Master's Thesis

Effectiveness of e-Learning materials in institutions of higher learning: Case study of Domasi College of Education in Malawi.

Master's Program

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Acknowledgements

Abstract

The purpose of this study was to examine the effectiveness of e-Learning instructional method in distance teacher training at Domasi College of Education in particular and in Malawi in general. Distance teacher training programs at Domasi College of Education and in Malawi in general are paper based and has shown a number of weaknesses such as reduced rate of interactivity between students and lecturers (instructors), students and content/learning system and among students themselves. There is also lack of prompt feedback to students' assignments or tasks from lecturers.

A quantitative type of research was conducted. Three hypotheses were set: (1) Online mode of content delivery in distance education will be more effective than paper based mode; (2) Online instructional materials will result in increased interactivity among learners, learners with contents/system and learners with lecturers than paper based instructional materials; (3) Online instructional materials will result in prompt feedback to learners' tasks than paper based instructional materials. Data collection mainly involved pretest and posttest scores, and observation and interviewing of participants. Questionnaires were used to get participants' views. In this research, instructional materials (topics) from my subject area (Instructional Technology) were used. There were two versions of instructional materials (paper based and online) covering two topics. Each topic had both paper based and online versions of instructional materials. A total of 60 participants (subjects) were invited for the research activities. The participants were randomly selected from year two diploma distance students class list. The participants were then randomly assigned into two equal groups of 30 participants per group and each group studied both topics using different versions (paper based and online).

After randomly selecting the research participants from the class list, invitation letters were written and sent to the research participants. The research participants were then invited for the orientation program. During the orientation program participants were taught basics in ICT skills. They were also oriented to the researcher's online and paper based experimental contents after which usernames and passwords for accessing online instructional contents were issued to the participants.

The whole experimental period was approximately three (3) weeks. All participants firstly sat for the pretest for the first topic (ASSURE Model). All participants wrote paper based pretest regardless of the version (delivery mode) of the topic they were going to study. The participants were then assigned to different versions (modes) of the topic for a week to study the contents of the topic. They then sat for a posttest which was also paper based like the pretest for both groups of participants. Soon after finishing the posttest, questionnaires were issued to all participants. The questionnaire had two sections, one for the participants who studied the online version (mode) and the other for those who studied the paper based version (mode).

Then after finishing the first topic or course, participants had to study the second topic or course for one (1) week. During the study of the second course, treatments were changed. Those who studied the online version of the first topic had to study paper based version of the second topic. Thereafter a pretest for this topic or course was administered to all participants which was paper based like the one for the first topic or course. After finishing studying the course, a posttest for the course followed and then questionnaires for the second course were issued which were the same as those for the first topic or course.

Pretest and posttest scores for both groups (versions) and topics or courses were analyzed. T-tests in pretests for both groups were used for checking group equivalence on prior knowledge. And t-tests on differences between pretests and posttests were also used for checking whether a group that studied online learned significantly than the other that studied using paper based instructional

materials for both topic 1 and 2, which was hypothesis 1. Questionnaire responses were analyzed for testing hypotheses 2 (interactions) and hypothesis 3 (feedback).

The results of t-test on differences between pretest and posttest for hypothesis 1 showed significant difference between two groups for topic 1 with the paper-based group scoring higher and no significant difference for topic 2 though online group scored higher than the paper based group. Thus, hypothesis 1 was rejected. As to hypothesis 2, questionnaire responses showed that the paper-based group claimed slightly higher interactions than the online group for both topics, thus hypothesis 2 was rejected. The hypothesis 3 was accepted with the online group scoring higher on feedback than the paper-based group for both topics 1 and 2.

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Chapter one

Introduction:

Study Background

Domasi College of Education as one of teacher training colleges in Malawi, in her efforts to address the shortage of teachers in Malawi introduced a unique system of training teachers through distance in addition to conventional (face to face) mode.

Currently, Domasi College of Education is struggling to expand its capacity, infrastructure, enrolment and territorial reach in the area of distance education. Despite Domasi College of Education's effort and other teacher training colleges which include the University of Malawi, Mzuzu University and Catholic University among others, the nation's shortage of primary and secondary school teachers remains unbearable. It is projected that by 2015 there will be a shortfall of over 15,000 teachers required to teach approximately 5 million primary school learners nationwide. By the same year the projected shortfall of 10,000 teachers to teach 1.6 million secondary school learners is expected.

Founded in 1993 to cure a perceived secondary school teacher shortage nationwide, Domasi College of Education currently enrols approximately 1480 trainees each year which include both conventional and distance trainees out of which 705 are distance trainees. Its annual application pool has exploded form 200 in 1993 to a current figure of 15000 candidates. This indicates that only 9.87% of the application pool is admitted into the college each year. Despite these achievements by Domasi College of Education, the instructional materials which are used in distance education are still paper based. In addition to that these paper based instructional materials limit interactivity between the learner and the contents, learners and lecturers, and among learners themselves. This limited interactivity is even made worse with lack of prompt feedback from lecturers to student's tasks or assignments.

