The inclusion of in text questions, quizzes, tests within the instructional material promoted interaction between participants and learning material, whereas the use of the Friendster bulletin board and emails facilitated interaction between participants themselves.

Learning is an asynchronous act (Piskurich, 2003). Each one of us learns every dayanytime, anywhere, under a variety of conditions, and with a variety of outcomes. On the other hand, it is also argued that teaching can either be synchronous or asynchronous (Piskurich, 2003), i.e. teaching can occur with groups and individuals, together or apart, all at once, or one at a time. Piskurich (2003) contends that asynchronous e-learning must have the following four basic elements or building blocks: presentation, elicitation, evaluation and collaboration. All these basic components were included in the e-Learning system which was used for this research. Hrastinski (2008) quotes the cognitive model of media choice proposed by Robert and Dennis (2003) which theorises that asynchronous communication increases a person's ability to process information. This is because the receiver has more time to comprehend a message since an immediate answer is not expected. This is different from synchronous e-Learning where the learner is supposed to give an immediate feedback to a question.

Johnson (2006) and Simpson (2006) in Ajayi (2009) observed that asynchronous discussion board is collaborative and interactive and thus opens new opportunities for preservice teachers to learn how to teach in innovative ways. Also Johnson (2007) and Doering and Beach (2002) contend that technology helps students to construct knowledge. Fortunately, asynchronous discussion board facilitates new models of teaching and learning where knowledge is networked in the affordances of people, tools, and technologies. In this regard, Gee (2003, 2007) in Ajayi (2009) argues that rather than teacher-authority, teacher domination, and knowledge transmission that characterize lecture-based approach to teaching, the use of technology facilitates critical learning, distributed knowledge, inquisition, discovery, and creativity for learners. In particular, asynchronous discussion board has the potential to build learning conditions that facilitate equitable participation for all students irrespective of their gender, ethnicity, language, and social-cultural backgrounds (Gee, 2007, 2003). This is one of the reasons why de Smet et al. (2008), Brewer and Klein (2006), van Aalst (2006) and Lim and Cheah (2003) in Ajayi 2009 suggested that there are clear differences between traditional teaching and online instruction.

Traditional instructional practices tend to be authoritative, linear and knowledge transmitted while asynchronous e-learning instruction seems to promote active learning, inquisitiveness, self-directed, self-reflective and analytical learning (Schellens & Valcke, 2006 in Ajayi, 2009). Obviously, there is a very big difference in social relations and participatory structures between traditional instruction and asynchronous e-Learning. For example, while traditional instruction facilitates competitive, face-to-face, and hierarchical kinds of social relation, a discussion board and emails in asynchronous e-Learning promotes dialogue, anonymity, multiple identities, and equality (Gee, 2003). More importantly, the potential of discussion board to support self-reflection, collaboration, and learning anytime and anywhere (Lim & Cheah, 2003) for pre-service teacher trainees is very important and essential in contemporary conception of teaching and learning.

# **Chapter 3**

# **Research Methods**

#### 3.1 Research Design

In this research, both descriptive and quasi experimental designs were employed. The descriptive design involved semi structured paper based interviews (for one to one participants only) and online questionnaires with a sample of participants selected randomly from Kasungu Teacher Training College (refer to Appendix 15). Face to face interviews were also conducted. Participants' reactions and impressions on asynchronous e-Learning feasibility and effectiveness were measured (refer to Appendix 9) and recorded. From the reactions, it was possible to determine how well asynchronous e-Learning would be accepted. Kirkpatrick (1998) observed that measuring reaction helps to ensure participants' satisfaction, motivation, and interest in learning. This will also help in deciding the way forward for asynchronous e-Learning implementation in Malawi teacher training colleges. The participants were also observed when they were interacting with the e-Learning instructional materials to determine their reactions and attitudes.

As for the quasi-experimental design, there was need to investigate if teacher training through asynchronous e-Learning can be more effective than face-to-face mode. Two groups of 40 participants each were set up at Kasungu Teacher Training College. One group went through the usual face-to-face mode of training (control group) and the other group was trained through asynchronous e-Learning (experimental group). Figure 1 below shows a face to face class.



Figure 1: A face to face class

A pretest, a mid course test and a posttest were administered to both online and face to face learners in order to collect quantitative data (refer to Appendices 3, 5, and 16) The mid course test and the posttest results had shown how much learning took place (Suzuki, 2004, chapter 3), and hence, determination of the effectiveness of asynchronous e-learning. The evidence and proof of learning through asynchronous e-Learning was determined by analyzing and comparing the attainments and average net gains of both the control and experiment groups after taking the pretest, midcourse test and posttest (Kirkpatrick, 1998). Both groups (control and experiment) were exposed to the same treatment except for the mode of delivery of the instructional material. In other words, all participants were expected to study the same content and take the same class assignments, and tests.

Katori (2001) in Suzuki (2004) emphasizes the need for an e-Learning community for a successful e-Learning course. So, the group studying through asynchronous e-Learning was required to hold online discussions on a set of questions through Friendster bulletin board and regular emails. They were also allowed to ask questions through the same means. Then a questionnaire was given to the online participants for their impressions and opinions about asynchronous e-Learning. Brewer and Klein (2006) investigated the effect of rewards, roles and affiliation motives in asynchronous learning for undergraduate students. Their findings show that students learn better when the design of an asynchronous discussion board provides an opportunity for students to work collaboratively and interact through asking and answering questions within groups. In this research, participants were given an opportunity to ask and respond to questions through emails and the Friendster discussion board. Schellens and Valcke (2006) examine whether collaborative learning in asynchronous discussion board enhances learning academic discourse and knowledge construction. They conclude that there are significant increases in the cognitive interaction, task-orientation and higher phases of knowledge construction (p. 349) when students use asynchronous discussion board. The two studies suggest a need for educators and instructional designers to provide structures that enhance cognitive interaction among participants.

All face-to-face participants were allowed to hold either pair or group discussions in their classroom during normal lessons.

Later, they were asked to make presentations to the whole class for comments from both other members of the class and the class teacher.

For this research to produce expected results, I tried to motivate both the online and face to face participants. Esque and Mc Causland (1997), in Allison Rossett (2002), defined motivation to learn as the attention and effort required to complete a learning task and then apply the new material to the work site. Learners fall in one of the following two categories when it comes to motivation (Allison, 2002);

- People with an active attitude towards life- these have a strong intrinsic motivation to learn/participate.
- People with a more passive attitude towards life- they lack intrinsic motivation and consequently develop a reluctant approach towards learning/full participation. In this case extrinsic motivation will be a key issue for them to overcome what might appear to them as a barrier to full participation.

Generally, all the participants were motivated because they were informed well in advance that the research instructional material was part of their training program and that grades acquired during the period of the research would be treated as continuous assessment. In other words, the grades which the participants obtained in the course of their participation in the research activities were compiled and submitted to the college assessment committee which will in turn submit them to the national examining body. To create extrinsic motivation for all the participants (both face-to-face and e-Learning participants), the following were also done:

 Show participants real needs- The participants were made to understand and appreciate how the research directly addressed their real needs. For example, possibilities of having learners learn wherever and at any time unlike in the face to face mode where they will have to wait for the instructor. Face to face participants were encouraged to study under this mode (face to face) because the presence of a teacher in their classroom enabled them to get immediate feedback from him/her. The course contained goals with specific standards of performance that could be completed in a short time. The instructional objectives that demonstrated the usefulness of instruction matched with authentic exercises and concrete examples directly related/applicable to their daily struggles within their learning environments were developed. The participants were also made to understand that, with asynchronous e-Learning training put in place, the problem of teacher shortage would be minimized if not eliminated.

- ii. Provision of a conducive environment- I made sure that there was enough support for full participation of all the subjects despite the inadequacy of computers for all participants. The tactics included making sure that all participants had web access despite the small bandwidth of the internet and provision of a quiet place to study (for online participants). For face to face participants, all necessary materials for their learning were provided. For example, text books, handouts, allocation of classrooms, etc. It was ensured that both face to face and e-Learning participants felt it was acceptable or safe to participate in the research even during working (class time) or odd hours. Both college supervisors and managers were well informed about the research activities and their importance.
- iii. Provision of both pull and push strategies- in push strategies, the research activities completion were required and monitored. In other words, an expectation was set and what was expected was inspected. Participants were informed that there would be real-time tracking and reporting of participation using either an LMS or physical observation of activities. A constant and

frequent communication between the participants and me before, during and even just after the research activities were ensured and maintained.

- iv. **Focus on results** All participants were told what they would be able to accomplish by fully participating in the research activities.
- v. **Focus on ensuring success** It was stressed that both the e-Learning and face-to-face instructional materials were designed around situations and needs of people like them, so it would be immediately applicable to them. They were also informed that the e-Learning and face to face courses were structured so that successful completion was well within their capabilities
- vi. **Highlight the topics of interest** even the most reluctant participants might have been more motivated to participate in the research when they knew that a topic which is covered in the regular course was covered online.
- vii. **Maintain a conducive environment** Increased motivation could be directly related to how the participants were impacted by environmental factors, people support, learning design strategy, and ease of use when it came to technology infrastructures. There was an online interaction with peers, and the instructor in an asynchronous way. As for face –to- face participants, a situation was created where they were able to communicate and interact with one another through group discussions and at times pair work. In both cases, participants were required to do assignments and ask questions either to their instructor or peers.
- viii. **Giving legitimate feedback** All the participants (both online and face to face) were given immediate feedback for them to assess themselves how well they were learning the content and performing in the course. The participants needed assertion, assurance and being told that they were doing well.

- ix. **Chunk the information** the e-Learning instructional material were divided into compact, 20 minute or less learning chunks for easy and effective presentation to participants in a digestible fashion. It included a review of prerequisites, an overview of objectives, interactive presentation of new material, job related exercises, and a brief summary. Where possible, the 'need to know' information was separated from the 'nice to know'.
- x. Provide the human touch- An online environment was created where participants had time to chat, email one another, audio streaming and an online mentoring, assignment of learning guides, to keep high learnability standards.

#### 3.2 Research Participants

In this research, a total number of 100 pre-service teacher trainees were involved as participants. These included 81 (81%) male and 19 (19%) female teacher trainees of age range between 18 and 40 years old. All of them were those who had completed senior high school education and passed in Mathematics (Chiwaya, M. et.al, 2007). All were full time trainees and 61 of them indicated that they were married and had children at home. All these participants were computer illiterate. Therefore, there was need to train all participants some simple computing basics. There were no specified criteria for selection of participants as they were randomly selected. Background knowledge and skills in IT was not considered as prerequisite for recruitment in the research activities.

During the research activities, 9 participants (2 one to one, 2 small group, 1 field trial and 4 face to face participants ) dropped out due to various reasons including picking other jobs, illnesses and scoring high marks in the pretest. All participants came from Kasungu Teacher Training College. This research is considered special because the participants involved were real teacher trainees unlike in some researches where simulations are used.

#### 3.3 Instrumentation

The materials used in data collection for this research were questionnaires, observation forms, an e-Learning Mathematics instructional material, and tests (refer to Appendices 3, 5, 13, 14, 15, 16). In order to come up with a good and effective asynchronous e-Learning instructional material, the following procedures were followed: current Mathematics curriculum analysis and review  $\rightarrow$  design/prototyping  $\rightarrow$  instructional material development + expert review  $\rightarrow$ one on one and small group formative evaluation $\rightarrow$  revision (ADDIE Model in Suzuki, 2004, chapter 2). In other words, the first step in coming up with a Mathematics curriculum for training elementary school pre-service teachers. This activity assisted in determining the weaknesses and strengths of the face to face instructional material. This also assisted me in figuring out what should be included in the e-instructional material which was then being developed.

Then, I designed and consequently developed a Mathematics e-Learning instructional material for 5 units based on one topic only. The topic was about 'teaching of numbers and basic addition'. The 5 units included:

- Unit1: Teaching of Pre-number activities
- Unit 2: Teaching of numbers
- Unit 3: Teaching of place values of numbers
- Unit 4: Teaching of addition of whole numbers and
- Unit 5: Teaching of subtraction of whole numbers

Each unit was split into small teachable lessons. The instructional material was uploaded to Free Hostia web server and it could be accessed using the following URL: http://kwerengwe.freehostia.com/main.php

Figure 2 below shows sample pages of the asynchronous e-Learning instructional material.

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Figure 2: structure of e-Learning instructional material

The instructional material went through the design and expert review processes where three subject matter experts for Mathematics were consulted to give their views on the quality of the instructional material. In the design review, I tried to answer the following questions:

- Does the instructional goal match the problem identified in the needs assessment?
- Do the learner and the environmental analysis match the audience?
- Does the task analysis include all the prerequisite skills?
- Are the test items reliable and valid, and do they match the objectives?

The expert review stage involved two teacher trainers (both from Kasungu Teachers Training College) and an instructional material designer at the Malawi Institute of Education. The instructional designer once worked as an elementary school pre-service teacher trainer in Mathematics. The teacher trainers and the instructional designer were involved in this exercise as experts/checkers (Suzuki, 2002, chapter 1) who could provide and offer advice on what could be done to increase usability and quality of the e-Learning instructional material. Figures 3 below shows a Mathematics subject expert reading the asynchronous e-Learning instructional material and later attending to a face to face interview.



Figure 3: subject matter expert Reading Instructional material



Face to face interview with subject matter expert

During the expert review stage, the following questions were taken into consideration;

- Is the content accurate and up-to-date?
- Does it present a consistent perspective?
- Are examples, practice exercises, and feedback realistic and accurate?
- Is the pedagogy consistent with current instructional theory?
- Is the instruction appropriate to the audience? (Refer to Appendix 16, for the checklist)

The one-to-one and small group formative evaluations were done within the last two weeks of October, 2009. After these two important stages, the instructional material was then fully implemented (field phase trial) as follows: all e-Learning and face to face participants were asked to take an entry and a pretest before they started studying their respective courses. The entry test had 20 multiple choice questions and the pretest had 22 items with both multiple choice and free response questions (refer to Appendices 7 and 16). Then each group (control and experiment) was allowed to start their respective courses. Face to face learners were taught in class by an instructor and e-Learning participants studied online. In both cases, quizzes, midcourse test and a posttest were administered (Ingram and Hathorn, 2003 in Suzuki, 2004, chapter 9). The midcourse test had 14 multiple choice questions whereas the posttest had 18 multiple choice questions and 4 structured questions (refer to Appendices 3 and 5). All these initiatives were made because findings emphasise that using true/false or multiple choice responses only is not encouraged in higher educational

environments (Hettiarachchi, E). Moreover, there is some evidence that on-line assessment, unless carefully planned, can encourage students to focus on lower level cognitive skills. The educational effectiveness of on-line assessment that concentrates primarily or exclusively on true/false or multiple choice responses, for example, is highly questionable in a higher education environment. As is widely known, such approaches to assessment can have direct negative effects on learners' approaches to learning by encouraging narrow reproduction rather than the development of higher order cognition that involves, for example, critical evaluation.

For the online instructional material, in text questions were also provided with answers hidden within the passages. The main reason for inclusion of in text questions was to provide a situation similar to face to face teaching where a teacher may ask questions to learners during a lesson presentation in class. Audio and video clips were embedded into the e-Learning instructional material to make it equivalent to face to face learning. Figure 4 below shows an online participant watching and listening to a video clip.



Figure 4: An online participant listening to and watching a video clip while studying

The e-Learning instructional material was divided into 15 one hour self-study lessons. Besides tests, survey questionnaires, and observation forms were also designed and developed (refer to Appendices 14 and 15). For the validity and reliability of the test items and the quizzes, views from three Mathematics subject experts were sought. Their recommendations and suggestions were taken into consideration on the improvement of the test/quiz items. A grade of 65% or above was regarded as a pass for each group of participants. A Friendster bulletin board was identified through which the online participants were able to send assignments, ask and answer questions, and make comments on their friends' work. While the face to face participants were allowed to hold pair or group discussions, ask questions during lesson presentations and send their assignments on paper. All group discussions were assessed by the class instructor.

The learning content was the same in both face to face and e-Learning courses. The difference was the mode of their delivery. Face to face participants were given text books to study outside class. The learning content had text information, pictures or diagrams, and questions within the text. They were also given quizzes to practise but these were marked or checked by the instructor.

Face-to-face lessons and the e-Learning course were facilitated by the same instructor who is also the author of this thesis. Rooms for operation of the asynchronous e-Learning course were computer laboratories. This decision was made because these facilities were not oftenly used by the other college teacher trainees. Most of the times, the computer laboratories are idle. This is so because in Malawian teacher training programs, computer literacy education is not a priority. In other words, teacher trainees are encouraged to visit computer rooms after working hours which is mostly at night. So, taking this scenario into consideration, it was felt that the computer laboratories would be the ideal places for the e-Learning course implementation for two main reasons:

- There would be minimal or no interference at all in the course operations.
- They were suitable for operation of the e-Learning course since the study would need the use of computers.

As for the face to face lessons, they were carried out in the classrooms which were allocated by the college authorities.
As a way of ensuring success of the research activities, the e-Learning instructional material was delivered to and accessed by participants using the internet (wide area network). All online participants were required to log in using User IDs and password in order to get access to the instructional material. In this case, each online participant was given a user Id and a password different from his/her friends'. Figure 5 below shows participants logging into the e-Learning system.