Therefore this study aims at exploring at how the use of e-learning instructional materials in teacher training can improve distance education at Domasi College of

Education in particular and in Malawi in general in terms of increasing interactivity between learners and contents, learners and instructors and among learners themselves and rate of feedback to student tasks and assignments from lecturers (instructors). ARCS model was used as a motivational model in the areas of lesson introduction, presentation and evaluation. Novel stories were used in the introduction to get the attention of the participants. Relevance was reflected in the objectives where the participants were oriented on what they will be capable of doing after studying the course/material. Confidence was instilled in participants through quizzes which provided automatic feedback for the online contents and where answers for quizzes were provided at the end of the material for the paper based instructional material. This also gave a sense of satisfaction to the participants.

Purpose

The purpose of this study was to compare the effectiveness of online and paper based modes of content delivery in distance education.

Identifying the Research Problem

Currently Domasi College of Education and other institutions of higher education in Malawi use paper based instructional materials in distance education which lack interactivity and immediate feedback from instructors to learner's tasks or assignments. Online instructional materials enables learners separated by distance to exchange ideas in group discussions or forums while those studying paper based instructional materials can only exchange ideas if they are at one place. Learners' assignments or tasks to lecturers are sent through post offices which take a long time before they are received by the lecturers and even longer time before the learners get feedback.

Formulating research questions

(1) Will online instructional materials result in better learning outcomes than paper based instructional materials?

(2) Will online instructional materials result in increased interactivity among learners, learners with contents/system and learners with lecturers than paper based instructional materials?

(3) Will online instructional materials result in prompt feedback than paper based instructional materials?

Research Hypothesis

Distance learning, regardless of the mode of delivery is flexible than face to face learning. This is the case because with distance learning, you can study at anytime, anywhere. Realizing the importance of collaboration in distance learning, online mode of distance learning would be better or effective than paper based mode of distance learning. In online distance learning, group discussions can occur online through online discussion boards while discussions for paper based mode of distance education would require face to face meetings which would be difficult for discussions anytime, anyplace. Therefore basing on these features of distance learning, the following hypotheses are set.

Three hypotheses reflecting the research questions above:

(1) Online mode of content delivery in distance education will result in better learning outcomes than paper based mode.

(2) Online instructional materials will result in increased interactivity among learners, learners with contents/system and learners with lecturers than paper based instructional materials.

(3) Online instructional materials will result in prompt feedback to learners' tasks than paper based instructional materials.

Research Variables:

Pretest and Posttest results for both online and paper based versions of instructional materials or courses, research questionnaire items, comments from the research participants.

Research Design

Participants were randomly assigned into two groups A and B after which there was a swap of treatments when studying the experimental instructional materials. ARCS model was used as a motivational model in the areas of lesson introduction, presentation and evaluation. ADDIE Model was used as a guiding framework in the course development process.

Procedures

Two identical sets of instructional materials (printed and online) were distributed to participants. Each participant used both sets of materials after which they were asked using a questionnaire to judge which material was good or not to them in terms interactivity with the material and the kind of feedback which they had using the material. Distance students in the second year of the Distance Education Program of Domasi College of Education in Malawi were randomly selected to practice using the instructional materials as research participants. After the participants had used both sets of instructional materials, they were given questionnaires to evaluate the instructional materials in terms of interactivity and promptness of feedback. Look at the table 1 below to see how the experimental contents were administered.

Table 1 Experimental Contents Administration Procedure

Group → Topic ↓	A	B
1	online	paper based
2	paper based	online

Paper based pretests were used for both online and paper based versions of the experimental instructional materials for both topics or courses. The same applied to the posttests. The posttests were administered to see which mode (method) of content

delivery in distance education results in better learning outcomes. Two expert reviewers were used for content validation. Small group formative evaluation was conducted for usability validation of the online experimental contents. Orientation to the participants to my experimental instructional material was conducted by the contents developer (myself) and a library assistant who had knowledge in ICT. The participants were then randomly assigned into two groups A and B as shown above (table 1). The assistant librarian and the contents developer trained the research participants in basic ICT skills. Each course or topic was available to students for approximately one week. The contents developer conducted ICT follow-up in case of technical problems with the online learning system by the participants. The contents developer was available to answer questions from participants. Pretest was administered at the beginning of each course or topic. Posttest and questionnaires were administered at the end of each course or topic followed by questionnaires.

Characteristics of participants

The participants were Domasi College of Education students (teacher-learners) studying through distance. They are serving secondary school teachers teaching in community day secondary schools in Malawi without secondary school teaching qualifications. Initially 60 participants were invited for the research activities out of which 12 were females and 48 were males. The age range of my research participants was 25 years to 45 years according to the enrolment requirements by the college. As pointed out earlier that they were serving secondary school teachers without secondary school teaching qualifications, they all had primary school teaching qualifications with a minimum teaching experience of 2 years either in primary school or community day secondary school. They were also required to have passed Malawi School Certificate Examinations (MSCE) with strong credits in their teaching subjects. Only three (3) of the participants had some or little knowledge in basic ICT skills. Fifty seven (57) participants had literary no knowledge nor skill in basic ICT skills.

Identifying Data Analysis Procedures

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Both quantitative and qualitative data analyses were used to interpret the data that was collected from the participants. Quantitative data was used to test the hypotheses while the qualitative data was used to explain other emerging issues during the research activities. Quantitative data was obtained from the participant scores after attempting a pretest and posttest before and after studying the experimental contents and from the participant questionnaires. Qualitative data was obtained from the questionnaires which were being administered to participants upon completion of the study of the contents and writing of posttests from the section of general comments of the questionnaire. T-Test was used for data analysis where it was expected that there will be better results for those studying online as compared to those studying using paper based instructional materials.

Possible research/study outcomes

The following are the expected research/study outcomes for the research hypotheses:

- Online mode to be more effective as a method of content delivery than paper based mode in distance teacher training

- Online mode to be less effective as a method of content delivery than paper based mode in distance education training

- Online mode to be equally effective as paper based mode of content delivery in distance education training:

- Online instructional materials to be more interactive than paper based instructional materials

- Online instructional materials to be equally interactive as paper based instructional materials

- Online instructional materials to be less interactive than paper based instructional materials

- Online instructional materials to result in prompt feedback than paper based instructional materials.

- Online instructional materials to equally result in prompt feedback as paper based instructional materials.

- Online instructional materials to result in less prompt feedback than paper based instructional materials.

Chapter two

Literature Review

Teachers, instructors prepare instructional materials without observing the instructional design principles or do prepare such materials and unknowingly incorporate such instructional design principles. An instructional material that does not reflect such instructional design principles is said to be ineffective, inefficient and inhumane. What do I mean by an ineffective instructional material? This refers to an instructional material that does not do what it is intended to do. On the other hand inefficient instructional materials are the ones that do what they are intended to do but not in a right way. Inhumane instructional material does what it intends to do and in a right way but takes away a human aspect of learning. In this research, effectiveness refers to an instructional material that does the right thing. An instructional material that is used for self-regulated learning has to be able to do the right thing for it to be effective. The right things which this instructional material needs to do is to provide prompt feedback in a human like kind of interaction between the learner and itself. The effective instructional material for self-regulated learning should be able to allow learners to interact with each other, with the instructional material and with the instructor or lecturer.

Self-directed study is not a new phenomenon in Malawi. There has been self-directed study particularly at secondary school level right from late 1970s in the form of distance education then called correspondence studies. Since then distance education that has been offered in Malawi has been paper based. This secondary school distance education programme or correspondence education gradually died when tutoring centres which were used were turned into Malawi Correspondence and Distance Education Centres (MCDEs).

Later in the year 2000 Domasi College of Education introduced distance education programme for secondary school teachers with funding from Canadian International Development Agency (CIDA). Since then up to now the instructional materials which are used are exclusively paper based which have the problems earlier mentioned.

Recently, Indira Gandhi National Open University (IGNOU) introduced The Tele-Education connectivity that enables 5 African Regional Leading Universities (including University of Malawi, Chancellor College) to be connected to a Hub through satellite to 53 Remote Virtual Classes distributed in all the 53 countries. Seven universities from India are connected via IPLC to the Hub located in Africa. India will hosts a Tele-Education LMS portal comprising the university Tele-Education delivery system software that incorporates the e-Learning, content management KMS (Knowledge Management System) and digital library solutions for each university as an integrated package.

This is looked at as a step forward towards the introduction of e-Learning in Malawi. Recent studies on the possibility of asynchronous e-learning in Malawi has shown that there is no significant difference in learning achievements between face to face and asynchronous e-Learning delivery modes (Kwerengwe SDA, 2010). 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 (Kwerengwe SDA, 2010). 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(Kwerengwe SDA, 2010) . 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.

2. Learner – learner interaction: forum facilities should be provided for where learners

   exchange ideas by reading and commenting on their colleagues' work.

   Learners should be made to see the advantages of learning from one another.

3. 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.

Regionally, University of Botswana which is within SADC region like Malawi has seen the need for self-regulated e-learning as Stephen M. Mutula, (2002) pointed out that there are people who are employed and wish to pursue further education at the University of Botswana, but employers are generally reluctant to release them while they are still in full time employment. Such people need a flexible model of learning. There are yet other people with family commitments that wish to study from home, but are not catered for.

At several places in rural Botswana, digital citizenship and participation is becoming more and more tangible through an ambitious national development initiative. With the so-called Kitsong Centres, Botswana has mobilised a project for the establishment of information centres equipped with a broad range of digital services across the country, including access to local and community information; eGovernment offerings such as requesting birth certificates, passport applications and school registration; as well as access to distance learning facilities. At the moment 25 centres are functional – most of them in post offices – and an additional 25 centres are being set up.