### Figure 5: participants logging into the e-Learning system

The e-Learning system had a Learning Management System (LMS) which had the following functionalities: recording learning duration for each participant, marking each learner's multiple choice answers, showing the learners' grade and advising him/her what to do, keeping a summary of all test grades for each participants and showing a summary of performance for each test item (refer to Appendices 2, 4, 6, and 8).

#### 3.4 Asynchronous discussion board

This study ran for one and a quarter months – 5 weeks, i.e. from 20<sup>th</sup> October to 25<sup>th</sup> November, 2009. The course instructor (also the author) prepared the students to use an asynchronous discussion board on Friendster bulletin board by first introducing them to the software, its capabilities and how its range of functions was specifically adapted for the purpose of the classes. An asynchronous discussion board is a web application for holding discussions and user-generated content. Discussions are grouped in threads that contain a main posting and all related replies. For example, when a student posts a question, it appears in the main thread and subsequent responses will be indented under the thread.

Typically, each posting may have multiple indented threads as responses to the original question. Students can post questions and responses at any time. There is, therefore, no time constraint on users. Also, students can navigate the postings in nonlinear order (Mabrito, 2006, in Ajayi, 2009). In this way, it allows students to deliberate, reflect, and simultaneously utilize other resources (texts, tools, people, and other technologies – websites), thus promoting active and critical learning (Biesenbach-Lucas, 2004, in Ajayi, 2009). It also allows students, when used regularly, to develop a sense of virtual community.

The integration of a discussion board into the course was designed to facilitate an engagement with course content as well as provide the participants a space for a social relation and collaboration. Figure 6 shows some participants using the asynchronous discussion board on Friendster bulletin board.



Figure 6: participants using Friendster bulletin board for postings and commenting on their colleagues' work.

All online participants logged onto the Friendster bulletin board to reflect and discuss their perceptions of the topics covered during their studies. Each participant (a) posted a question about topics covered in the course, (b) posted a response to another participant's question, (c) postings addressed course related topics, and (d) postings discussed and reflected critically on their perceptions of learning.

The structured nature of the assignment was to facilitate a productive social interaction by ensuring that the participants engage in in-depth discussions rather than random postings. On weekly basis, the course instructor read the postings, provided comments and graded them as one way of motivating the participants. The grades formed part of their continuous assessment as per requirement. The instructor's comments were designed to provide additional ideas and concepts on different topics. All the threads were available to the participants to view throughout the research period.

### 3.5 Procedures

Data collection took place from 20thOctober – 25<sup>th</sup> November, 2009 for the 2009/2010 Malawi academic year. The research activities were split into three phases of formative evaluation. These three phases were; one –to- one, small group and field trials. (Dick and Carey, 1991, in Morrison and Ross, 2007). One-to-one trials occurred during the process of development of the instructional material. This exercise was done in order to try out the instructional material with individual learners (Brenneman, 1989, in Morrison and Ross, 2007, Suzuki, 2002). The goal was to obtain descriptive information pertaining to the clarity, impact and feasibility of initial versions of the instructional material. A total number of 8 individual participants were involved in the one-to-one formative evaluation. They included high, average and low achievers in class. Main measures of this task included observations, survey questionnaire and interviews with the participants.

The small group trial also consisted of 8 participants (Morrison and Ross, 2007). In this exercise, a more developed version of the instructional material was used. Through observational, attitudinal and performance data, it was possible to identify the weaknesses and strengths of the instructional material before it was put in the final form. Rosen (1986) and Rothkipf (1963) observed the following weaknesses with instructions ;(i) teachers/trainers are not good predictors of the effectiveness of instructional content. (ii) Instructional Theory is not a perfect science. (iii) Few instructional products are ever evaluated with learners.

During the small group phase, the participants were allowed to study the instructional material, do all tasks within the instructional material and then evaluated. Figure 7 below shows participants studying online.



Figure 7: participants studying online

They also included low, average and high class achievers. At this stage, Mathematics subject expert view was also sought where one instructor at Kasungu Teacher Training College and an instructional designer from Malawi Institute of Education were involved. These were picked from the Mathematics department. The subject matter experts were asked to look at the instructional material and all tests to determine both the weaknesses and strengths of the instructional material.

The third stage was the field trial which examined the use of the instruction with full sized learner group under realistic conditions. The main measures were performance and attitudes. A total of 80 pre-service teacher trainees were involved at this stage. Before the start of data collection exercise, two groups of 40 teacher trainees each were set up. The participants were then briefed and oriented on procedures of the research and asynchronous e-Learning as a mode of training. Figure 8 below shows field phase participants being oriented on the research activities.



Figure 8: Participants being oriented to research activities

Then arrangements were made that one group of participants should use the e-Learning Mathematics instructional material and the other group to learn the same instructional material through face-to-face mode. This was followed by interviews which sought to solicit online participants' attitudes towards and impressions on asynchronous e-Learning, i.e. to understand participants' opinions of asynchronous e-Learning. The interviews were done online. Most of the questions were structured for controllability with regard to time and content. Very few questions were open-ended. Open ended questions had been included so that learners' feelings and the reasons for them on asynchronous e-Learning would be obtained (refer to Appendix 13) The close-ended questions consisted of a longer list of alternatives from which the participants would be checking interesting or important choices or rating the alternatives on a numerical scale.

All participants were observed as they were using the e-Learning instructional material. Similarly, students learning through face-to-face mode were observed. Observing participants during interaction with the e-Learning instructional material provided information about participants' attitudes towards the e-Learning mode of delivery.

Four instruments were used to collect data for the study. They were: (a) students' postings on the discussion board: this included the weekly posted questions, answers and comments. (b) Interviews: students were interviewed regarding their experiences using discussion board and the e-Learning instructional material, (c) written reflection: each participant answered free response questions to give their perceptions regarding the eLearning mode of delivery and the impact of discussion board as a tool of learning to teach, and (d) tests. Assignments pertaining to discussion board carried 20 points. Face to face interviews with the participants took place at an open place towards the end of the research activities. Figure 9 below shows some of the online participants attending face to face interviews.



Figure 9: face to face interviews with online participants

The interview questions were based on the theoretical framework proposed by Gee (2007) in Ajayi (2009) that tools and technologies mediate learning and that technology is a product and process of socially dynamic relations (Davies, 2006, p. 219) that promotes:

- Active learning by promoting reflection
- Learning as a social practice involving shared practices, interaction, and collaboration
- Dialogue between students and between students and faculty
- Freedom, autonomy, and flexibility
- Different types of knowledge.

Both the asynchronous e-Learning and face-to-face participants took the same assignments and tests under the same conditions. The test items were both multiple choice and structured questions.

The evidence and proof of asynchronous e-Learning effectiveness was collected from a summary of students' feedback, ratings of asynchronous e-Learning, performance/assessment results, records of observations of learners' behaviour, and

department evaluations of the instructional material (refer to Appendices 2 and 16). Effectiveness answers the question, "To what degree did the students accomplish the learning objectives prescribed in the course?" Both face to face and the asynchronous e-Learning participants took an entry test, pretest and a posttest (Suzuki, 2002, Chapter 3).

A passing mark of 65% for those participating in asynchronous e-Learning against the traditional 40% for face to face learners was set in order to determine whether asynchronous e-Learning can be more effective than face-to-face mode. The scores obtained were displayed on frequency graphs or histograms for easy analyses. Then, the net gains in both asynchronous e-Learning and face to face learning were compared and analysed.

Whilst doing the study, documents and information on Malawi's teacher training education system and ICT infrastructure was also collected. The information collected assisted in determining the challenges faced by the Malawi education system and hence, determine if asynchronous e-Learning could be most suitable type of e-Learning for teacher training in Malawi.

The data set was, therefore, constructed from multiple sources which included:

- A series of observations of the online participants. Each observation lasted for over one hour, and extensive notes recorded. Some online participants were given a copy of the notes along with an evaluation form on which they were asked to evaluate the accuracy of the evaluations.
- A series of one hour-long online questionnaire were conducted over the period of the study to each asynchronous e-Learning participant.
- Reports from asynchronous e-Learning participants only (experimental group) and Mathematics subject experts about asynchronous e-Learning.
- Both online and face to face participants' (teacher trainees) assessment data.
- One to one asynchronous e-Learning participants were given paper based questionnaires (refer to Appendices 1, 7, 13, and 14).

In this research, both qualitative and quantitative data was collected. The qualitative (involving impressions) data was collected by use of observation of participants in the course of using the e-Learning instructional material, interview responses and open-ended survey questionnaire responses. Quantitative (involving numerical indices) data was collected by use of tests and closed-ended survey questionnaires.

## Chapter 4

### Data and analyses

## 4.1 Types of collected data

Data in this study are both qualitative and quantitative which consist of written documentation collected from pre-service teacher trainees, records of the instructor (the author) made after several online lesson observations, interviews with participants and test score results (refer to Appendices 2, 3, 7 and 15). The data were collected from the following groups of participants: Mathematics expert reviewers, one to one, small group, experimental (field trial) and control groups.

A discussion of qualitative data analysis will be given first followed by quantitative data analysis in sections 4.2 and 4.3 respectively.

Analysis of the data set consists primarily of tabulation of quantitative data such as the test scores and rating scale, and content analysis of qualitative data (interviews, written responses, and video clips). Data were coded according to a matrix that was developed to help focus the analysis on four general areas: a) context variables, or "What was going on during asynchronous e-Learning studies?"; b) process variables or "What were the participants actually doing as evidenced by classroom practices; and c) outcome variables or "How the participants had changed as a result of online studies. (d) Interactivity – when the participants' responses confirmed, appreciated, challenged or learned from others' ideas or positions ".

Data were compressed, integrated, and written into interim case summaries which included descriptive, narrative and direct quotes (Erickson, 1986) in Ajayi (2009). The following were the research findings based on qualitative data:

### 4.2 Qualitative data analysis

Qualitative data consist of data set collected from one to one, small group, and field trial (experimental) participants. These were obtained through questionnaire surveys, observing the participants and holding discussions with them about the quality and effectiveness of

the instructional material and the mode of delivery. An asynchronous discussion board was also used in data collection.

### 4.2.1 One to one formative evaluation results

One-to-one formative evaluation occurred during the process of development of the instructional material. This exercise was done in order to try out the instructional material with individual learners (Brenneman, 1989, in Morrison and Ross, 2007, Suzuki, 2002). The goal was to obtain descriptive information pertaining to the clarity, impact and feasibility of initial versions of the instructional material. Data was collected through discussions, survey questionnaires and participants' reports. Figure 10 below shows the instructor holding discussion with one to one formative evaluation participants about the quality and effectiveness of the asynchronous e-Learning instructional material and its delivery mode.



Figure10: instructor holding discussions with one to one participants.

Appendices 14 and 15 show the instrumentations that were used in the one to one formative evaluation. Table 2 below shows the responses given by one to one formative evaluation participants about their opinions and impressions on quality of instructional material and asynchronous e-Learning effectiveness.

 Table 2: One to one formative evaluation summary results

Question /response		Somehow	No	Not
				sure
Was the time adequate for learning this material?	1	2	5	0
Were the examples given relevant to the	7	0	1	0

content and course objectives?				
Were the examples adequate enough to make you learn comfortably?		1	2	0
Did the examples and explanations clarify concepts and new ideas?	5	3	0	0
Did you find this material helpful enough to assist you teach numbers and basic operations comfortably and effectively?	5	1	2	0
Would you rate this material as good enough for self –learning?	4	3	1	0
Were explanations clear enough to make you learn without problems?	5	2	1	0
Was the language used in this material appropriate for self learning?	7	0	1	0
Did you face any problems with this instructional material?	3	3	2	0
Does the content meet all the learning objectives	3	2	3	0

Note: 1, 2... 7= number of participants (out of 8) in the category

## Responses to survey questionnaire

Item/response	Strongly agree	Agree	Disagree	Strongly disagree	Undecide d
An asynchronous e-Learning course will be more convenient for me than a traditional classroom course.	2 (25%)	5 (62.5%)	1 (12.5%)	0	0
Taking an e-learning course will give me more flexibility than a traditional classroom course	3 (37.5%)	5 (62.5%)	0	0	0
There is higher interactivity in asynchronous e-Learning with fellow students as well as lecturers than in face to face mode	1 (12.5%)	3 (37.5%)	3 (37.5%)	0	1 (12.5%)
After the asynchronous e- Learning course, I will need an instructor to teach me the same content.	1 (12.5%)	2 (25%)	4 (50%)	1 (12.5%)	0
I expect anybody learning through this mode to perform better than one doing face to face	2 (25%)	2 (25%)	3 (37.5%)	0	1 (12.5%)
If I continued learning using asynchronous e-Learning, my performance in class would improve.	2 (25%)	5 (62.5%)	1 (12.5%)	0	0
Given the chance to choose the mode of training, I would go for asynchronous e-Learning	2 (25%)	5 (62.5%)	1 (12.5%)	0	0
I like asynchronous e-Learning	3 (37.5%)	2 (25%)	3 (37.5%)	0	0

because it gave me a lot of opportunity to make contributions during the learning process.		

## Note: 1, 2... 7= number of participants (out of 8) in the category

The one to one participants indicated how they rated asynchronous e-Learning as follows:

## To what extent would you recommend this type of learning to friends?

2 (25%) said they would recommend it to their friends as excellent, 4 (50%) said it is good and 2 (25%) said it is average.

## How do you rate the e-Learning mode of delivery?

3 (37.5%) rated it as the best, 4 (50%) said it is good and 1 (12.5%) rated it as average.

## How effective is this mode of training?

Out of 8 one to one participants, 7 (87.5%) felt the asynchronous e-Learning effectiveness is good and 1(12.5%) said it is average.

In addition to these responses, the following statements were also produced by one to one participants in their reports about asynchronous e-Learning:

"This method of learning is very good because the learner uses his or her knowledge when dealing with work given to do and this also improves the thinking capacity of a learner."

"Yes, I liked the asynchronous e-Learning course, because it is faster than face to face in that I have learnt a lot of things for a short period of time. For example, prenumber activities, just to mention a few."

### 4.2.2 Observations made during and after one to one formative evaluation

The one to one phase revealed (through observation) that most participants had shown positive attitudes and interest in e-Learning. This was shown by their enthusiasm to study online. Most of them requested to continue studying even if it was past midnight. The participants acquired the following knowledge, skills, and attitudes during the training: Basic IT skills, teaching of numbers and basic operations, participating in discussions online, interacting with each other and instructors online, and respecting each others' views. They also developed confidence that people can learn through a computer.

There was very high participation by almost all participants despite electricity and internet problems. However, few one to one participants asked questions both to their fellow students and the instructor. A discussion board was instituted. Participants were also allowed to post questions on the discussion board.

The one to one participants' interests in the asynchronous e-Learning lessons were on the following features: Layout of instructions, quizzes with immediate feedback, and interacting with fellow participants. The quality of their participation was rated as very high. Contributions made were positive and highly assisted them to improve their thinking ability.

Despite all these positive developments, I observed that my organization is not yet ready for e-Learning. This was evidenced by the following factors: all instructors are almost computer illiterate, the institution has many computers but with a very small internet bandwidth which can accommodate about five computers only. Funding and policies for e-Learning activities are not there. The college managers feel e-Learning is costly as opposed to paper-based instructional materials. However, individual learners are ready for e-Learning. This was evidenced by participants' enthusiasm to continue learning through e-Learning. Some of them said they could be happy if they were given a chance to learn through online.

Despite the above factors about my institution, asynchronous e-Learning is still best suited to my organization and to its learners. My argument is based on the following reasons: the institution has computers and an internet connection although not very reliable, cannot

accommodate all students who apply for teacher training courses, and most learners had shown great interest in e-Learning.

During the observation exercise, the one to one participants sought clarifications on computer operations and how they could view and send mails and /or postings from and to fellow participants. As for the instructional material, majority indicated that they did not have any problems with the language, quizzes and the examples given and that there was adequate information to enable self-learning go on smoothly. However, some participants suggested that some lessons needed enough examples, pictures, and additional information so that learners could find it easy to learn on their own. All participants who required and asked for assistance on operating a computer were shown how to do it. In very few cases, some participants sought for clarification of certain concepts and they were assisted immediately. Figure 11 below shows instructor observing and assisting participants who may have technical problems with the e-Learning system.



Figure 11: instructor observing participants while studying online.

### 4.2.3. Results from small group formative evaluation

In the small group formative evaluation, a more developed version of the instructional material was used. Through observational, attitudinal and performance data, it was possible to identify the weaknesses and strengths of the instructional material before it was put in the final form. Data was collected through observations, survey questionnaires and reports on the asynchronous discussion board. Most small group participants felt the

instructional material was far much better for self learning, and consequently suggested that there was no need to modify any part of the instructional material. However, very few participants suggested the following: addition of more pictures, examples, notes and correcting some typos in the text of the instructional material. Most participants had shown easiness in using the instructional material. This was shown as most learners completed the course without asking any question for clarification despite my presence all the time. The only questions that I received were those concerning computer operations.

Question /response		Somehow	No	Not
				sure
Was the time adequate for learning this material?	5	2	0	1
Were the examples given relevant to the content and course objectives?	7	1	0	0
Were the examples adequate enough to make you learn comfortably?	6	2	0	0
Did the examples and explanations clarify concepts and new ideas?	8	0	0	0
Did you find this material helpful enough to assist you teach numbers and basic operations comfortably and effectively?	5	2	0	1
Would you rate this material as good enough for self –learning?	6	2	0	0
Were explanations clear enough to make you learn without problems?	5	2	1	0
Was the language used in this material appropriate for self learning?	7	0	1	0
Did you face any problems with this instructional material?	1	3	4	0
Does the content meet all the learning objectives	3	4	0	1

Table 3: Small group formative evaluation summary results

Note: 1, 2... 8= number of participants (out of 8) in the category

## Responses to survey questionnaire by small group participants

Item/response	Strongly	Agree	Disagre	Strongly	Undecide
	agree		е	disagree	d
An asynchronous e-Learning					
course will be more convenient for	3 (37.5)	3	1	1	0
me than a traditional classroom		(37.5	(12.5%)	(12.5%)	
course.		%)			
Taking an e-learning course will					
give me more flexibility than a	4 (50%)	4	0	0	0
traditional classroom course		(50%)			
There is higher interactivity in					

asynchronous e-Learning with fellow students as well as lecturers than in face to face mode	0	4 (50%)	3 (37.5%)	1 (12.5%)	0
After the asynchronous e-Learning course, I will need an instructor to teach me the same content.	0	3 (37.5 %)	5 (62.5%)	0	0
I expect anybody learning through this mode to perform better than one doing face to face	2 (25%)	5 (62.5 %)	1 (12.5%)	0	0
If I continued learning using asynchronous e-Learning, my performance in class would improve.	4 (50%)	3 (37.5 %)	0	1 (12.5%)	0
Given the chance to choose the mode of training, I would go for asynchronous e-Learning	4 (50%)	3 (37.5 %)	0	0	1 (12.5%)
I like asynchronous e-Learning because it gave me a lot of opportunity to make contributions during the learning process.	3 (37.5%)	3 (37.5 %)	0	1 (12.5%)	1 (12.5%)

Note: 1, 2... 5= number of participants (out of 8) in the category

The Small group participants also answered the following questions to get their opinions and impressions about asynchronous e-Learning:

## To what extent would you recommend this type of learning to a friend?

3 (37.5%) participants said they would recommend it as excellent, 4 (50%) said it is good

and 1 (12.5%) said is it average. None said it is poor.

## How do you rate the e-Learning mode of delivery?

4 (50%) rated asynchronous e-Learning as the best, 2 (25%) said it is good and 2 (25%)

said is it average. None of the small group participants rated it as poor or very poor.

## How effective is this mode of training?

Out of the 8 small group participants: 3 (37.5%) said it is excellent, 3 (37.5%) said it is good,

1 (12.5%) rated it as average and 1 (12.5%) said it is very poor.

#### 4.2.4. Results from Mathematics Expert reviewers

There was an expert review exercise of the instructional material by three Mathematics subject experts. The mathematics expert reviewers were given the instructional material to study and later make recommendations and suggestions for improvement. The following was their combined report on the instructional material and the e-Learning system:

- Strengths of the instructional material inclusion of background information, proper organization of the content, well formulated and laid out procedures, well formulated questions for exercises, quizzes and tests, relevant information according to the teacher training curriculum and the vocabulary used was to the level of the participants.
- Weaknesses of the instructional material- very few and minor ones such as the phrase 'pre-number activities' not defined, there was no mention of the relationship between sorting out and classifying objects in pre-number activities lesson, the number 4 was not properly introduced so that it would be difficult for learners to introduce big numbers such as 12, teaching of writing of numbers not properly followed and all specific objectives should have the word 'must' instead of 'should'.
- Suggestions for improvement- all three indicated that the instructional material was okay but suggested the following; inclusion of meaning of pre-number activities in the concerned lesson, relationship between sorting out and classifying objects be clarified, and to use add on method when introducing the numbers 4, 5, ... and upwards.

Based on the responses of the one to one, small group formative evaluation participants, and the Mathematics subject experts provided, no major changes and /or modifications were made to the instructional material. The only changes which were made were correction of typos and grammatical errors, adding pictures and little more information to some parts of instructional material and refining content on how numbers from 4 onwards can be introduced.

### 4.2.5 Field trial (experimental) phase results

The field phase trial was the main part of the study. This is where a full implementation of the asynchronous e-Learning instructional material was done under normal conditions. 40 participants were involved in the field phase study. Data was collected through survey questionnaires, discussions and reports from participants.

This research mainly focused on the feasibility and effectiveness of asynchronous e-Learning in teacher training programs. It tried to answer the following questions:

- Why is the research I want to conduct important and unique?
- What are the pre-service teachers' views of asynchronous e-learning as a tool for learning to teach?
- What are the participants' perceptions of the kinds of learning opportunities afforded by asynchronous discussion board instruction?
- What are the participants' views of the contribution of other students to the learning process in asynchronous discussion boards?
- Are e-mail and forum facilities a fair substitute for face to face interaction?
- What are the advantages of asynchronous e-Learning in Malawian scenario?
- What are the special factors to consider when facilitating interaction in an asynchronous environment?
- What are the barriers to facilitating interaction in an asynchronous environment?
- What are the disadvantages and limitations of asynchronous e-Learning in Malawi?
- What are the anticipated problems students may face once e-Learning is introduced in teacher training colleges in Malawi?
- What features will make the e-Learning materials attractive to students?
- How can asynchronous e-Learning be effective in teacher training programs in Malawi?
- What kind of support will asynchronous e-Learning participants require?
- Who/what will decide the effectiveness of an e-Learning material?

To obtain participants' opinions and impressions about asynchronous e-Learning, the following questionnaire (Appendix 13) was given to all online participants and their responses were recorded as follows:

## Item 1: Taking an e-learning course will give me more flexibility than a traditional classroom course.

Out of a total of 39 field phase participants, 16 (41%) strongly agreed, 17 (44%) agreed, 4 (10%) participants disagreed, and 2 (5%) strongly disagreed that an online course would give them more flexibility to learn than in face to face. Figure 12 below shows the experimental group's response over flexibility in asynchronous e-Learning.



Figure12: experiment group's responses on asynchronous e-Learning flexibility

## Item 2: An asynchronous e-Learning course will be more convenient for me than a traditional classroom course.

11 (28%) participants strongly agreed, 21 (54%) agreed, 7 (18%) disagreed and none strongly disagreed that asynchronous e-Learning is more convenient for them than face to

face mode of delivery. Figure 13 below shows a summary of the field trial (experiment) participants' responses about convenience in asynchronous e-Learning.



Figure 13: participants' responses about convenience in asynchronous e-Learning

# Item 3: There is higher interactivity in asynchronous e-Learning with fellow students as well as lecturers than in face to face mode.

4 (10%) participants strongly agreed, 11 (28%) agreed, 19 (49%) disagreed, 2 (5%) strongly disagreed and 3 (8%) were undecided about higher interactivity in asynchronous e-Learning than in face to face. Figure 14 below shows a summary of the experimental group's views on interactivity in asynchronous e-Learning.





## Item 4: After the asynchronous e-Learning course, I will need an instructor to teach me the same content.

3(8%) participants strongly agreed, 14 (36%) agreed, 19 (48%) disagreed and 3 (8%) strongly disagreed. The experimental group's opinions on whether an instructor will be required or not after an asynchronous e-Learning course are shown in figure 15 below.



Figure 15: participants' opinions on whether instructor is required or not after asynchronous e- Learning

## Item 5: I expect anybody learning through this mode to perform better than one doing face to face

In this category, 12 (31%) participants strongly agreed, 15 (38%) agreed, 8 (21%) disagreed, 1 (3%) strongly disagreed and 3 (8%) were undecided that anybody learning through asynchronous e-Learning can perform better than in face to face mode of training. Figure 16 below shows the responses given by the field trial participants about performance in asynchronous e-Learning.



Figure 16: participants' responses on whether asynchronous e-learners can perform better than face to face learners.

Item 6: If I continued learning using asynchronous e-Learning, my performance in class would improve.

Of the 39 field trial participants, 13 (33%) strongly agreed, 20 (51%) agreed, 5 (13%) disagreed and 1 (3%) was undecided whether their performance would improve if they continued with asynchronous e-Learning. Figure 17 below shows summary of the experimental group's views on improvement of performance if they continued studying through asynchronous e-Learning.



Figure 17: experiment participants' opinions on whether their performance would improve or not if exposed to asynchronous e-Learning.

# Item 7: Given the chance to choose the mode of training, I would go for asynchronous e-Learning

13 (33%) participants strongly agreed, 20 (51%) agreed, 5 (13%) disagreed and 1 (3%) was undecided whether they would go for an asynchronous e-Learning training or not if given the chance to choose the type of delivery mode. Figure 18 below shows a summary of experiment group's responses.



Figure 18: participants' opinions on whether they would choose asynchronous e-Learning or not if given the chance.

## Item 8: I like asynchronous e-Learning because it gave me a lot of opportunity to make contributions during the learning process.

Responses given were as follows: 13 (33%) participants strongly agreed, 15 (38%) agreed, 11 (28%) disagreed that asynchronous e-Learning gave them a greater opportunity to make contributions during the learning process. Summary of the field group participants' views and impressions about having a lot of opportunities for them to make contributions during learning are shown in figure 19 below.





## Item 9: To what extent would you recommend this type of learning to a friend?

On the extent to which the participants would recommend asynchronous e-Learning to a friend, the following were the results; 13 (33%) said asynchronous e-Learning is excellent, 16 (41%) felt it is good and 10 (26%) said it is average. A summary of the experimental group's opinions on whether they would recommend asynchronous e-Learning to their friends is shown in figure 20 below.



Figure 20: shows how participants would recommend asynchronous e-Learning to their colleagues.

## Item 10: How do you rate the e-Learning mode of delivery?

On rating of asynchronous e-Learning as a mode of delivery, the following views were given: 14 (36%) participants rated it as the best, 15 (38%) rated it as good, and 10 (26%) said it is average and none said it bad. Figure 21 below shows summary results of the field group participants' rating of asynchronous e-Learning.



#### Figure 21: Participants' rating of asynchronous e-Learning.

### Item 11: How effective is this mode of training?

Finally, on participants' impressions about asynchronous e-Learning effectiveness as a mode of training, the following were their responses: out of 39 participants, 8 (21%) said its effectiveness is excellent, 22 (56%) said it is good and 9 (23%) felt it is average. Figure 22 below shows the summary results of the experimental group's opinions about asynchronous e-Learning effectiveness.



Figure 22: experiment group participants' impressions about asynchronous e-Learning effectiveness

#### 4.2.6 Discussion of the qualitative data analysis

An analysis of the qualitative data (refer to section 4.2.5 and Appendix 13) revealed that majority of participants was impressed with asynchronous e-Learning. Data to substantiate this observation was collected through survey questionnaires, discussions and participants' reports on the asynchronous discussion board. It was also found out that the

participants acquired a lot of knowledge and skills from their studies. From the participants' comments and reports, I found out that the following skills were acquired: technological, teaching, participatory, critical thinking, and respect of each other's opinions. The following comments from participants substantiate my arguments above:

#### i) Technological skills

The following comments imply that the participants acquired basic IT skills from their studies through asynchronous e-Learning:

"My feelings and general impressions about asynchronous e-Learning is that I wish if I could use this type of learning throughout my life so that my life could benefit a lot from this type of learning since it involves the use of technology which is now popular nowadays."

"I have felt happy to be one of the people using e-Learning and this method is good compared with other methods."

"And it improves knowledge and skills of computer to a learner since there are learning of two things at once."

"I also had a chance to widen my knowledge on how to use a computer."

"Besides learning the course, learners are also imparted with the knowledge and skills of computer since they are learning using computers."

"I like this e-Learning course and the reason is: learning through a computer or through a website encourages seriousness and makes a person to pay more attention than in class and increases knowledge of a computer to match with modern world."

"Yes, because it exposes the learner to a wide range of communications through e-mails and it also helps the learner to understand the world technologically since most of the information providers use computers."

"Yes I would recommend this mode of delivery because, first: learning is simple and one cannot quarrel with teacher while learning and it also promote knowledge of computer."

"Yes. This is because the mode is faster and attractive if not obstructed by the failure of the network (internet). Again, because we are living in the World of technology, learners should

therefore be trained to use computers as part and parcel of education which can lead to the development of the nation socially."

"Yes I would recommend this mode of delivery to a friend because of the following reason: In order for all of us to be technologically advanced."

"Knowing mathematics and computer operation at once."

### ii) Teaching skills

Some participants' reports and comments revealed that basic teaching skills were also acquired. The following were direct quotes from some participants' reports:

"YES! I like this e-Learning course, because I have a confidence that I can apply the knowledge and skills, if I can continue learning this course."

"My feeling is that I have learnt more things and so it is good."

And I feel to have more chance of learning a lot through this mode of training.

"Assuredly I would recommend this mode of delivery to a friend. I am saying this because I learned clearly through this course. For example I have seen and learnt the proper steps of teaching pre-numbers, introducing numbers and place values and since then I know them clearly through this course."

"Yes, I liked the asynchronous e-Learning course, because it is faster than face to face in that I have learnt a lot of things for a short period of time. For example, prenumber activities, just to mention a few."

#### iii) Participatory skills, autonomy and respect of each other's opinions

The participants also acquired participatory skills and developed autonomy as well as respect for each other's opinions during the process of their study of the asynchronous e-Learning instructional material. This assertion has been made on the basis of the participants' statements which are guoted below:

"Since a discussion on the bulletin board is done on a computer and not face-to-face, there is less intimidation of expressing myself compared to sharing my concerns during a whole class discussion."

"Bulletin board was a great way to read people's different perspectives or ideas about assigned questions. Many times . . . I noticed that my ideas were different from others which was great because it helped me think of things differently which made me grow as a pre-service teacher trainee."

"Shy learners can participate without shame e.g. asking questions."

"I like discussion board because it allowed us to work with, contribute to one another and share thoughts and ideas freely."

"Another thing I learned from the discussion board was to respect others' thinking. When I read questions from classmates, I understood them. I appreciated their beliefs and feelings towards education."

"I used to think that the teacher was the only one who has all the right answers, but now I know that I can also learn from my colleagues."

"Usually, when you attend classes in schools, you do not get a chance to talk to many people from your class. Even though I did not talk to some of my classmates face-to-face, I talked to them through the bulletin board. . . I connected with many of the peoples' questions and answers. It helped me think I was not alone in my studies.

"Yes. It's so because teaching deals with sharing with others."

"It better to use this mode of e-Learning since learners are fully participating."

"A learner is fully participating in the lesson."

"Learning takes place even when there is no teacher."

'This is because student teachers will be able to interact with their teacher in terms of learning even if he/she is away thus increasing the number of teachers.'

"I need not to be in a classroom all the time."

"It is good because the learner is able to do the work on his/her own and freely."

Learners can learn at their own time or any time provided the internet is there

"It is important because I can learn where there is no teacher beside that I can be resourceful getting learning resources on my own."

### iv) Critical thinking

During the follow up interviews, majority of participants indicated that asynchronous e-Learning assisted them to develop critical thinking skills. The following are some of the statements and comments made by some participants:

"The course promotes critical thinking to learners since it needs only listening and reading then applying knowledge. The subject was brought in phases and allowed a person to go to another phase only if one has passed the test. So if one completes the whole course it means that he or she has indeed mastered what has been learnt."

"Yes, it gave me an opportunity to read the notes and interpret in my own views. The test gave me enough confidence that I can work using my own understanding."

"I like asynchronous e-Learning because I was using my own understanding of the information displayed on the computer."

"I would recommend to my friend because it can assist learner to develop critical thinking and reasoning capability."

"It is friendly as it is promoting self reliance to students. There is no favouritism or discrimination during the learning process."

"It encourages individual work rather than group work which is common in face to face mode of delivery."

"This method of learning is very good because the learner uses his or her own knowledge when dealing with work given to do and this also improves the thinking capacity of the learner."

"It is good because it makes a learner to think critically on tasks given other than just relying on a teacher all the time."

"I am more creative than before and have more interest to learn more."

### v) The participants also developed general interest in asynchronous e-Learning.

I also noted that the participants developed general interest in the asynchronous e-Learning instructional material and its mode of delivery. The following comments from participants substantiate my assertion:

"It is a very good mode of study and enjoyable."

"It is the best way of learning than to see a teacher because some how you may fall asleep in class while a teacher is teaching."

"I am really feeling good and impressed by asynchronous e-Learning course.

"Because this mode of delivery is enjoyable."

"The mode attracted my entire interest that I managed to study through it for a long period of time without losing interest which is different when I do use Hand Books. I also paid much attention on the day I learnt from the wall display where I could see my lecture teaching about Pre-number Activities."

"This course is effective to slow learners since every one concentrate on his or her work. And I say YES."

"Yes because I am used to this e-Learning course."

"Yes, I would recommend this course to a friend because it saves much time to a learner." "This course is simple because I do not need to write notes or to obtain learning materials e.g. sticks, stones. All learning materials are provided or drawn on the computer does not need a teacher to write on the chalkboard. So a lot of work can be covered within a period given. When it comes to exams, it reduces the problem of exam leakages or cheating because each and every learner is given one computer and marking is done by the computer itself. Grading and receiving of marks is done at the same time within a short period of time, rather than waiting for some days to receive the marks."