The notion of e-learning, commonly understood as 'learning facilitated online through network technologies' (Garrison & Anderson, 2003), has emerged across South African higher education institutions since the 1990s. As in other national contexts, e-learning practices appear together with an entirely new vocabulary, institutional policies and structures, and substantial institutional budgets. E-learning also appears as one of many ICT-enhanced practices in universities from the provision of e-mail, online journals, and networked libraries, to the development of creative software solutions for information management tasks in teaching, research and all sorts of institutional administrative systems for online registration, finance, human resources, student performance data, course evaluations and so on. The new practices have provoked a range of issues around online pedagogies, patterns of access and of exclusion, increasing ICT costs in the context of unequal resources and competing institutional priorities, and the relation of e-learning practices to other institutional interventions seeking to transform the colonial fabric and cultures of South African higher education institutions. It is therefore useful to

view ICTs as 'one thread in a complex net of transformation, including historical redress, curriculum transformation, diversity, equity and so on' (Czerniewicz, Ravjee & Mlitwa, 2006: 43).

Organizationally, the emergence of full-scale 'digital universities', such as the African Virtual University (Juma, 2003), which involves more than 30 higher education institutions from 17 African countries, and the increasing use of online learning in contact universities, are seen to blur the traditional distinctions between distance-mode and contact-mode institutions (Butcher 2003: 13-19). Butcher suggests that these kinds of 'dual-mode' institutions are increasing in developing countries. The universities of Stellenbosch and Pretoria as two clear examples in South Africa, where the number of 'distance' students enrolled in traditionally 'contact' institutions increased by almost 500% between 1993 and 1999, particularly in the historically Afrikaans language universities (Jansen, 2004: 303).

Clark, R.C. & Mayer, R.E (2002) pose a question "What makes e-Learning unique?" which they respond to by saying that three potentially valuable instructional methods unique to e-Learning are ; practice with automated tailored feedback, integration of collaboration with self-study and the use of simulation to accelerate expertise (pp.21). Roger C. Schank (1995) says that right feedback at the right time helps students understand and correct their own misconceptions helping them to do things better. On interactivity, Broadbent, B. (2002) says that interactive learning keeps students energized and helps participants absorb information and remember it. He says interactive learning helps students focus. To explain this point further he uses an illustration of how a human brain works. He says it works five or six times faster than instructors speak or e-Learning audio files play. If a classroom instructor , an online instructor , or an e-Learning module limits the messages to facts , participants whose minds are working five times as fast as the information is being delivered will start to draw their own conclusions- and perhaps day-dream about subjects not related to the material being taught.

The role of interaction and prompt feedback in self-regulated learning:

Learners need a supportive social context in which they can freely interact with one another as they engage in their problem solving groups. It is through these interactions that they accomplish their work and hone important social and critical thinking skills. It is also hoped that collaborative problem solving will provide learners with experiences that build an intrinsic motivation to learn, inquire, collaborate, and problem solve. This can often be promoted by building the relevance and ownership that learners feel over their learning. It is essential to nurture attitudes and skills that will encourage students to be life-long learners (Nelson, L.M pp. 254-25) in Instructional-Design Theories and Models: A New Paradigm of Instructional Theory. Volume II by Charles M. Reigeluth.

Encourage simultaneous interaction where there are multiple active participants engaged in problem solving tasks (Kagan & Kagan, 1994) in Instructional-Design Theories and Models: A New Paradigm of Instructional Theory. Volume II by Charles M. Reigeluth. It is believed that this is the essence of collaborative problem solving. It is accomplished when each group member is responsible for a task essential to the project and when the group must work in concert to succeed.

Ensure equal participation so that all learners have an opportunity to contribute (Kagan & Kagan, 1994; Slavin, 1995). This is an indication that online instruction can enable learners contribute without fear of failure and rebuke by other learners as is the case with the face to face instruction.

Promote positive interdependence, in that each group member is positively linked with others in such a way that the individual cannot succeed unless the group does (Johnson & Johnson, 1994; Kagan & Kagan 1994). Require individual accountability where students are held responsible for doing their share of work (Johnson & Johnson, 1994; Kagan & Kagan, 1994; Slavin, 1995). Brown and Champione (1996) in Reigeluth C.M (1999, p.284) claim that dialogue provides the format for the novice to adopt the discourse structure, goals, values and belief systems of scientific practice. Overtime the community of learners adopts a common voice and common knowledge base, a shared

system of meaning, beliefs, and activity that is as often implicit as it is explicit…. Ideas are seeded in discussion and migrate throughout the community.

Reigeluth C.M (1999, p.473) says that "In general, feedback is more effective in promoting learning when it transmits more complete information. In addition, Perkins in Smart Schools in Reigeluth C.M (1999, p.6) indicate that an instruction should contain in part thoughtful practice, informative feedback and strong intrinsic or extrinsic motivation if it is to foster cognitive learning. Considering the fact that self-regulated study is only possible when a learner is motivated either intrinsically or extrinsically or both, the course content delivery for the research instructional material was based on Dr. Keller's Motivation Model (ARCS Model). ARCS Model is according to Dr. Keller an acronym that stands for Attention, Relevance, Confidence and Satisfaction.

The application of ARCS Model to my instructional material has been adapted from Instructional Theories in Action: Lessons Illustrating Selected Theories and Models by Charles M. Reigeluth (1987, p289).