"I STRONGLY Agree, that it is, an effective way of teaching the core element, since, it is simple than other methods."

"I liked this course because: It helped me to know more before being taught in class."

"Yes, since it is more advanced as it will be able to address the shortages of teachers especially in rural areas in schools. And the system is easy to those who are serious and eager to learn."

"I liked very much the e-Learning course since I was gaining two things at once The system has also substituted the task of writing notes in the exercise books and it attracts the interest of the learners."

"Yes, I would recommend this mode because student teachers can address these concepts to rural areas. And can benefit if they are serious to develop rural areas."

"My feelings and general impressions about this asynchronous e-learning is that it is very good and important mode of training. It also consumes a lot of time; hence it requires a lot of asynchronous learning for it to be successful and efficient."

"I learn at the right time I want to learn."

"I have enjoyed this system of learning and I don't take this for granted."

"I feel so good and attentive whenever I am learning using this type of learning and I've liked it so much that I could wish to be taught in this way as far as mathematics is concerned."

#### vi) Contrary views about asynchronous e-Learning

On a negative note, few participants reported the following about asynchronous e-Learning:

"No, I do not like asynchronous e-Learning because it is advantageous to quick learners only .It is time consuming due to black outs and unavailability of internet at times."

"No, asynchronous e-Learning is not good because it will be difficult for slow learners to get information and understand properly."

"No, I did not like it just because learning using this course is very faster .So it is difficult for slow learners to get the points."

"No, asynchronous e-Learning is not good. It is difficult for slow learners to get information. They need to be directed by the teacher for them to get information."

"Asynchronous e-Learning is not very good just because it needs electricity."

"It is very beautiful kind of learning but we lack guidance as to how we can apply knowledge to solve some problems."

"My feeling on asynchronous e-Learning is that try to make a lenient circle in order for anybody having a wish to participate should gain the treatment equally. It takes more for a subject to be covered since the equipments are not enough to be used by the whole class." "When there is no network the lesson will be disturbed and you are not able to ask question to your teacher directly and being answered at the same time."

"It needs electricity all the time so makes it impossible to learn when there is a power failure. If there is a question to ask you have to wait for the answer as it will require you to send the message first. Shortage of computers was another problem."

"The bad part of this type of learning was frequent black outs. This led to unnecessary stoppages of lessons. It is not environmental friendly as it can easily be affected by power black outs."

"Some points needed clear interpretation by the lecturer which was not there because we used our own times to use the e-learning system."

"The part of asking questions to a teacher directly since we were mostly being advised to ask it by just sending an email or through Friendster bulletin board since in most cases it was not convenient."

"Asynchronous e-Learning is difficult to someone who is less intelligent because it promotes self –learning. There is also a network problem since it needs the use of a computer."

The above remarks by some participants imply that instructional designers and instructors should always bear in mind that learners are not the same. What appears to be simple to one learner may not be simple to another learner. This calls for thorough researches to find out how all learners can be accommodated in e-Learning courses. As for teachers, it is very important to ensure favourable learning conditions are put in place. An e-Learning course must state clearly what is required of the learner for him /her to complete his/her course successfully.

The qualitative data of this study shows that majority of participants indicated that the asynchronous e-Learning course and discussion board offered them greater opportunity to fully participate in all learning activities. In other words, majority of participants felt the asynchronous e-Learning is a very good tool for learning how to teach. The evidence is found in their comments about how they viewed learning from online (refer to participants' comments above). Observation of participants during this study indicated that most of them had the freedom to express themselves and make contributions towards the learning process by either asking questions or making a comment to their colleagues' postings. Some indicated in their responses to a questionnaire that asynchronous discussion board and emails gave them an opportunity to learn from each other through their postings and that even those participants who are too shy to ask or respond to questions were able to make contributions (refer to participants' comments above) through the discussion board. In this case, it means the asynchronous discussion board makes everyone to feel free to make a contribution whatever its quality could be. In other words, in a face to face classroom, some learners do not make contributions for fear of being laughed at or reprimanded by other students.

Some participants indicated that it was important for them to learn online because it offered them an opportunity to move with the changing world.

However, a handful of participants were of the view that asynchronous e-Learning could not afford them the opportunity to get immediate clarifications or feedback on some areas from their instructors and/or fellow learners whenever need arose (refer to Appendix 13).

To sum up everything, this research revealed very strong support from teacher trainees (participants) for the asynchronous e-Learning delivery mode but mixed with serious concerns about the impact of shortage of computers and frequent black outs on their studies. The other concern is on the college to respond to the new demands of technology given the available resources. The participants' support was frequently justified with their praise for the usefulness of asynchronous e-Learning as a tool for learning. To arrive at these conclusions, the following factors were taken into consideration. Table 4 below shows how data was analysed.

Criteria for analysis	Data collected and analysis
Frequency of a particular response	What majority said about a situation
Consistency of responses	Two or more groups of interviewees giving similar responses at the same time
Amount of influence of the person who made the response	Was the response coming from the intended participants?
Changes in data over a period of time	Participants' performance changing after using asynchronous e-learning for sometime
Criticality of the information to the success of e-learning in the institution	Concerns and recommendations about e- learning mode of training

Table 4: criteria used for data analysis

Students' perceptions of the value of their interactions with others in asynchronous discussion board significantly influenced their interests in using the computer as a learning tool. This means that pre-service teacher trainees need to perceive a discussion board as a technology that does not only provide quality postings but serves as a social space for removing loneliness, interaction, and learning from each other. The participants had positive views of the contributions of their peers because, despite the variety of activities, they shared a common endeavor in the sense that all activities related in one way or another to learning to teach.
#### 4.3 Quantitative data analysis

The research also compared participants' tests (pretest, midcourse, and posttest) grade results in a class that was taught by the same instructor using face-to-face and online delivery modes. The effectiveness of an asynchronous e-Learning can be determined by measuring the extent to which the course objectives have been achieved as well as participants' reactions after they have gone through a course. In short, test scores were used to collect quantitative data from both online and face to face participants. The aim was to verify the effectiveness of asynchronous e-Learning by analysing and comparing the participants' performance in the face to face and online modes. Table 5 below shows average gains for one to one, small group and field trial participants.

Participants/Test	Pretest	Posttest
One to one	44.63 (SD = 6.28)	60.00 (SD = 20.17)
Small group	44.00 (SD = 13.76)	70.75 (SD = 15.94)
Field trial (experimental)	48.54 (SD = 13.91)	61.67 (SD = 10.04)

Table 6 below shows average net gains and between subjects t-test scores for pretest and midcourse test results.

Table 6: average	net gains	and t-test	score fo	r average	pretest and	midcourse test
results.						

Group/test	Pretest	Midcourse test	Net gain
Mean score- face to face	39.86% (SD = 13.49)	62.44% (SD = 13.50)	22.58%
Mean score -online participants	48.54% (SD = 13.91)	73.59% (SD = 4.86)	25.05%
Difference in net gains			2.47%%
Standard error- online participants	2.14	1.01	
Standard error- face to face participants	2.19	2.29	
t-test score	<i>t</i> (75)= 2.83 <i>p</i> < 0.01	t (75)= 4.58 p< 0.01	

From table 6 above, the difference between the average net gains between pretest and mid course test results was 25.05% - 22.58% = 2.47% in favour of asynchronous e-Learning participants (the experiment). This is the net score attributable to the asynchronous e-Learning course because all other factors were the same for both experimental and control

groups. Therefore, the overall net gain due to the asynchronous e-Learning delivery was only 2.47% which is slightly significant.

A further analysis of table 6 above indicates that the standard deviation for pretest scores was 13.91 for online and 13.49 for face to face participants with a t-test score of T (75) = 2.83, P< 0.01. The pretest standard deviations for the two groups show that the spread of the pretest scores in both face to face and online tests was almost the same. Based on these statistical figures, it means there was a slight difference in initial knowledge about the course content for the two groups, face to face and online participants. Also from table 6 above, the net gain due to the e-Learning course was only 2.47%. The midcourse test standard deviation was 4.86 for online and 13.50 for face to face with standard errors of 1.01 and 2.29 respectively with a t-test score of T (75)= 4.58, P< 0.01. The standard deviations show that the grades in face to face participants were more spread than in online participants. However, the midcourse test t-test score show that there was a slight difference in learning achievements between face to face and asynchronous e-Learning participants. Table 7 below shows the average net gains and between subjects t-test scores for pretest and posttest results.

Group/test	Pretest	Posttest	Net gain
Average score -face to face	39.86% (SD= 13.49)	64.29% (SD = 10.29)	24.43%
Average score-online participants	48.54% (SD = 13.91)	61.67% (SD = 10.04)	13.13%
Difference in net gains			11.30%
Standard error- online participants	2.14	1.56	
Standard error- face to face participants	2.19	1.72	
t-test score	t(75)= 2.83 p< 0.01	t(75) = 1.13 t> (0.05)	

Table 7: average net gains and t-test score for pretest and posttest results.

An analysis of table 7 above shows that the difference in the average net gains between pretest and posttest results was 24.43% - 13.13% = 11.30% in favour of face to face participants (the control group). This is the net score attributable to the face to face course

because all other factors were the same for both experimental and control group. Therefore the gain due to face to face course was 11.30%. Also the posttest standard deviation was 10.04 for online and 10.29 for face to face with standard errors of 2.14 and 2.19 respectively and a t-test score of T (75) = 1.13, P> (0.05). The standard deviations show that the grades in face to face participants were more or less spread in the same way as in online participants. The posttest t-test score is below the standard t-test value and therefore, shows that there was no significant difference in learning achievements between face to face and asynchronous e-Learning participants. Table 8 below shows an overall net gain and between subjects t-test scores for face to face and asynchronous e-Learning participants based on average scores of the midcourse test and the posttest results.

Type of participants/average score	pretest	Mid course test	posttest	(Mid course + posttest) ÷ 2
Online participants	48.54%	73.59%	61.67%	67.63%
	(SD = 13.91)	(SD = 4.86)	(SD = 10.04)	(SD = 5.50)
Face to face participants	39.86%	62.44%	64.29%	63.37%
	(SD = 13.49)	(SD = 13.50)	(SD = 10.29)	(SD = 13.23)
Standard error –online test	2.14	1.01	1.56	0.98
Standard error- face to face test	2.19	2.29	1.72	1.70
T-test	T(75)= 2.83,	T(75)= 4.58	T(75)= 1.13	T(75)= 2.61
	P< 0.01	P<0.01	P> 0.05	P = 0.01

Table 8: population average results and between subjects t-test of test scores

#### 4.3.1 Discussion of quantitative data analysis

Table 8 above shows that the overall standard deviations (for the average scores of midcourse test and posttest) were 5.50 and 13.23 for online and face to face participants respectively with standard errors of 0.98 and 1.70 and a t-test score of T(75)= 2.61, P = (0.01). The standard deviations show that overall grades in face to face participants were more spread than in online participants. The overall t-test score is equal to the standard t-test value with a probability error of about 0.05. Therefore, statistically, this shows that there was no significant difference in learning achievements between face to face and asynchronous e-Learning participants

However, a further comparison of the average test scores of one to one, small group and the field trial participants shows a downward trend in performance despite several revisions and improvements of instructional material (Refer to appendices 9, 10, and 11). This was due to the fact that 10 computers had to be shared by 40 field trial participants, unlike in one to one and small group scenario where each participant had a computer of his/her own. The implication here is that the field trial group was deprived of adequate time to study online.

Based on the statistical figures from tables 5, 6, 7 and 8 above, there is no proof that more learning took place in asynchronous e-Learning than in face to face mode of delivery (Kirkpatrick pp9-10). An analysis of both the average net gains and between subjects t-test scores on posttest grades for both face to face and asynchronous e-Learning modes of delivery which were used to determine if a significant difference existed show that asynchronous e-Learning is as effective as face to face mode of delivery. This is evidenced by both the average net gains of 25.05% and 13.13% respectively for online participants against 22.1% and 23.95% for face to face participants with a t-test score of T (75) = 2.61, P = 0.01.

The online participants were prevented from scoring higher grades than expected due to the following reasons; (i) limited study time- the computer laboratories were open for them for a maximum of 2 hours only each day whereas face to face participants had books with them all the time. In this regard, the face to face learners had more time to study outside classroom time than the online participants, (ii) frequent black outs- this prevented online participants from studying but face to face learners were not affected, and (iii) slow typing speed- due to slow typing speed, it was not possible for some participants to finish their assignments within the allocated time of their study. As a result, they submitted unfinished tasks leading to low grades.

From the three factors outlined above, it is evident that the face to face participants had more studying advantages over the online participants. The online participants managed to

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achieve more or less the same as face to face participants. However, given equal opportunity and adequate amount of time, the online participants might have achieved higher grades than in face to face training. Despite the asynchronous e-Learning participants facing problems with their studies, they still achieved a lot, which meant learning took place. Therefore, asynchronous e-Learning is at least as effective as face to face learning or possibly more effective if all necessary conditions are provided.

#### 4.4 Experimental Problems during the study

Problems faced during research activities while participants were interacting with the instructional material were as follows: all participants were computer illiterate, the internet was very slow due to small bandwidth (about 32 gigabits), frequent internet and power failures, and too few computers (10 only for about 60 participants). These problems resulted in limited study time for online participants. Most participants were forgetting their passwords for accessing instructional material and Friendster bulletin board. Some wrote their assignments using Microsoft Word and could not know how to send their postings on the discussion board. All participants had very slow typing speed. All the above problems were with regard to the ICT infrastructure and trainees' ICT skills.

#### Chapter 5

#### Conclusion

#### 5.1 Summary of findings

This research has shown that there is no significant difference in learning achievements between face to face and asynchronous e-Learning delivery modes. This assertion has been proved by analysing the overall average net gains and t-test score of T (75) = 2.61, P = 0.01 for the online and face to face participants' average posttest results. Additionally, online mode of delivery does very well when measuring student satisfaction, and enthusiasm about learning achievements. The results show that the asynchronous e-Learning material could enable effective learning and that the combination of emails and forum facilities could be a fair substitute for face to face interaction. Based on the findings of this study, pre-service teacher training can be done through asynchronous e-Learning.

From participants' reactions, it has been noted that there are many advantages of asynchronous e-Learning such as development of critical thinking by learners as they learn from each other, learners are given the opportunity to create their own knowledge, and development of confidence in the learners that learning can take place even when there is no teacher. For a successful and attractive asynchronous e-Learning instructional material, all the dimensions of interactivity should be accommodated. The instructional material should allow for:

- 1. Learner –material interaction: this is possible with the inclusion of quizzes, short tests and exercises with immediate feedback by the learning system.
- Learner learner interaction: forum facilities should be provided for where learners will exchange ideas by reading and commenting on their colleagues' work. Learners should be made to see the advantages of learning from one another.
- Learner instructor interaction: it is also important to give learners an opportunity to have their instructor's feedback on their learning progress. All in all two way communication should be promoted in asynchronous e-Learning.

In ideal conditions, the research participants needed to be exposed to equal opportunities of study time, and other learning resources, but this was not the case with my research. The online participants had a lot of experimental problems such as power and internet failures, inadequate computers, limited study time in the computer laboratories and slow internet. This meant that the face to face participants had a lot of advantages over online participants in terms of study time, and resources. In other words, when there was no electricity, face to face participants continued learning. Similarly, 10 computers were supposed to be shared by 40 field trial online participants within a limited time. Despite the experimental challenges outlined above for the online participants, the findings of this research show that they had almost the same achievements in terms of performance as face to face participants (refer to Appendices 11 and 12).

Asynchronous e-Learning is possible and desirable in Malawi teacher training programmes based on the following reasons:

- All teacher training colleges have computers (though inadequate) and are connected to the internet (though very slow).
- Teacher trainees are ready and enthusiastic to learn through online.

The uniqueness of my research was that it was the first time to conduct a research of this kind in the history of elementary (primary) school pre-service teacher training colleges in Malawi. Furthermore, the participants in this research were real pre-service teacher trainees unlike in other researches where simulations are used.

#### 5.2 implications and limitations of this research

The findings in this study show positive implications for asynchronous e-Learning in Malawi. It shows a bright future for asynchronous e-Learning. The results of this research have shown that asynchronous e-Learning mode of delivery can be effective and can have positive impacts on the way pre-service teacher trainees learn to teach. Furthermore, students' perception of their own learning in asynchronous e-Learning mode of delivery is very encouraging. This is shown by students' positive remarks that they would have loved if

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they continued learning mathematics online. They also expressed their willingness to work on their own first before an instructor comes in.

Teacher training colleges and faculty should realize that technology has become "an external extension of human intelligence" (Gura & Percy, 2005, in Ajayi, 2009) with a potential to support pre-service teachers' active exploration and manipulation of learning materials, and create contexts for social interactions that support knowledge construction. In particular, online interaction provides learners a community of practice with the potential for "cognitive and affective development and opportunities for growth as independent learners" (Kayler & Weller, 2007, in Ajayi, 2009). The Malawi Ministry of Education is advocating for learner centred education which can easily be achieved by asynchronous e-Learning. In this regard, this paper calls for approaches that integrate asynchronous e-Learning into pre-service teacher preparation in ways that increase the capacity of teacher training colleges, and enhance the quality of instruction and learning.