A (Attention): Attention in the instructional material was done through the introduction. The introduction was done in such a way that it attracted the participants' attention. This was done by perceptual arousal in which the participants' attention was gained and maintained by the use novel stories.

R (Relevance): Relevance of the instructional material was shown in objectives where participants were told what they will be capable of doing after the instruction.

C (Confidence): The confidence was developed by participants after attempting the quizzes and get them right.

S (Satisfaction): Satisfaction was achieved by the right responses the students got to the quiz questions in a short term and what they could be able to do after the course in the long run.
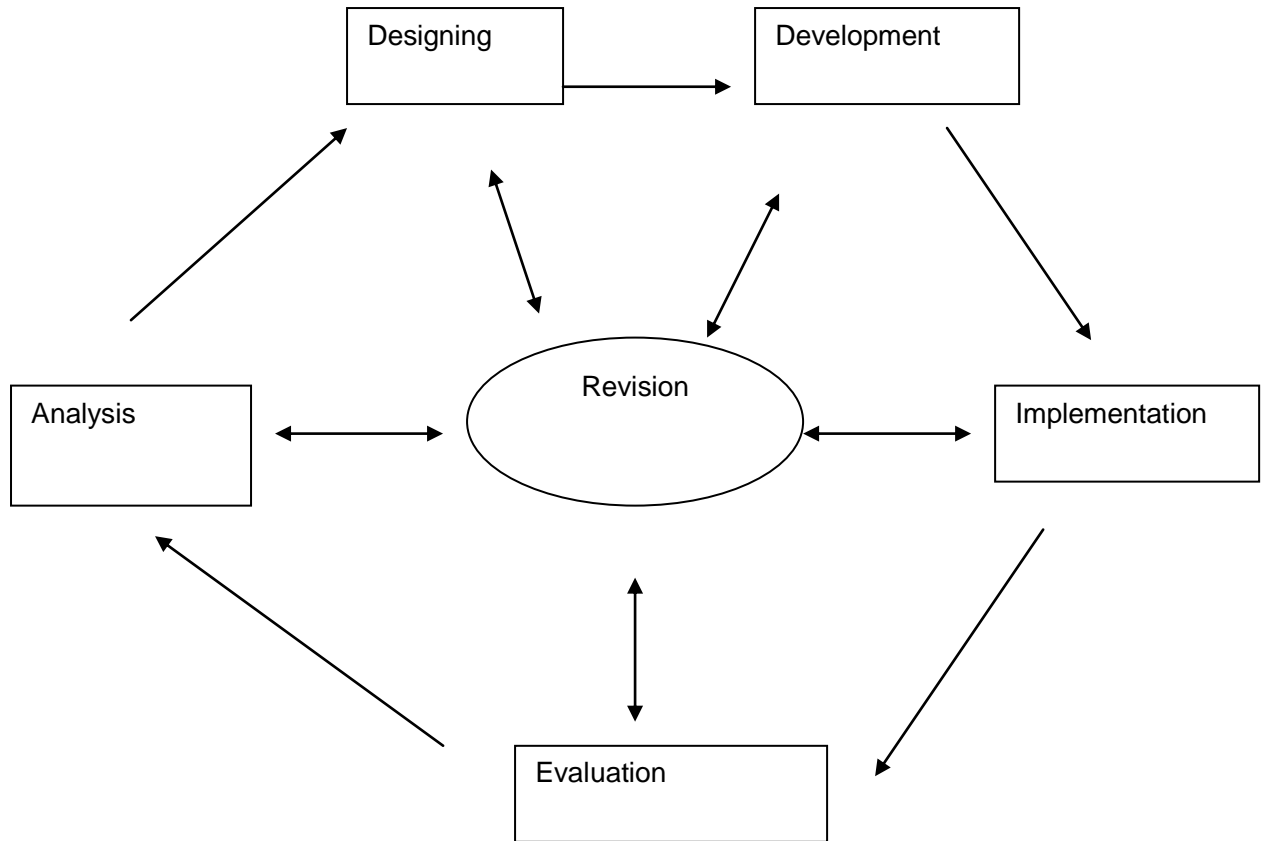
Figure 1. ADDIE's Model adapted from e-Learning Fundamentals, (Katsuaki Suzuki, 2004)

This model was based upon throughout the entire development process of the experimental contents that were used for the research activities. ADDIE is an acronym that stands for Analysis, Designing, Development, Implementation and Evaluation as shown in figure 1 above.

Chapter three

Procedures

(a)   Research Design:

   The research was designed in such a way that an instructional material consisting of two topics with two versions (online and paper based) for each topic was developed. Research participants studied both topics in both online and paper based versions alternatively. The participants who studied topic 1 online studied paper based version of topic 2 (group A) and participants who studied paper based version of topic 1 studied online version of topic 2 (group B). Look at table 2 below.

Table 2 Order of Experimental Instructional Materials Study by Research Participants

Group ⟶ Topic ↓	A	B
1	online	paper based
2	paper based	online

   The topics which were used for the development of the experimental contents were taken from one of the courses from the Faculty of Education in the department of education foundations called Instructional Technology. This is a second year course to second year diploma students in distance education programme.

(b)   Research Participants:

   The research participants were students of Domasi College of Education studying through distance. They were serving secondary school teachers who teach in community day secondary schools in Malawi without secondary school teaching qualifications. All participants had primary school teaching qualifications obtained from Teacher Training Colleges (TTC) in Malawi but were promoted to teach in community day secondary schools due to teacher shortage in these schools soon after opening these community

day secondary schools. They were 60 participants in total out of which 12 were females representing 20% of the research population and 48 were males representing 80% of the research population. The age range of the participants was 25 to 45 years according to Domasi College of Education admission rules. The participants had a minimum of two years teaching experience either in primary school or community day secondary school according to the same admission standards of Domasi College of Education. The participants were the holders of Malawi School Certificate of Education (MSCE) in which they were required to have at least two strong credits in the subject areas of their specialization. 57 of the 60 participants representing 95% of the whole research population were completely computer illiterate. Only 3 of the 60 participants representing 5% of the whole research population had some knowledge and skills in basic ICT skills.

Participants were randomly selected from second year class list of distance learners. This was done in the third week of September (16/09/2010). The entry test was not administered to the research participants. All the students were equally legible to participate in the research activities since they were all selected into the college to study by writing an entrance examination and this examination was used as entry test for them to my research activities. The total class size was 285 out of which 60 participants were selected. 1 participant was randomly selected out of 4 possible participants. 60 participants selected for the research activities were divided into two equal groups of 30 participants each represented as group A and B in the table 2 above. The participants were also to swap the versions of topics or courses of study after finishing the first topic as shown in table 2 above.

Thereafter letters were written to research participants informing them of the research activities which they were to be involved in. The research orientation program was set and all the 60 participants were written to attend the orientation. An orientation activity was conducted on 23rd October, 2010. This was three weeks later than initially planned because students delayed coming to college for residential session due to Malawi National Examinations Board activities at the college. 50 out of the shortlisted research

participants attended the orientation program as scheduled. Those who did not attend the first orientation session were informed of the next orientation session which was two days later (25/10/2010) in the evening. During the orientation sessions usernames and passwords for accessing online research experimental contents were given to the research participants.

For the research participants to use the online research contents they had to be trained in basic ICT skills which was done to the research participants during the orientation exercise. One assistant was hired to help in the teaching of basic ICT skills to research participants.

Figure 2. Participants being Oriented to Basic ICT Skills

Figure 3. Participants Studying an Online Topic

There was high attrition rate of the research participants as the research activities progressed. This was due to the tight and busy schedule for the participants because they were supposed to attend to classes during the same research period. Limited knowledge and skills in basic ICT skills, poor internet connectivity, and frequent power interruptions which frustrated the participants were also some of the factors which contributed to high attrition rate among participants. Out of the 60 participants who were shortlisted for the research activities 52 participants initially started the research activities and the number continued to decrease until there were only 29 participants at the end of research activities representing 48.33% which means 31 participants dropped from the initially 60 shortlisted participants representing an attrition rate of 51.67%. Look at the tables 3 and 4 below.

Participants' Characteristics

Table 3 Summary of Participants Characteristics during Study of Topic 1 (Week 1)

			Gender		ICT skills	
		Number per Group	Female	Male	None	Little
Group A	Initial number	30(100%)	7(23.33%)	23(76.67%)	29(96.67%)	1(3.33%)
	Number of dropouts	10(33.33%)	2(28.57%)	8(34.78%)	10(34.48%)	0(0.00%)
Group B	Initial number	30(100%)	6(20.00%)	24(80.00%)	28(93.33%)	2(6.67%)
	Number of dropouts	8(26.67%)	1(16.67%)	7(29.17%)	8(28.57%)	0(0.00%)
Totals	Initial	60(100%)	13(21.67%)	47(78.33%)	57(95.00%)	3(5.00%)
	Dropouts	18(30.00%)	3(23.08%)	15(31.91%)	18(31.58%)	0(0.00%)

Table 4 Participants Characteristics during Study of Topic 2 (Week 2)

			Gender		ICT skills	
		Number per Group	Female	Male	None	Little
Group A	Initial number	20(66.67%)	5(16.67%)	15(50.00%)	19(63.33%)	1(3.33%)
	Number of dropouts	4(20.00%)	2(40.00%)	2(13.33%)	4(21.05)	0(0.00%)
Group B	Initial number	22(73.33%)	5(16.67%)	17(56.67%)	20(66.67%)	2(6.67%)
	Number of dropouts	9(40.91%)	1(20.00%)	8(47.06%)	9(45.00%)	0(0.00%)
Totals	Initial	42(70.00%)	10(16.67%)	32(53.33%)	39(65.00%)	3(5.00%)
	Dropouts	13(30.95%)	3(30.00%)	10(31.25%)	13(33.33%)	0(0.00%)

Note: Treatments to groups changed during topic 2.