Such approaches should raise some fundamental questions, including: (a) What is the impact of asynchronous e-Learning on the way pre-service teachers learn to teach? (b) What are the students' perceptions of their own learning in asynchronous e-Learning mode of delivery? (c) How do they want to experience learning? (d) How do teacher educators want them to experience learning?

The limitations of my research using mathematics course are that the findings may not be automatically relevant to other subjects. The other limitation is that the research was carried out in one college only (Kasungu Teachers Training College) out of the five teacher training colleges in Malawi. It is not automatically guaranteed that what worked for the college will work in the same way for the other colleges.

#### 5.3 Challenges for Malawi with regard to asynchronous e-Learning:

Millions of Malawian people still cannot access the Internet and do not understand how to use it to harness the global web of knowledge. They do not know how to deal with digital

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information, the basic currency of the knowledge economy. They do not know how to find information, how to handle it, how to trade in it, and how to invest it. In this regard, challenges include:

- Need for greater access to broadband connectivity
- Need for guidance in the best uses of the Web for learning
- Understanding of how people learn differently with the Internet
- College administrators and teaching staff have little understanding of "what is possible with the technology and how to make it happen" [Gura and Percy, 2005, (in Ajayi, 2009)].
- Most teacher trainees and college instructors have little or no IT knowledge and skills.
- Need for instructional designers who can design and develop online courses.

If asynchronous e-Learning was introduced in Malawi today, the immediate problems learners would face would be inadequate computers at each teacher training institution coupled with very slow internet, daily blackouts and Internet interruptions.

#### 5.4 Future plan for e-Learning

In future research it is the author's intention to investigate how efficient asynchronous e-Learning is. In particular, I will gauge the degree to which the pre-service teachers demonstrate how they will be applying the knowledge and skills gained from asynchronous e-Learning in their day to day work as elementary school teachers, the extent to which they have made progress toward meeting the new standards, and the degree to which they have received adequate support and professional development. One suggestion might be to pilot Web-based learning in a few teacher training colleges, before trying to initiate a national program. Such a pilot project would not only allow teacher training college administrators to experience the process of developing or adapting content for the Web, it would also allow them to evaluate mechanisms for assessment, feedback, and student support. To further evaluate limits of the innovation, another suggestion for those charged with teacher training would be to look at alternative models of pre-service teacher trainee evaluation.

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Appendices: test scores, questionnaires, observation forms and test items.

#### Appendix 1

#### Entry test for both face to face and asynchronous e-Learning participants

Before you study this course, we would like to find out if you have the required prerequisite knowledge. The aim of this test is to determine whether you have good knowledge of Mathematics or not. The passing mark is 65%. If you score less than 65%, you will not be allowed to study the course. You will be allowed to take this test once only. After submission of your answers, you will immediately receive feedback on how you have performed in the test. The instructional material will open for you only if your score is 65% and above. Answers to this test are available and will be accessed after submission of your responses. Good luck!!!

1. The cost price of a unit of umbrellas is K3000 and the selling price of each umbrella is K320.00. How much was the profit?

- K 200.00
- K 2 680.00
- K 840.00
- No profit was made

# 2. in a meeting of 60 participants, 40 are women. What percentage of the participants are men?

- 66.67%
- C 50%
- **a** 33.33%
- C 20%

3. Solve the following pair of simultaneous equations: 2x - y = 8, 3x + y = 17

x = 5, y = 2

x = 2, y = 5

### **C** x = 9, y = 10**C** x = 4.83, y = 5

4. Rain falls to a depth of 3 centimetres on maize field whose area is 7 000 square centimetres. Calculate the volume of the rainfall in litres.

$\bigcirc$	21	000	litres
		000	11000

- 21 litres
- 2333.3 litres
- 2.3 litres

5. Find the median in the following set of numbers: 1, 3, 3, 5, 1, 2, 2, 4, 3

6. Mary spent half of her money on biscuits and half of the remainder on sweets.

If she still had K105.00 left, how much money did Mary have at first?

- K315.00
- C K0.00
- K210.00
- K420.00

7. Find the simple interest on K12000.00 for 8 months at 15% per annum

- K14 400.00
- K144 000.00
- K1 200.00
- K12.00

8. Mr. Kwerengwe's body mass increased by 15%. He then went on a diet and reduced his body mass by 15%. What can you say about his final body mass?

His final body mass was the same as the original because the increase and decrease cancelled each other.

- His final body mass was 2.25% less than the original mass.
- His final body mass was 2.25% more than the original mass
- All answers above are correct.

9. in an aptitude test, 45% of the candidates failed. If there were two more candidates who passed the test than those who failed, find the total number of candidates who passed the test.

- C 11
- C 55%
- C 20
- C 9

10. Simplify: 5xy -2y -3xy -4y +4x +5x

- C 13xy
- 🖸 <sub>5y</sub>
- **5**x
- C 2xy 6y + 9x

11. What is the value of zero (0) in the following number; 7 309 739?

- C Zero
- Ten thousand.
- it has no value since zero means nothing.
- Zero thousand.

12. In an examination, 16 boys averaged 68% and 14 girls averaged 71%. What was the average mark for all the pupils?

- 69.4
- **6**9.5

□ <sub>4.64</sub> □ <sub>1 041</sub>

13. Factorise completely: ac + ce - ad - de.

C (c - d)(a + e)

14. Take away the sum of 3 601 and 6907 from the product of 245 and 68

- 13 354
- C 19 966
- **1**9 972
- C 6 152

15. Write the next number in the following series of numbers; 2, 5, 11, 23...

- **G** 47
- C 35
- C 34
- C 26

16. Arrange the following fractions in ascending order; 3/8, 5/6, 7/12 and 2/3.

- 2/3, 3/8, 5/6, 7/12
- **5**/6, 2/3, 7/12, 3/8.
- **7**/12, 5/6, 3/8, 2/3.
- **3**/8, 7/12, 2/3, 5/6.

17. Write one million, seventy nine thousand and eight in words.

- **1** 1 798
- 1 079 008

- L 1 709 008
- L 1 790 008

18. Write 895.0987 correct to one significant figure.

- C 8
- C 9
- 895.1
- C 900

19. The cost price of a bicycle is K2500.00. If it is reduced by K750.00, find the ratio by which the price is reduced.

- **1**0:3
- **C** 10:7
- C 3:10
- C 7:10

20. Find the Lowest Common Multiple of 24 and 44.

- 264
- C 4
- C 180
- C 198

#### Appendix 2: Online entry test results question by question

Question*	Full Mark	Number of Answers	Average Mark	Percentage
Q.1	5	57	4.9	98%
Q.2	5	57	4.6	91%
Q.3	5	57	4.3	86%
Q.4	5	57	4.6	91%
Q.5	5	57	3.7	74%
Q.6	5	57	3.9	78%
Q.7	5	57	1.1	22%
Q.8	5	57	0.8	16%
Q.9	5	57	3.2	64%

Average Sco	71.7%			
Q.20	5	57	4.8	96%
Q.19	5	57	1.2	24%
Q.18	5	57	1.8	36%
Q.17	5	57	4.5	90%
Q.16	5	57	3.3	66%
Q.15	5	57	5.0	100%
Q.14	5	57	5.0	100%
Q.13	5	57	4.9	98%
Q.12	5	57	0.8	16%
Q.11	5	57	4.1	81%
Q.10	5	57	5.0	100%

#### Appendix 3

#### Pre-test for both face to face and asynchronous e-Learning participants

The aim of this pre-test is to determine how much knowledge you have on teaching of numbers and basic operations. The passing mark for the pre-test is 65%. You will, therefore, not be allowed to study this course if your score is 65% and above. Answer all the questions. Submit your answers by pressing the 'submit' button below. Your grade will appear as soon as you have submitted your responses. Good Luck!!!

## 1. What is the difference matching and comparing objects in prenumber

### activities?

Matching means looking at similarities and differences of objects while comparing means suiting or fitting objects.

Comparing means looking at similarities and differences of objects while matching means suiting or fitting objects.

Matching means looking at similarities and differences while comparing means arranging objects according to a given condition or pattern.

Comparing means suiting or fitting while matching means putting objects of the same kind together.

#### 2. 481 - 296 can best be taught to children by using;

- C Sticks
- Place value chart
- spike abacus
- Place value box

#### 3. The reason for my choice in number 2 above is because;

 $\square$ Sticks are locally and easily found within the school environment.  $\square$ A place value chart can easily be drawn by the teacher or the children themselves.  $\Box$ A spike abacus uses few objects and would, therefore, be convenient to use.  $\square$ A place value box requires a lot objects and would, therefore, help learners to follow the lesson easily.

# 4. Why is it important to face the chalkboard when demonstrating to children writing a number in the air?

To let children know that in future all numbers will be written on the chalkboard.

So that all children who fear the teacher can learn comfortably.

The teacher takes the children's position and wants to show them the correct way and direction of writing the number.

Some teachers are shy and would not be comfortable to face the children.

#### 5. What is the name of the following; 3 + 5 = 8?

- A number sentence
- an addition question.
- Three plus five equals eight.
- All of the above

#### 6. The prerequisite knowledge for teaching place values of numbers to children

is;

- Pre-number activities.
- Place value box.
- Modeling numbers.
- Knowledge of numbers

#### 7. The value of 8 in 208 729 is;

- Eight thousand seven hundred and twenty nine.
- One thousand.
- Two hundred and eight thousands.
- All of the above.

# 8. In what order would you teach the following pre-number activities; matching, classifying, sorting out and comparing objects?

- Matching, classifying, sorting out, comparing
- classifying, matching, sorting out, comparing.
- Sorting out, classifying, matching, comparing
- sorting out, comparing, matching, classifying.

#### 9. The following are basic subtraction facts of 14 except;

- 14 8 = 6
- 14 9 = 5
- 14 6 = 8
- 14 4 = 10

10. A teacher taught addition of whole numbers to children using 2 + 1 = 3 as an example. He followed the following steps;

-placed two pencils and one leaf in two groups.

-Placed a correct number card below each group.

-brought the two groups together and asked the learners to find the total

number of objects.

-placed a number card below the new group.

-drew an illustration to represent the addition process.

#### Identify the mistake that the teacher made.

The teacher did not make any mistake because he followed the correct procedures of introducing addition of whole numbers.

- He used objects of different kinds
- there was no need to place number cards below the groups.
- The teacher did not ask questions to the learners.

#### 11. In what correct teaching order would teach the following;

- (a) 65 34 (b) 15 7 (c) 8 5 (d) 35 17?
- (c), (b), (a), (d)
- (a), (c), (b), (d)
- C (c), (a), (b), (d)
- all at once

12. Study the following addition sentences; 0 + 3 = 3 and 3 + 0 = 3. This means that;

- Addition has both zero and commutative properties.
- Addition has zero property only.
- Addition has commutative property only.
- Addition has both associative and commutative properties.

#### 13. A teacher would determine if his/her children have mastered the

#### understanding of numbers by involving them in the following activities except;

- Picking a number card to match them with the number of objects.
- Counting the numbers.

- Pronouncing the numbers
- ordering the numbers correctly

14. Which of the following pre-number activities can best be taught by using 4 bottles and 7 bottle tops;

Sorting out, classifying, matching, and comparing objects?

2.1	
_	

- Matching
- **comparing**
- Classifying
- all of the above

15. Study the following subtraction sentence; 11 - 7 = 4. 11 is called:

- Subtrahend
- minuend
- difference
- addend

#### 16. Place value of a number means;

- Parts of a place value box.
- The importance of a number.

A teaching and learning resource with compartments each representing the value of a digit in a number.

The value of a digit as it stands in a number.

#### 17. How many addition facts does 15 have?

C 2 C 4 C 15 C many

# 18. The reason why school children are taught addition first before subtraction is because;

Subtraction requires knowledge of addition.

Addition is simpler than subtraction.

Children learn about addition while at home but they hear about subtraction when they come to school.

Subtraction is very difficult for children so the teacher must wait for the children to grow up first.

#### 19. A pupil worked out an addition question as follows;

#### 237 + 156 = 383. What error did the pupil make?

- He/she failed to add the numbers
- did not regroup when it was necessary to do so
- he/she did not arrange the numbers properly.
- she/he didn't know which of the numbers addends were.

#### 20. the number 0 is introduced after the numbers 1, 2, and 3 because;

- 0 is abstract and can only be introduced by subtraction
- 0 means nothing, so it cannot come first.

Children already know about 0 while at home so there is no need to waste time teaching it first.

0 is not used most of the times so it is important to teach very useful numbers first.

21. A pupil was asked to take away 175 from 329. Write down all the subtraction basic facts used by this pupil to solve the question.

22. Suppose a pupil in your class brought you 6 bean seeds and 4 empty transparent bottles. Explain, in details, how you would use these materials to teach the concept of '0' to your standard one learners.

<b>Question*</b>	Full Mark	Number of Answers	Average Mark	Percentage
Q.1	5	56	3.8	76%
Q.2	5	56	2.2	44%
Q.3	5	56	2.2	44%
Q.4	5	56	5.0	100%
Q.5	5	56	1.2	24%
Q.6	5	56	1.0	20%
Q.7	5	56	2.9	58%
Q.8	5	56	3.1	62%
Q.9	5	56	2.2	44%
Q.10	5	56	4.2	84%
Q.11	5	56	3.0	60%
Q.12	5	56	1.7	34%
Q.13	5	56	2.8	56%
Q.14	5	56	1.8	36%
Q.15	5	56	0.9	18%
Q.16	5	56	2.9	58%
Q.17	5	56	0.4	8%
Q.18	5	56	3.2	64%
Q.19	5	56	2.1	42%
Q.20	5	55	2.6	52%
Q.21	5	56	1.6	32%
Average S	48.54%			

#### Appendix 4: Online pre-test results question by question

#### Appendix 5

#### Mid-course test for both face to face and asynchronous e-Learning participants

This examination is meant to test your understanding of units 1, 2, and 3. The passing mark is 65%. You cannot open Block 2 if your passing mark is less than 65%. The grade you will get from this test will be part of your continuous assessment. You will be allowed to submit your answers only once. Upon submission of your answers, you will receive immediate feedback on how you have performed. Answer all questions and then click the submission button below this page. There are 20 questions in this paper.

#### 1. Which of the following activities is not modeling of numbers?

- Moulding numbers with clay soil
- Use of objects to represent numbers.

- Drawing numbers on the ground.
- Use of number cards

2. Which of the following activities would you use when teaching recognition of numbers to standard 1 children?

- Moulding of numbers using clay soil
- Use of objects to represent numbers
- Drawing numbers on the ground
- Use of number cards

#### 3. Arrange the following prenumber activities in the correct teaching order;

#### matching, ordering, sorting out, classifying, Comparing.

- matching, ordering, sorting out, classifying, Comparing
- Sorting out, Classifying, Matching, Comparing, Ordering
- Classifying, matching, sorting out, comparing, ordering
- Comparing, classifying, sorting out, ordering, matching

## 4. Which teaching and learning resource is good to use when introducing place values of numbers?

- Sticks
- Place value chart.
- Spike abacus
- Place value box

#### 5. The reason for my choice in number 4 above is that;

- Sticks can be easily found within the school environment.
- Place value charts are easy to make since any piece of paper will do.
- Place value boxes allow learners to see a true representation of the place values
- Spike abacus uses few objects and therefore, easy to teach to children

6. A teacher taught recognition of numbers to his standard 1 learners as follows;

(1) held number card in his hand and asked learners to name the number on it.

(2) Asked the learners to name the number on the number cards.

(3) He let one learner name a number and then asks the other learners to pick a number card bearing the mentioned number.

(4) The teacher provided number cards to all the learners.

Arrange the steps in the correct teaching order.

- 4, 2, 1, 3
- **1**, 2, 3, 4
- 2, 3, 1, 4
- **3**, 1, 2, 4.

7. Suppose you asked your learners to write the number 3 in their notebooks soon after teaching it to them. Surprisingly, you found out that most of them wrote is as  $\epsilon$ . What do you think might have been the problem?

Those who failed to write correctly were sleeping in class while I was demonstrating how to write 3 in the air.

- I was facing them while I was demonstrating writing of 3 in the air.
- Most learners in the class are left handed.
- The learners did not have enough practice after the lesson.

8. When teaching about numbers, learners can be asked to arrange number cards either in ascending or descending order if the lesson is on;

- Ordering numbers
- writing numbers
- recognizing numbers
- conservation of numbers

#### 9. What is the value of 0 in 509 381?

- It has no value because 0 means nothing.
- It represents thousands.
- Ten thousand
- 0 thousand

#### 10. What is a digit?

- It is the value of a number.
- Parts of a place value box
- it is a symbol from which a number can be formed.
- A finger or a toe of human beings or corresponding part of other vertebrates.

#### 11. Which of the following is not a prenumber activity?

- Classifying objects
- Matching objects
- Comparing objects
- ordering numbers
  - 12. When introducing numbers to children, which of the following activities

#### should come second?

#### Modeling, recognizing, pronouncing and writing numbers

- Pronouncing
- C modeling
- recognizing
- writing
- 13. The prerequisite knowledge for teaching place value of numbers is;
- Place value box

### numbers

- Spike abacus
- counting

#### 14. Real life situations where comparing can be used are as follows except for;

- When people want to find the difference in amount or quantities of commodities.
- If one wants to put things side by side.
- When people want to find who has more or less objects.
- When one wants to find out whether two quantities have the same value.

<b>Question*</b>	Full Mark	Number of Answers	Average Mark	Percentage
Q.1	5	56	2.9	58%
Q.2	5	56	3.2	64%
Q.3	5	56	4.8	96%
Q.4	5	56	3.8	76%
Q.5	5	56	3.6	72%
Q.6	5	56	4.3	86%
Q.7	5	56	5.0	100%
Q.8	5	56	4.6	91%
Q.9	5	56	4.6	91%
Q.10	5	56	2.7	54%
Q.11	5	56	5.0	100%
Q.12	5	56	3.0	60%
Q.13	5	56	0.1	2%
Q.14	5	56	3.6	72%
Average Score				73.59%

#### Appendix 6: Online mid-course test results question by question

#### Appendix 7

#### Posttest questions for both face to face and asynchronous e-Learning participants.

The aim of this post test is to determine how much knowledge you have acquired on teaching of numbers and basic operations after going through the course. The passing mark for the post test is 65%. Answer all the questions. Submit your answers by pressing the 'submit' button below. Your grade will appear as soon as you have submitted your

responses. You will be allowed to take this post test once only. The time allowed for this test is 2 hours. Good Luck!!!

# 1. What is the difference between matching and comparing objects in prenumber activities?

Matching means looking at similarities and differences of objects while comparing means suiting or fitting objects

Comparing means looking at similarities and differences of objects while matching means suiting or fitting objects.

Matching means looking at similarities and differences while comparing means arranging objects according to a given condition or pattern

comparing means suiting or fitting while matching means putting objects of the same kind together.

2. 481 - 296 can best be taught to children by using;

- C Sticks
- place value chart
- spike abacus
- place value box

3. The reason for my choice in number 2 above is because;

- Sticks are locally and easily found within the school environment.
- A place value chart can easily be drawn by the teacher or the children themselves.
- A spike abacus uses few objects and would, therefore, be convenient to use.

A place value box requires a lot objects and would, therefore, help learners to follow the lesson easily.

# 4. Why is it important to face the chalkboard when demonstrating to children writing a number in the air?

- To let children know that in future all numbers will be written on the chalkboard.
- So that all children who fear the teacher can learn comfortably.
- The teacher takes the children's position and wants to show them the correct way and direction of writing the number.
- Some teachers are shy and would not be comfortable to face the children.

#### 5. What is the name of the following; 3 + 5 = 8 ?

- a number sentence
- an addition question
- three plus five equals eight
- all of the above

#### 6. The prerequisite knowledge for teaching place values of numbers to children

is;

- Pre-number activities
- place value box
- modeling numbers
- knowledge of numbers

#### 7. The value of 8 in 208 729 is;

- Eight thousand seven hundred and twenty nine.
- One thousand.
- Two hundred and eight thousands.
- All of the above.

8. In what order would you teach the following pre-number activities; matching, classifying, sorting out and comparing objects?

- Matching, classifying, sorting out, comparing
- classifying, matching, sorting out, comparing.
- Sorting out, classifying, matching, comparing
- sorting out, comparing, matching, classifying.

#### 9. The following are basic subtraction facts of 14 except;

- 14 8 = 6
- 14 9 = 5
- 14 6 = 8
- **14** 4 = 10

10. A teacher taught addition of whole numbers to children using 2 + 1 = 3 as an example. He followed the following steps;

-placed two pencils and one leaf in two groups.

-Placed a correct number card below each group.

-brought the two groups together and asked the learners to find the total

number of objects.

-placed a number card below the new group.

-drew an illustration to represent the addition process.

#### Identify the mistake that the teacher made.

The teacher did not make any mistake because he followed the correct procedures of introducing addition of whole numbers.

- He used objects of different kinds
- there was no need to place number cards below the groups.
- The teacher did not ask questions to the learners.

#### 11. In what correct teaching order would you teach the following;

(a) 65 - 34 (b) 15 - 7 (c) 8 - 5 (d) 35 - 17?

- (c), (b), (a), (d)
  (a), (c), (b), (d)
  (c), (a), (b), (d)
- all at once

12. Study the following addition sentences; 0 + 3 = 3 and 3 + 0 = 3. This means that;

- Addition has both zero and commutative properties.
- Addition has zero property only.
- Addition has commutative property only.
- Addition has both associative and commutative properties.

13. A teacher would determine if his/her learners have mastered the concept of numbers if they are able to do the following activities except;

- Picking number cards to match them with the number of objects.
- Counting the numbers properly.
- Pronouncing the numbers correctly
- ordering the numbers correctly

14. Which of the following pre-number activities can best be taught by using 4

#### bottles and 7 bottle tops?

- C Matching
- comparing
- C classifying
- all of the above

15. Study the following subtraction sentence; 11 - 7 = 4. 11 is called:

- Subtrahend
- C minuend

- difference
- addend

#### 16. Place value of a number means;

- Parts of a place value box.
- The importance of a number.
- A teaching and learning resource with compartments each representing the value of a digit in a number.
- The value of a digit as it stands in a number.

#### 17. How many addition facts does 15 have?

- 2 4 15
- 🖸 <sub>many</sub>

### 18. The reason why school children are taught addition first before subtraction

#### is because;

Subtraction requires knowledge of addition.

Addition is simpler than subtraction.

Children learn about addition while at home but they hear about subtraction when they come to school.

Subtraction is very difficult for children so the teacher must wait for the children to grow up first

### 19. A pupil worked out an addition question as follows;

#### 237 + 156 = 383.

-What error did the pupil make?

-suggest a reason why the pupil made this error.

-how would you assist the pupil so that he/she doesn't make a similar error in future?

20. A pupil was asked to take away 175 from 329. Write down all the subtraction basic facts used by this pupil to solve the question.

21. Explain how you would use a spike abacus to teach place values of 609 to your grade 3 learners. In your explanation, include both the materials and the methods you would use.

22. Suppose a pupil in your class brought you 6 bean seeds and 4 empty transparent bottles. Explain, in details, how you would use these materials to teach the concept of '0' to your standard one learners.

Question*	Full Mark	Number of Answers	Average Mark	Percentage
Q.1	5	55	4.3	86%
Q.2	5	55	3.5	70%
Q.3	5	55	3.5	70%
Q.4	5	55	4.9	98%
Q.5	5	55	3.5	70%
Q.6	5	55	1.1	22%
Q.7	5	55	3.8	76%
Q.8	5	55	4.5	90%
Q.9	5	55	4.9	98%
Q.10	5	55	4.9	98%
Q.11	5	55	3.5	70%
Q.12	5	55	1.5	30%
Q.13	5	55	1.8	36%
Q.14	5	55	4.1	81%
Q.15	5	55	4.0	80%
Q.16	5	55	3.6	72%
Q.17	5	55	1.9	38%
Q.18	5	55	4.0	80%
Q.19	5	55	3.4	68%
Q.20	5	55	2.1	42%
Q.21	10	55	3.4	34%
Q.22	10	55	4.7	47%

Appendix 0. Online positest results question by question	Appendix 8:	Online po	osttest results	question b	v ai	uestion
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Average Score	61.67%

#### Appendix 9: online one-to-one participants' test scores

Participant	Entry test	Pretest	Mid course	Posttest
	-		test	
Student 1	65	42	71	77
Student 2	70	47	71	75
Student 3	65	52	85	69
Student 4	75	33	50	21
Student 5	70	47	78	41
Student 6	65	52	71	57
Student 7	80	42	71	61
Student 8	65	42	85	79
Average score	69.375	44.63	72.75	60.00

#### Appendix 10: online small group participants' test scores

Participant	Entry test	Pretest	Midcourse	Posttest
Student 9	70	23	57	39
Student 10	75	28	57	69
Student 11.	70	66	71	87
Student 12	85	52	78	76
Student 13	70	47	64	81
Student 14	70	42	71	76
Student 15	70	42	78	56
Student 16	85	52	64	82
Average score	74.375	44.00	67.5	70.75

### Appendix 11: online field trial participants' test scores

Participant	Entry test	pretest	midcourse	posttest
Student 17	65	42	71	73
Student 18	70	66	71	58
Student 19	65	33	71	66
Student 20	80	42	71	65
Student 21	70	47	71	72
Student 22	75	76	71	64
Student 23	65	23	71	58
Student 24	65	57	71	62
Student 25	65	57	71	60
Student 26	80	47	71	71
Student 27	65	52	71	60
Student 28	65	57	78	49
Student 29	70	42	71	58
Student 30	75	23	64	50
Student 31	65	38	71	62
Student 32	65	38	71	65
Student 33	80	57	71	66
Student 34	75	61	85	71
Student 35	65	52	71	79
Student 36	65	52	71	37

Student 37	85	52	78	54
Student 38	75	61	78	60
Student 39	70	33	71	58
Student 40	80	57	71	71
Student 41	80	66	85	52
Student 42	70	19	78	55
Student 43	65	71	78	57
Student 44	65	47	71	77
Student 45	70	38	78	38
Student 46	70	47	85	78
Student 47	85	38	78	70
Student 48	80	66	74	74
Student 49	75	33	71	64
Student 50	70	52	78	61
Student 51	70	57	50	50
Student 52	75	52	71	57
Student 53	80	57	78	56
Student 54	80	52	78	57
Student 55	70	33	85	70
Student 56	45			
Average score	71.25	48.54	73.59	61.67

### Appendix 12: Face to face participants' test scores

Participant	Pretest	Midcourse	posttest
Student 57	24	79	56
Student 58	33	64	67
Student 59	33	71	72
Student 60	46	43	
Student 61	19	71	79
Student 62	43	64	40
Student 63	23	36	62
Student 64	14	57	43
Student 65	38	57	78
Student 66	42	50	63
Student 67	43	50	50
Student 68	43	64	63
Student 69	48	79	65
Student 70	29	64	
Student 71	33	79	65
Student 72	52	50	71
Student 73	62	93	73
Student 74	24	50	56
Student 75	38	36	48
Student 76	67	71	66
Student 77	24	50	66
Student 78	48	64	64
Student 79	48	50	58
Student 80	57	64	73
Student 81	48	50	67
Student 82	62	86	84
Student 83	48	57	65
Student 84	33	57	63
Student 85	33	64	64
Student 86	33	50	65
---------------	-------	-------	-------
Student 87	24	64	58
Student 88	38	79	84
Student 89	52	64	73
Student 90	62	71	67
Student 91	38	86	57
Student 92	33	64	61
AVERAGE GRADE	39.86	62.44	64.29

## Appendix 13: Online participants' questionnaires and responses

## Questionnaire

Now you have come to the end of this course. Please tick the response which best fits your opinion or impression about this course and its mode of delivery. Your responses will not be shared with anybody. There will be no score assigned to this questionnaire, hence, no effect on your continuous assessment grade. You are advised not to be influenced by your colleagues' opinions.

# \* 1. Previous knowledge of the instructional material is important in taking an elearning course.

## One to one participants

1: Strongly	2: agree	3: disagree	4: strongly disagree	5: undecided
	6	0		0

## Small group participants

1: Strongly	2: agree	3: disagree	4: strongly	5: undecided
	3	1		0
4			0	

## Field trial participants

1: Strongly	2: agree	3: disagree	4: strongly	5: undecided
agree	0	0	disagree	0
0	18	4	0	0
17			0	

# \* 2. Taking an e-learning course will give me more flexibility than a traditional

classroom course

## One to one participants

1: Strongly	2: agr	ee 3:	disagree	4:	strongly	5:	undecided
agree				disagree	;	$\odot$	
	5	0				0	
3				0			

## Small group participants

1:	Strongly	2: agr	ee 3:	disagree	4: strong	ly 5:	undecided
agree		0			disagree		
$\odot$		4	0			0	
4					0		

## Field trial participants

1: Strongly	2: agree	3: disagree	4: strongly	5: undecided
agree	0	0	disagree	0
	17	4		0
16			2	

• 3. An e-learning course will be more convenient for me than a traditional classroom course.

## One to one participants

1: strongly agree	2: a	igree	3:	disagree	4:	strongly	5:	undecided
			$\bigcirc$		disagree	<b>;</b>	$\Box$	
2	5		1				0	
					0			

## Small group participants

1: strongly agree	2: agree	3:	disagree	4:	strongly	5:	undecided
0				disagree	<b>!</b>	$\odot$	
3	3	1				0	
				1			

## Field trial participants

1: strongly agree	2: agree	e 3:	disagree	4:	strongly	5:	undecided
0				disagree	;	$\Box$	
11	21	7				0	
				0			

\* 4. There is higher interactivity with fellow students as well as lecturers than in

face to face mode.

## One to one participants

1: strongly agree	2: agr	ree 3:	disagree	4:	strongly	5:	undecided
		$\Box$		disagree		$\Box$	
1	3	3				1	
				0			

# Small group participants

1: strongly agree	2: agree	3: disa	agree 4:	strongly	5: undecided
0			disagree	;	
0	4	3			0
			1		

# Field trial participants

1: strongly agree	2: agree	3:	disagree	4:	strongly	5:	undecided
				disagree	;	$\Box$	
4	11	19				3	
				2			

\* 5. After the e-learning course, I will need an instructor to teach me the same content.

## One to one participants

1: strongly agree	2: agree	3:	disagree	4:	strongly	5:	undecided
				disagree	è	$\square$	
1	2	4				0	
				1			

## Small group participants

1: strongly agree	2: agr	ree 3:	disagree	4:	strongly	5:	undecided
	0			disagree	;	$\Box$	
0	3	5				0	
				0			

## Field trial participants

1: strongly agree	2: agre	e 3:	disagree	4:	strongly	5:	undecided
C	0			disagree	;	$\Box$	
3	14	23				0	
				3			

# \* 6. I expect anybody learning through this mode to perform better than one doing face to face

## One to one participants

1: strongly agree	2: agree	3:	disagree	4:	strongly	5:	undecided
				disagree	;	$\Box$	
2	2					1	
				0			

# Small group participants

1: strongly agree	2: agree	3: dis	agree 4:	strongly	5: undecided
C			disagree	;	
2	5	1			0
			0		

# Field trial participants

1: strongly agree	2: agree	3: 0	disagree	4: strongly	5:	undecided
				disagree	$\Box$	
12	15	8			3	
				1		

\* 7. If I continued learning using asynchronous e-learning, my performance in

class would improve.

# One to one participants

1: strongly agree	2: agree	3:	disagree	4:	strongly	5:	undecided
0	0			disagree	;	$\square$	
1	4	2				1	
				0			

# Small group participants

1: strongly agree	2: agree	3: 0	disagree	4:	strongly	5:	undecided
0				disagree		$\Box$	
2	4	0				1	
				1			

## Field trial phase participants

1: strongly agree	2: a	agree	3:	disagree	4:	strongly	5:	undecided
0					disagree	;	$\Box$	
10	20		7				2	
					0			

## \* 8. Given the chance to choose the mode of training, I would go for asynchronous

## e-learning

## One to one participants

1: strongly agree	2: agree	3:	disagree	4:	strongly	5:	undecided
0				disagree	;	$\Box$	
2	5	1				0	
				0			

# Small group participants

1: strongly agree	2: agree	3:	disagree	4:	strongly	5:	undecided
C				disagree	<b>!</b>	$\odot$	
4	3	0				0	
				1			

## Field trial participants

1: strongly agree	2: agre	e 3:	disagree	4:	strongly	5:	undecided
C				disagree	<b>;</b>	$\Box$	
13	20	5				1	
				0			

\* 9. I like asynchronous e-learning because it gave me a lot of opportunity to make contributions during the learning process

## One to one participants

1:	strongly	2: a	gree	3:	disagree	4:	strongly	5:	undecided
agree						disagree	9	$\odot$	
		2		3				0	
3						0			

# Small group participants

1:	strongly	2: agr	ee 3:	disagree	4: strongly	5:	undecided
agree		0			disagree	$\square$	
		3	0			1	
3					1		

## Field trial participants

1:	strongly	2: ag	gree 3	3: disagree	e 4: stro	ongly 5	: undecided
agree			C	0	disagree		
		16	1	11		0	
13					3		

# \* 10. To what extent would you recommend this type of learning to a friend?

# One to one participants

1:	excellent	2:	good	3:	average	4:	poor	5:	very	poor
$\square$		$\bigcirc$		$\Box$		$\bigcirc$		$\Box$		
2		4		2		0		0		

## Small group participants

1:	excellent	2:	good	3:	average	4:	poor	5:	very	poor
		$\bigcirc$		$\Box$		$\Box$		$\Box$		
3		4		1		0		0		

# Field trial participants

1:	excellent	2:	good	3:	average	4:	poor	5:	very	poor
				$\Box$				$\bigcirc$		
13		16		10		0		0		

# \* 11. How do you rate the e-learning mode of delivery?

## One to one participants

1:	the	best	2:	good	3:	average	4:	poor	5:	very	poor
$\square$			$\square$				$\square$		$\square$		
3			4		1		0		0		

## Small group participants

1:	the	best	2:	good	3:	average	4:	poor	5:	very	poor
$\odot$			$\bigcirc$		$\square$				$\square$		
4			2		2		0		0		

## Field trial participants

1:	the	best	2:	good	3:	average	4:	poor	5:	very	poor
$\Box$			$\bigcirc$		$\bigcirc$		$\square$		$\square$		
14			15		10		0		0		

# \* 12. How effective and efficient is this mode of training?

## One to one participants

1:	excellent	2:	good	3:	average	4:	poor	5:	very	poor
$\bigcirc$								$\Box$		
0		7		1		0		0		

## Small group participants

1:	excellent	2:	good	3:	average	4:	poor	5:	very	poor
$\square$		$\square$		$\Box$		$\Box$		$\square$		
3		3		1		0		1		

## Field trial participants

1:	excellent	2:	good	3:	average	4:	poor	5:	very	poor
$\Box$		$\square$		$\square$		$\Box$		$\square$		
8		22		9		0		0		

13. What are your feelings and general impressions about asynchronous elearning?

learning?