Three (3) non-participating students were used in small group formative evaluation of the experimental instructional materials of the research activities for usability validation. They intensively studied the experimental contents for three days before they were used by research participants after which material revision followed. Two members of staff from my college who are specialists in the field of Instructional Technology and Curriculum Studies were also used for content validation as well as structural organisation of subtopics within each topic. This was done from the second week of September, 2010 to around the end of September, 2010.

(c)   Operational definitions of key terms:

Effectiveness in my research will be measured by the posttest scores of the instructional materials. The mode of the instructional material (online/paper based) that will produce a higher posttest average score for the participants will be regarded as an effective instructional material. It is expected that such a higher average score will be the

product of promptness of feedback and the frequency of interactivity between the instructional material and the learner, among learners themselves and between learners and lecturer.

(d)   Experimental contents:

After undergoing the training in basic ICT skills and orientation to the research activities, the participants had to start studying the experimental contents.   The participants were divided into two groups in which both groups had to study the same topic of different versions (one online and the other paper based). Before beginning studying the contents, the participants sat for a pretest. Both studying online and paper based versions had to seat for the same pretest which was paper based. This was done due to slow internet connectivity and to make the pretest conditions the same. The same applied to posttests. What was the different was the mode of content delivery where online and paper based methods of content delivery were used. My experimental research contents did not provide or use video links due to poor internet connectivity. The experimental contents were developed from the Education Foundations Syllabus from the subject called Instructional Technology. This is a compulsory second year credit course for the diploma programme in both distance and face to face programmes. The course development was based on ARCS Model as a motivational element in the contents. ARCS Model is according to Dr. Keller an acronym that stands for: Attention, Relevance, Confidence and Satisfaction. Each of these motivational elements was incorporated in the instructional material to motivate the learners as they studied the contents.

A (Attention): Attention in the instructional material was done through the introduction. The introduction was done in such a way that it attracted the participants' attention. This was done by perceptual arousal in which the participants' attention was gained and maintained by the use novel stories.

R (Relevance): Relevance of the instructional material was shown in objectives where participants are told what they will be capable of doing after the instruction.

C (Confidence): The confidence was developed by participants after attempting the quizzes and get them right.

S (Satisfaction): Satisfaction was achieved by the right responses the students got to the quiz questions in a short term and what they could be able to do after the course in the long run.