# Reactions from one to one participants:

Student 1

It is fun and fast.

I fell if this mode of training should continue to others too

#### Student 3

My feelings on asynchronous e-learning are try to make a lenient circle in order for anybody having a wish to participate should gain the treatment equally. It takes more for a subject to be covered since the equipment is not enough to be used by the whole class

Student 4

I HOPE ITIS VERY HELPFUL IN LEARNING THE CORE ELEMENT

Student 5

I feel happy

Student 6

my feelings is that I have learn more things and is good

Student 7

my feeling and general impression about asynchronous e-learning is not so

good because there is no discussion between learners and a teacher.

Student 8

My feelings and general impressions about this asynchronous e-learning is that it is very good and important mode of training. And I feel to have more chance of learning a lot through this mode of training.

#### **Reactions from small group participants**

#### Student 9

It is very good but not 100 percent

#### Student 10

I am over the moon to come across this type of learning.

#### Student 11

I am more creative than before and have more interest to learn more.

I am very happy with e-learning in the way that I have already learnt more things than my friends who are waiting to be taught in class.

#### Student 13

I am feeling comfortable/well, according to my feelings and

general impressions about asynchronous e-learning.

#### Student 14

Excellent.

## Student 15

I have enjoyed this system of learning and I don't take for granted

#### Student 16

It is very beautiful kind of learning but we lack guidance as to how we can apply

knowledge to solve some problems

#### Reactions from field trial group.

.Student 17

one is able to learn a lot within a short period of time

Student 18

I need to learn more about other programs on the computer

Student 19

I feel free and effective

Student 20

my feelings are so good and I am impressed.

Student 21:

brilliant

Student 23

It better to use this mode of e-learning since learners are fully participating.

It is good because it makes a learner to think critically on tasks given other than just relying on a teacher all the time.

Student 25

ENJOY

I ENJOY THE IT AND IT GIVES A DESIRE OF LEARNING

Student 26

the asynchronous e-learning increases my self esteem.

Student 27

It's good because the learner is able to do the work on his/her own and freely.

Student 28:

I FEEL MUCH BETTER AND IS FLEXIBLE.

Student 29

it is not really good and it is not really bad but its average because it needs electricity and

network so where there is no this no learning no

Student 30

i learn in write time i want to learn

Student 31

very impressed especially with detailed notes

Student 32

This method of learning is very good because the learner uses his or her knowledge when dealing with work given to do and this also improves the thinking capacity of a learner.

Student 33

i feel good

Student 34

A synchronous e-learning is just okay

It is a very good mode of study and enjoyable

Student 36

It is quite better because a learner has got an opportunity of the modern way of learning then it is good.

Student 37

good but not perfect

Student 38

.I am really feeling good and impressed by asynchronous e-learning course

Student 39

am glad with the learning system because am now familiar with the computer.

Student 40

It encourages individual work rather than group work which is common in face to face mode of delivery. It also consumes a lot of time; hence it requires a lot of asynchronous for it to be successful and efficient.

Student 41

I have felt happy to be one using e learning and this method is good compare with other methods.

Student 42

good

Student 43

it is the best way of learning than to se a teacher because some how you may a sleep in class while a teacher is teaching

Student 44:

I feel so good and attentive whenever I am being taught using this type of learning and I've liked it so much that I could wish to teach in this way as far as mathematics is concerned.

Have good feelings and general impression

Student 46

I take it as a very a very good learning course and i insist the lecture to continue using it

because it has a lot of advantages than disadvantages

Student 47

asynchronous e\_learning is not good because it has no time to questioning the teacher

Student 48

It is good and it maintains attention through out the lesson

Student\_49:

Not good to shy learners

Student 50

It is very easy to understand

Student 51

It is very good and ok.

Student 52

it is not very good just because it need electricity

Student 53

i feel good, since it is a fast way of learning

Student 54

I feel not good

Asynchronous e-learning is good and it can help somebody to pass with flying colour.

Student 55

my feelings and general impressions about asynchronous e-learning is that I wish if I could use this type of learning throughout my life so that my life could benefit a lot from this type of learning since it involves the use of technology which is now popular nowadays.

To have my own computer

• 14. In your opinion, what do you think was the good part of this mode of learning?

## One to one participants' opinions

Student 1

because we know more about it.

Student 2

I need not to be in a classroom all the time

Student 3

It simplifies the work in the sense that the work which would cover a

week is covered in two days.

Student 4

1.quiz

2.compering of my answer which i have contribute during lesson

3.making system is very fast

4. There is no favouritism or discrimination during learning process

5.effective to shy learners

Student 5

According to my views all the parts are so good /nice/fantastic and well understandable parts.

Student 6

it is well explained

Student 7

Equipments should be added with good necessities.

Student 8

WE ARE INVOLVING OURSELVES IN TECHNOLOGICAL USE

#### Small group participants' opinions

Student 9

It allowed me to go to another phase/lesson only if I passed the test.

Student 10

The teacher was so friendly and this made the learning environment

Student 11

One can learn at his own time due to some other busy things

Student 12

It provide me with knowledge and skills, because full / enough

information of mathematics.

Student 13

The good part of this e-learning is that I was able to know more things before being taught

by the teacher. So during class time I will be just adding where I did not understand well.

Student 14

The teacher was so friendly and the class was quit.

Student 15

Presentation and briefing was well molded and ordered

Student 16

Learners may learn all the topics which a teacher has planed to teach without any

disturbances like absenteeism of a teacher or a learner.

#### Field trial participants' opinions

Student 17

The good part was o0nly getting the knowledge of how a computer works

Student 18:

no answer

Student 19:

notes are good

I learned and know many things through this type of learning

Student 21

The internet has the best part I have learnt.

Student 22

i have gained some knowledge of using computer.

Student 23

All parts of this mode of learning are good.

Student 24

the good part of this mode of learning is that it encourages reading skills and it makes

student teacher to memorize what he was doing on the previous course

Student 25

everyone is participating

Student 26:

All were good

Conducive.

Student 27

I do make some contributions without any disturbances

Student 28

The good part is that learners be willing to study through this mode.

Student 29

it is friendly as it is promoting self reliance to students

Student 30:

The good part of e-learning mode is that.

(1) It gives an opportunity to learners to contribute ideas while learning is in process.

(2) It is more convenient to learners.

(3) It is more flexible.

(4) It is not time consuming

The good part was the notes presentations

Student 32

The good part was it's presentation since it was strongly attracting our attention.

Student 33

More work is covered for a short period of time.

Student 34:

LEARNERS FEEL FREE WHEN LEARNING SINCE THERE IS NO ANY

DISTURBENCES IN TERMS OF NOISE

Student 35

the good part of this mode is demonstration.

Student 36

mathematics

Student 37

WHEN WRITING EXERCISE YOU NO LONGER TAKE MUCH TIME TO KNOW THE

RESULT.

Student 38

All parts are good

Student 39

If properly planned it is fast mode of delivery. It also assists one to gain some knowledge of computer.

Student 40

it saves time, it is fast and effective

Student 41:

every part was good since it clearly shows me convenient information

Student 42

Mostly when demonstrating numbers using place values, abacus.

everything was just good

Student 44

the good part of this learning is that it creates a critical thinking among learners since it attracts full attention of the operator.

Student 45:

1. the assessments i.e. quiz and tests

2. How to teach pre numbers, addition of whole numbers and subtraction numbers

3.promotes fast learning the use c

Student 46

Time can be saved

Student 47

In my opinion, the good part of this mode of learning was that I was free to express my views to my lecturer and classmates whether positive or negative because it was not face to face contact.

Student 48:

It is good because it helps learner to part and parcel among those, who uses computers.

Student 49

we learn more things at short period of time.

Student 50:

according to me it was addition and subtraction of whole numbers but only time for reading notes and to copying them.

Student 51

yes

Student 52

methodology

.Student 53

easy to understand

The teaching area whereby a teacher was speaking [teaching].

Student 55:

to me the operation of the computer was very interesting

#### Student 56

Everything was interesting

#### \* 15. What was the bad part of this type of learning?

#### One to one participants' responses

Student 1

it is bad because of net work

Student 2:

it needs electricity all the time so makes it impossible to learn when there are power

failures. If there is a question to ask you have to wait for the answer as it will require you

to send the message first.

Student 3

There were no real objects for demonstration that learners could see

Student 4

1. NO practise

2. You not given a chance to ask question

3.It is easily affected by other techniques

Student 5

Assuredly I didn't found any part which is bad. And if I will get something wrong which means I will just forgotten.

Student 6

difficult to get points

No any part was bad since what we were trying to cover is in our syllabus.

Student 8

THE BAD PART OFTHIS TYPE OFLEARNING IS THAT IT TAKES MORE TIME

MASTERING THE MACHINE.

## Small group participants' responses

Student 9

some typing mistakes were found in the learning.

Student 10

the bad part of this type of learning was perpetual black out.

This led unnecessary stoppages of lesson

Student 11

It fail short of some explanation hence not effective unless otherwise

Student:12

nothing

Student 13

the bad part was that I was not able to understand other things because they need to be clarified by the teacher.

Student 14

the bad part of this type of learning was perpetual black out

this lead to unnecessary stoppages of lessons.

Student 15

lack reference for acquisition of further knowledge

Student 16

the bad thing is learners have no chance of asking question where they met with

problems or where they not understand.

#### Field trial participants' responses

Student 17 the learning is too fast Student 18 you are not able to ask question to you teacher and being answered at the same time Student 19 it is tiresome Student 20 when there is no network the lesson will be disturbed Student 21 to me I don't think there is any part I don't like, everything was quite ok. Student 22 slow learn is a problem Student 23 Nowhere Student: 24 no any bad part of this type of learning Student 25 shortage of computers Student 26 there was no bad part .Student 27 it increases cheating because learners do study question before answering it Student 28 I do not see any bad part. Student 29 it is not environmental friendly as it can easily be affected by power black outs Khondiwa Samuel: 30 The bad part of e-leaning is that,

(1)since learning is done on the computer, there would/will be a problem of learning if there is no internet.

(2)There would be a problem of learning if there is black out

Kalua John: 31

some points needed clear interpretation by the lecture which was not there

because sometimes we used our own times to use this system

Student 32

The part of asking questions to a teacher since we were mostly being advised to ask it by

just sending an email since in most cases it was not convenient.

Student 33

No demonstration to the learners.

Student 34

IF YOU DO NOT UNDERSTAND YOU FACE PROBLEMS BECAUSE YOU DO NOT

HAVE ANY CHANCE OF ASKING THE QUESTIONS

Student 35

it is lecturing.

Student: 36

no bad part

Student: 37

THERE IS NO CHANCE OF QUESTIONS AND ANSWERS AT THE TIME.

Student: 38

All are good

Student 39

It is time consuming

Student 40

not effective for slow learners

.Student 41

there was no bad part

When giving information and reasoning were a bit low.

Student 43

nothing

Student 44

the bad part was that it leads to delays in cases of internet failure. Minus that, this type of learning is very fine.

Student: 45

-it is difficult to someone who is less intelligent because it promotes self -learning

-network problems since it need a use of computer

Student 46

Learners do not have time ask

Student 47

The bad part of it was that it becomes difficult to practice in field because nowadays we work in the field where we find no access of computers.

Student 48

It bad because learners do not have chances of asking at the same time hence it only help quick learners more than slow learners.

Student 49

we do not have time to question where we do not understand.

Student 50

to me it was teaching place value and introducing numbers.

Student 51

not all part

Student 52

nothing

Student 53

it takes more time to know the computers for those who do not know

Nothing.

Student s: 55

failing of the computer to operate an activity was bad

# \* 16. What are some of the things that you liked about e-learning as a mode of

## delivery?

Student 1

I developed skills and knowledge through computer

Student 2

the teacher does not need to go around looking for material to use for demonstration

when teaching e.g. bottle tops, sticks, and place value charts

Student 3

- 1. Few resources are needed.
- 2. It saves time
- 3. It reduce cheating

Student 4

- 1.To be given a chance to ask
- 2.We should have a chance to practise

Student 5

these are; 1.the practical are in good stages.

- 2. The demonstration is very well understandable.
- 3. It provides to me some skills in computer.

Student 6

I like the way it explained the sentence

Student 7

I've added some of the knowledge which I had never had

SOME OF THING ARE SKILL AND TEACHING METHODS OF THE CORE, EL` ELEMENTS.

#### Small group participants

Student 9

More explanation of the content.

Student 10

the quietness of the class room.

Equal treatment from the teacher.

Student 11

I like much in this mode of delivery because it has changed me from computer illiterate to computer literate.

Student 12

I would like to have a Degree in mathematics though e-learning as a mode of delivery.

Student 13

some of the things are; 1. Opening of mail address in the computor. 2. Learning before

being taught by the teacher.3.the computer learning.

Student 14

This type of learning creates the chance for me to know something

about computer.

. Student:15

when we have questions relating to what we have learnt there is need for rapid response

Student 16

Learning without disturbances like unnecessary noise from fell students.

#### Field trial participants' responses

Student 17

it is only good for the quick learners

you develop some skills and knowledge of computer

Student:19

it makes learners to be active in researching

Student: 20

I like to do so activity and to know what it woks.

Student 21

Sending E-mails to friends, knowing how one has faired in an exam at the same time an

E-mail is sent to a teacher.

Student 22

u can learn the lesson though the teacher is out of the campus.

Student 23

ALL

Student 24

you can access any where you are in the world

Student 25

To learn more about power point

Student 26

all things

Student 27

I want the teacher to give only one chance to open the question paper

Student 28

i need to find other subjects through this mode.

Student 29

detailed notes

Student 30

.The use of computer which increases our knowledge and skills, since we are using a well advanced technological equipment.

The presentation of resources itself made the understanding of the lessons

Student: 33

The presentation the computerized notes which completely attracted our attention plus the double benefit of computer knowledge and academic knowledge.

Student 34

I am exposed to the computer software e.g. Microsoft word and it is quick method of delivery.

Student: 35

WE SHOULD BE GIVEN MORE TIME FOR STUDING IN ORDER TO CACH UP ALL

IMPORTANT POINTS

Student 36

demonstration, answering question

Student 37

the teacher should be shown writing when teaching is

Student 38

IWOULD LIKE TO LEARN AS IT IS AND GIVE ME A CHANCE TO KNOW MORE

ABOUT COMPUTER.

Student 39

I like all the things

Student 40

the access to computer

Student 41

as in mathematics i would have liked if it was possible for one to make some calculations using the same computer [not multiple choice]

Student 42

short and direct information

doing the work, reading myself.

Student 44

Some of the things i liked in e learning mode of delivery are: it helps me as a learner to, know how to use a computer and it also improves thinking capacity of the learner.

Student 45

some of the things I liked in this mode of delivery were the presence of Quiz after the learning Unit, this increases my fast thinking ability.

Student 46

1.the use of computer

2.self learning since you understand on your own

Student 47

More examples

Student 48

Some of the things that I liked were, continuous assessment which were being given to me through quiz which helped me to be alert on knowing the areas and topics the exams might come from and lastly it assisted me in becoming familiar with the computer in that through doing the exercise, I knew how to write frequently on the computer.

Student: 49

Supervision during the operation.

Student 50

there should be another teacher who will be support the learners where they do not understand.

Student 51

you should give enough time to lead

Student 52

all

Student 53 learning at advanced stage Student 54 more computers Student 55 Written notes and tests. Student 56 clearly arranged information since the Lecture took a time in arranging the information

# \* 17. What are some of the things that you did not like about e-learning as a mode of delivery?

## One to one participants' responses

Student 1

things that I did not like are that in many times net wok is a very big problem.

Student 2

It needs somebody to use his thinking capacity all the time so that should be able to interpret the message properly.

Student 3

1.pour connection of internet

2.no face to face discussions of internet

Student 4

1.few questions

2.few examples

3.multiple choice

4.it never give chance to explain

Student 5

Nothing.

it does not brings good looking pictures

Student 7

Time consuming

Student 8

THESE ARE SHORT NOTES AND SUMMARY.

#### Small group participants' responses

Student 9

Nothing.

Student 10

I was not interested with that blackout

Student 11

Time consuming unless one an expert in typing.

Student12

No chance of asking oral questions to the teacher. Few resources e.g. only few

computers used for many people. At times, i went back because i found the computer room fully packed

Student 13

IT makes a student not to have notes that can be used where ever he goes. In the absence of computer cannot be practised.

Student 14

The black out.

Student 15

nothing any

Student 16

Disturbances due to little number of computers as other learners who were coming did not give chance to their friends.

#### Field trial participants' responses

Student 17 it is not good for the slow learners Student 18 it is difficult to use it when there is no network Student 19 it needs research that's too much to me Student 20 It is not easy to do the lesson when there is no electricity Student 21 There were some minor problems like the blackouts & intervention of other classes (strangers) was giving tough time to us. Student 22 interaction between learners and teacher is slow. Student 23 Nothing Student 24 nothing because is a good mode of delivery Student 25 congestion in the computer lab because we get confused because of noise Student 26 nothing .Student 27 noise from other learners when am studying Student 28 I do not want learners to repeat questions for many times. Student 29 inadequate resources

.Mode of delivery of e-learning promotes laziness to learners since there is no writing of notes and everything is provided.

Student 31

the charts were not enough to accommodate all the information explained in the lessons

Student:32

The part of asking questions to a teacher.

Student 33

Takes time for the learner to be assisted the same time since there is no direct contact with a Lecturer.

Student 34

HAVING SHORT TIME FOR STUDYING AND WRITING

Student 35

no chance for asking questions when the teacher is teaching in this mode

Student 36

noisy

Student: 37

TIME SHOULD BE INCREASED.

Student 38

I like all the things

Student 39

It consumes time of other subjects due to inadequate computers

Student 40

inadequate resources thus computers

Student 41

demonstration by using long statements

Student 42

The steps to be taken to achieve this mode.

You cannot ask questions. So this can make you to write both wrong and right things since you can not be conversant with some of the things

Student 44

It needs some clarifications from the lecturer in some areas which i could not understand

Student 45

takes time master the work

Student: 46

Nothing is wrong

Student 47

The only problem I faced was that of electricity black out and shortfalls of network which made some of the exercises not to be made accordingly.

Student 48

1.Noise 2.Misbehaving

Student 49

time for using this computer should be change because other learners they use long time.

Student 50

colour when you are teaching us with your computer

Student: 51

time consuming

Student 52

nothing

Student: 53

lacking computers

Student 54

Nothing.

Student: 55

Tiresome at the beginning if you do not know very well the computer

## \* 18. Please, write down any comment you have about this course.

#### Comments by one to one participants

Student 1

my recommendation is that have learn more things from this computer.

Student 2

It is good if possible we should continue to learn using this method.

Student 3

This course is not so bad and is not so good

Student 4

This program is so good if you will correct some errors

Student 5

I am proposing this course that it is very good and profitable course. And my concept is to

argue you that you may continue teaching us through this mode of delivery.

Student 6

it is well understandably and applicable and well seen

Student 7

No any comment.

Student 8

IT IS QUITE GOOD AND RELIABLE WAY TEACHING THE SUBJECT

## Comments by small group participants

Student 9

I had no more disturbances which improved my interest and allowed me to go to another

phase only if I passed the test. Therefore it has been a good course

Student 10

The should proceed offering this type of learning.

Student 11

The world is changing technologically so the only way we can adapt to the world is through this mode of delivery.

I am very happy being the one who is trained through this mode of delivery. I as a student I will try my best to achieve my goals.

## Student 13

This course has helped me to know more things within a short period of time. This is done because of you our lecture. Through this course I have opened my mail address and I have practised in the computer. Lastly I would like thank you Mr. Kwerengwe for providing us with this course.

Student 14

This course was so good and enjoyable.

Student 15

the course was success and I have enjoyed it continue with the system

Student: 16

I enjoyed this course very much.

#### Comments by field trial participants

Student 17

it is not good for slow learners

Student 18

no comment

Student19

this course is so good to me

Student 20

E learning is very important because I know how to use computer

Student 21

This course is good only that it needs very organized people who understands when is there time to be in the lab and when its not.

materials of this course are not locally found. Time consuming due to problem of blackout and network. I disagree this mode.

.Student 23

This course is very good and nice i prefer it.

Student 24

i would wish this course to continue because is the best mode of delivery

Student 25

this course is good because it has assisted us to gain skills and knowledge of using

computer

Student 26

It is good since time management is enhanced

Student 27

this course is very important because i do get some information which is missing in our

handbook. It improves resourcefulness among learners

Student 28

I need this mode to be continued.

Student 29

very good & and interesting

Student 30

.The course is good only that the problem of internet and frequent power black out (Load shedding) will not work efficiently.

Student 31

The course was just fine however the availability of proper functioning computers affected us a lot

Student 32

It is good and help that it can improve somebody's knowledge but it has to be given much time.

I appreciate using the mode of delivery despite some limitations.

Student 34

COURSE IS VERY GOOD AND MORE ATTRACTIVE

Student 35

this mode is very good to fast learners but for slow learners is bad it need special help.

Student 36

the course is very fine

Student: 37

THIS COURSE IS VERY FLEXIBLE AND WE ARE GETTING SKILLS ABOUT

COMPUTER. PLEASE CONTINUE WITH THIS COURSE. THANK YOU VERY MUCH.

Student 37

It is so fine

Student 39

It should be managed properly for it to be successful.

Student: 40

this course would have been effective if the materials used were sufficient.

Student 41

proceed on giving us this course

Student 42

It good and nice it helps me to be motivated in other areas.

Student 43

This way of learning is important mostly because it is time saving and young can learn things in a short period of time.

Student 44

This is very good mode of learning because someone may acquire information at a short period of time than in a classroom where it is difficult to get whatever point the lecturer is saying because of presence of noise from class members
Student 45

1.this should continue

2.friends should also learn through this course

3. Government should provide more computers for this learning system to be promoted

4.it is advanced way of learning

Student 46

I wish i will continue learning

Student 47

The course is just good and excellent

Student 48

This system of learning is partially good since other learners seem to know what to do but in true sense they are not gain much knowledge.

Student 49

we should continue with course

Student 50

this course is good but it requires enough time

Student: 51

the system is good

Student 52

very excellent I love it

Student: 53

it has to continue it's good

Student 54

This course is good and is enjoyable one because apart from learning Mathematics I have learned how to use a computer. Moreover, this kind of learning is faster and easier than face to face.

#### Student 55

This is the best but the computer should be mastered first and also have the reliable computer.

#### Appendix 14

Observation questions during participants' interaction with the asynchronous elearning material

• Q: What attitudes did learners have towards e-learning before, during, and after the e-learning activities?

**A:** Most learners had shown positive attitudes and interest in e-learning. This was shown by their enthusiasm to learn. Most of them requested to continue studying even if it was past midnight.

Q: What knowledge, skills, and attitudes did they acquire during the training?
 A: Basic IT skills, teaching of numbers and basic operations, making and participating in discussions online, interacting with each other and instructors online, respecting each others' views, developed confidence that people can learn through a computer.

#### • Q: How much did they participate?

**A:** There was very high participation by almost all participants despite electricity and internet problems. However, few participants asked questions both to their fellow students and the instructor. A discussion box was instituted. Participants were also allowed to post questions on the discussion board.

#### • Q: What was students' interest in the lessons?

A: Layout of instructions, quizzes with immediate feedback, interacting with fellow participants

#### • Q: What was the quality of their participation?

**A:** Very high. Contributions made were positive and highly assisted them to improve their thinking ability.

• Q: Is my organization ready for e-learning?

**A:** Not yet. This is evidenced by the following factors; all instructors are almost computer illiterate, the institution has many computers but with a very small internet bandwidth which can accommodate about five computers only. Funding for e-learning activities is not there. The college managers feel e-learning is costly as opposed to paper-based instructional materials.

#### • Q: Are individual learners ready for e-learning?

**A**: Yes. This was evidenced by participants' enthusiasm to continue learning through e-learning. Some of them said they could be happy if they were given a chance to learn through online.

## • Q: Is asynchronous e-learning best suited to my organization and to its learners?

A: Yes.

• *Q: Explain your answer above.* 

There are computers and an internet connection although not reliable. The institution cannot accommodate all students who apply for teacher training courses. In addition, learners show great interest in e-learning.

# • Q: What techniques can e-learning instructor use to enhance the effectiveness of training teachers?

**A:** Maximizing rate of interaction, i.e. making sure that learners get responses and other necessary information within a short time, providing questions which will lead learners to think and improve their knowledge, providing opportunities for trainees to practise what they have learnt.

# Q: Did participants display positive attitudes towards this mode of delivery? A: Yes.

• *Q: Explain your answer above.* 

**A**: This was shown by participants' insistence to continue learning even during odd hours.

• Q: What problems were noticed as participants were interacting with the material?

**A**: Participants forgetting User IDs and passwords, failure to access other participants' postings so that they could read them and make their comments, some wrote their assignments in word and could not know to send their postings, limited time for studying as they were expected to attend all classes despite the online course. Some failed to move the cursor to the desired icon/place.

#### • Q: What might have been the cause of the problem?

**A:** IT was a completely new concept to all of them. Some may not have understood why passwords and user ID were required.

#### • Q: In which part(s) did the learners seek clarifications?

**A:** Learners sought clarification on computer operations and how they could view and send mails postings from and to fellow participants. As for the instructional material, all participants said they did not have any problems with the language, quizzes and the examples given. However, they suggested that each lesson needs enough examples so that learners should have a variety of them. They also suggested that pictures be increased to concretise some concepts.

#### • Q: How were the learners assisted?

**A:** Those participants who asked for assistance on operating a computer were shown how to do it.

- Q: What was the participants' reaction towards the instructional material?
   A: Most of them felt the instructional material was far much better for self learning.
- Q: Did the participants show easiness in using the instructional material? Explain your answer.

**A**: Yes, this was shown as most learners completed the course without asking any question for clarification despite my presence all the time. The only questions that I received were those concerning computer operations.

#### <u>Key:</u>

Q: Question

A: Answer

### Appendix 15

#### One to one and small group Formative Evaluation Questionnaire

Tick ( $\sqrt{}$ ) the answer which best describes your opinion about this material.

Question	Yes	Somehow	No	Not
				sure
Was the time adequate for learning this				
material?				
Were the examples given relevant to the content and course objectives?				
Were the examples adequate enough to make				
you learn comfortably?				
Did the examples and explanations clarify				
concepts and new ideas?				
Did you find this material helpful enough to				
assist you teach numbers and basic operations				
comfortably and effectively?				
Would you rate this material as good enough				
for self –learning?				
Were explanations clear enough to make you				
learn without problems?				
Was the language used in this material				
appropriate for self learning?				
Did you face any problems with this				
instructional material?				
Does the content meet all the learning				
objectives				

### Please, provide free responses to the following questions;

- 1. What is your overall rating of this instructional material?
- 2. What should be added and/or removed from the instructional material to make it more effective?
- 3. Does this instructional material have adequate information to enable a learner understand concepts and other key points? Explain your answer.

4. Which part (s), if any, of the instructional material should be modified? Explain how it should be modified.

5.	Write	any	other	comments	that	you	have	about	this	instructional	material.
		· · · · · ·									

### Appendix 16

## Subject matter expert evaluation checklist for evaluation of e-Learning instructional

#### material.

Criteria	Questions	Yes	No
	Do they specify what is expected to be learnt in the course?		
Objectives	Are learning objectives clear and relevant?		
	Are they measurable?		
Consistency	Are the e-learning and classroom lessons designed with similar elements?		
Real-world	Does the e-learning mimic real-world problems and environment?		
Reinforcemen t	Does the e-learning reinforce or support the learning that takes place in the classroom?		
	Is the course presented in a logical format?		
Course structure	Are lesson units broken down into manageable pieces/chunks?		
	Are directions clear?		
	Does feedback for questions appear on the screen near the question?		
	Do practice examples reinforce the learning objectives?		
	Are abstract concepts illustrated with concrete, specific examples?		•
	Do post-tests and other assessments adequately measure accomplishment of the learning objectives?		

	Is the essential act of student interaction with faculty and other students facilitated through a variety of ways, including voice mail and/or email? Are diagnostic pre-tests available to help learners' custom tailor learning to their needs?	
Instructional		
design	Are graphics and text relevant?	
	Is the text and/or narration conversational in style?	
	Where possible, does the e-learning use narration instead of text to communicate content?	
	where possible, does the e-learning use working examples with real-world job tools and situations?	
	Does the e-learning promote self-questioning when learners are learning for receptive e-lessons?	
	Does the e-learning use pre and post assessments to measure the levels of learning?	
	Does the e-learning allow learners to choose advanced or beginner options based on their skill level and experience?	
	Was the content valuable enough to their learning?	-
	Is the e-learning intuitive to use for learners who are new to e-learning?	
	Are the icons clear and used consistently?	
User interface	Do learners have to scroll down or can they access all of the information on their screen?	
	Are plug-ins avoided or available by easy download?	
	Can learners bookmark the site so they can quit and return without losing their place?	
	Are help screens available to learners?	
	Is the e-learning accessible 24/7?	
	Are graphics and scenarios appropriate for a global audience?	
	Does the e-learning avoid slang, jargon, or local phrases?	
	Does the e-learning avoid humor, which could be misinterpreted?	
Appropriaten ess	Where possible, are icons used instead of buttons with text?	

	Does the e-learning allow space for translation if necessary?		
	Deep the clearning reinforce or support the learning that		
	takes place in the classroom or on the job?		
	Where possible, does the e-learning use working examples		
	with real world job tools and situations?		
	Is the instruction accurate and current?		
	Doos the source cover the subject in sufficient breadth and		
	denth to meet the objectives?		
	Does the content meet the course objectives, clear and		
	adequate to enable learners answer all questions?		
Content			
criteria	Is the course free from production errors, such as broken		
	links, missing graphics, and typographic errors?		
	Does each lesson give an overview?		
	Are the examples clear and adequate?		
	Are the questions appropriate?		
	Are learners given the opportunity to practice ideas and skills immediately after they are presented?		
	skins infinediately after they are presented?		
	Does practice activities exercise knowledge and skills in a		
	way that prepares learners to apply learning to their jobs?		
Practice and	Are practice activities provided to help learners integrate		
Teeuback	separate bits of knowledge and low-level skills?		
	Is feedback in practice activities and tests sufficient to help		
	learners recognize and correct misconceptions?		
	Is the feedback to student assignments and questions		
	constructive and provided in a timely manner?		
	Are the questions clear and adequate to cover the whole		
	course?		
	Can learners get started taking the course (locate it,		
	register, access starting page) using only online assistance?		
	Is the combination of on-screen instructions and online help		
	sufficient for learners to learn to navigate and operate the		
Usability	course?		
criteria	le it clear what learners should de if they get study at here		
	upestions?		

	Can learners predict the general result of clicking on each button or link?		
Media criteria	Is the text in the course written at a level that learners can fully understand?		
	Is text legible as displayed using default browser settings and only default fonts?		
	Are graphics (illustrations, photographs, graphs, diagrams, etc) used appropriately?		
	Are multimedia content modules used where simple words and pictures are not adequate to communicate visual and spatial concepts?		
	Do graphics and multimedia assist in noticing and learning critical content rather than merely entertaining or possibly distracting learners?		
	Will the course be accessible to those with visual and hearing impairments?		
	Can learners decide what parts of the course to learn, in which order, and at what pace?		
Navigation and control criteria	Are navigation and access mechanisms (menus, browsing trails, maps, indexes) sufficient that learners can find specific items of content?		
	Are units self-contained enough that learners can take them out of sequence without becoming confused?		
	Do learners always know where they are?		
	By examining page titles, constantly displayed menus, or other location indicators, can learners deduce their current location in the course?		
	Does the course initially make clear to learners what they gain by taking the course?		
	Does each lesson or other sizable unit make clear to learners what they gain by taking it?		
	Will the difficulty of the course appropriately challenge my learners—not too hard or too easy?		
Motivation criteria	Are students properly advised about the program before they begin, to determine if they possess the self-motivation and commitment to learn at a distance and if they have access to the minimal technology required by the course design?		
	Are students provided with supplemental course information that outlines course objectives, concepts, ideas, and learning outcomes for each course?		

## Appendix17: Sample of asynchronous discussion board work by online participants.

То:	?
Subject:	Re: Assignment 2
Message:	<ul> <li>Dear Prospelina, I read your answers. Your arguments were not adequate more especially in number 3. You need to check with your friends' work make necessary improvements where possible. Your grade is 11/20. Kwerengwe</li> <li>Prospelina wrote: <ol> <li>These are number cards and charts with numbers.</li> <li>A learners fail to regroup ones into tens. B learners fail to add regrouped ones .c learners fail to add ones to tens and tens to ones. And tell them how to put the ones and tens when they add numbers.</li> </ol> </li> <li>Because learners already know the object when they are still at home and it is not difficult to them to pronounce the numbers.</li> <li>Stan wrote: Post your answer to this bulletin board. Read any two postings from your classmates and make comments on them. Post your comments to the discussion board. Marking will be done both on your comments and assignment. Good luck!!! <ol> <li>Why are objects used when introducing numbers to children for the first time?</li> <li>Name any two materials you would use to help your learners remember numbers.</li> </ol> </li> </ul>
То:	?
Subject:	Re: Assignment 1
Message:	Your grade is 8/10. Good Kwerengwe Daniel Trouble wrote: 1. colour length size shape height 2.i can bring similar object but differ in size/length then I will demonstrate to arrange objects then will ask learners to arrange object accordingly

Stan wrote:

1. Name any five attributes that can be used when teaching pre-number activities.

2. Explain how you would teach ordering of objects to your grade/standard one learners. In your explanation, include the teaching and learning resources you would use and how you would evaluate your lesson.

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