Then two subject matter experts one in the field of Instructional Technology and the other in curriculum studies reviewed the instructional materials. Both subject matter experts were from Domasi College of Education.
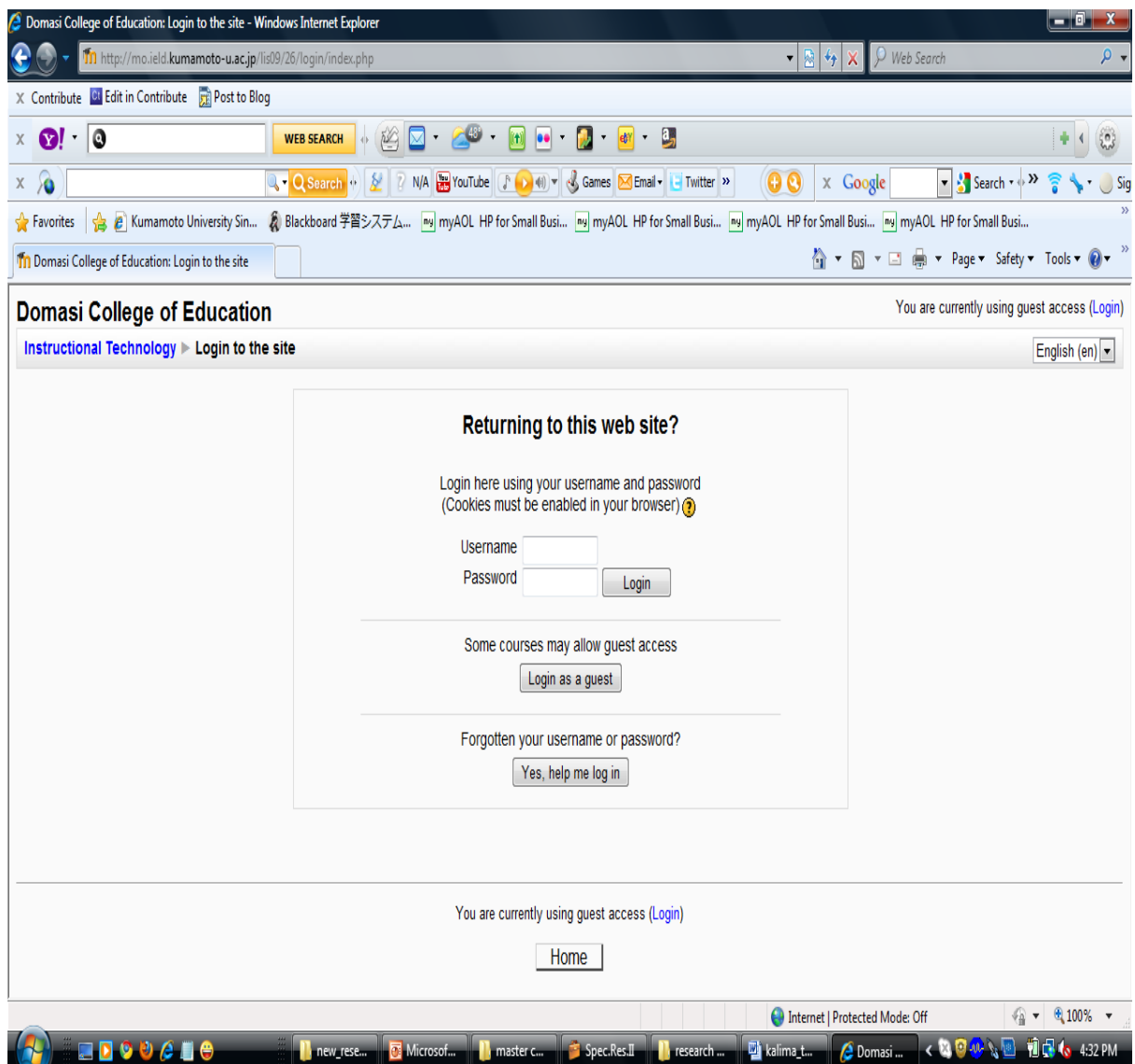
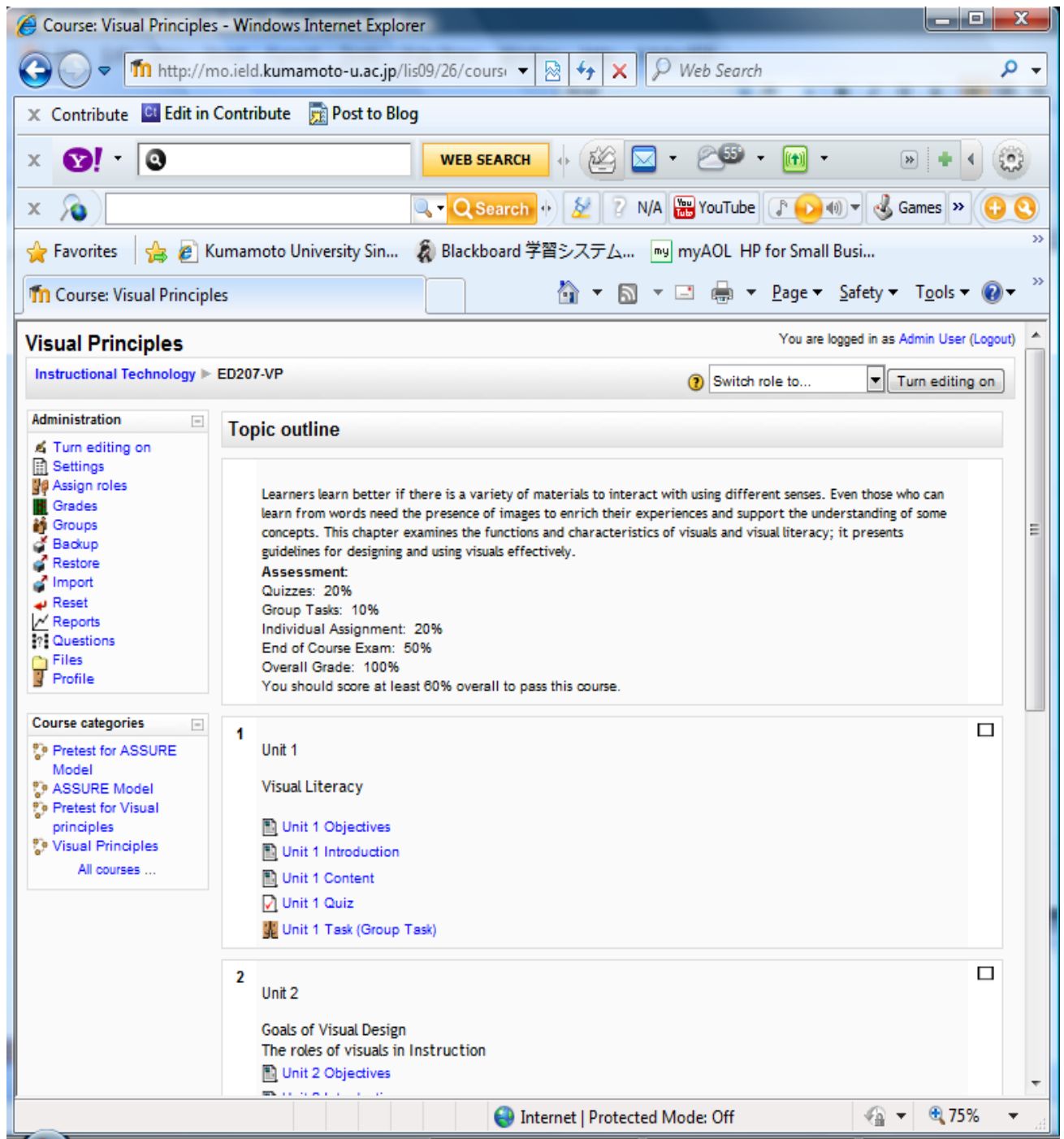Figure 4. Login page for the Online Experimental Contents

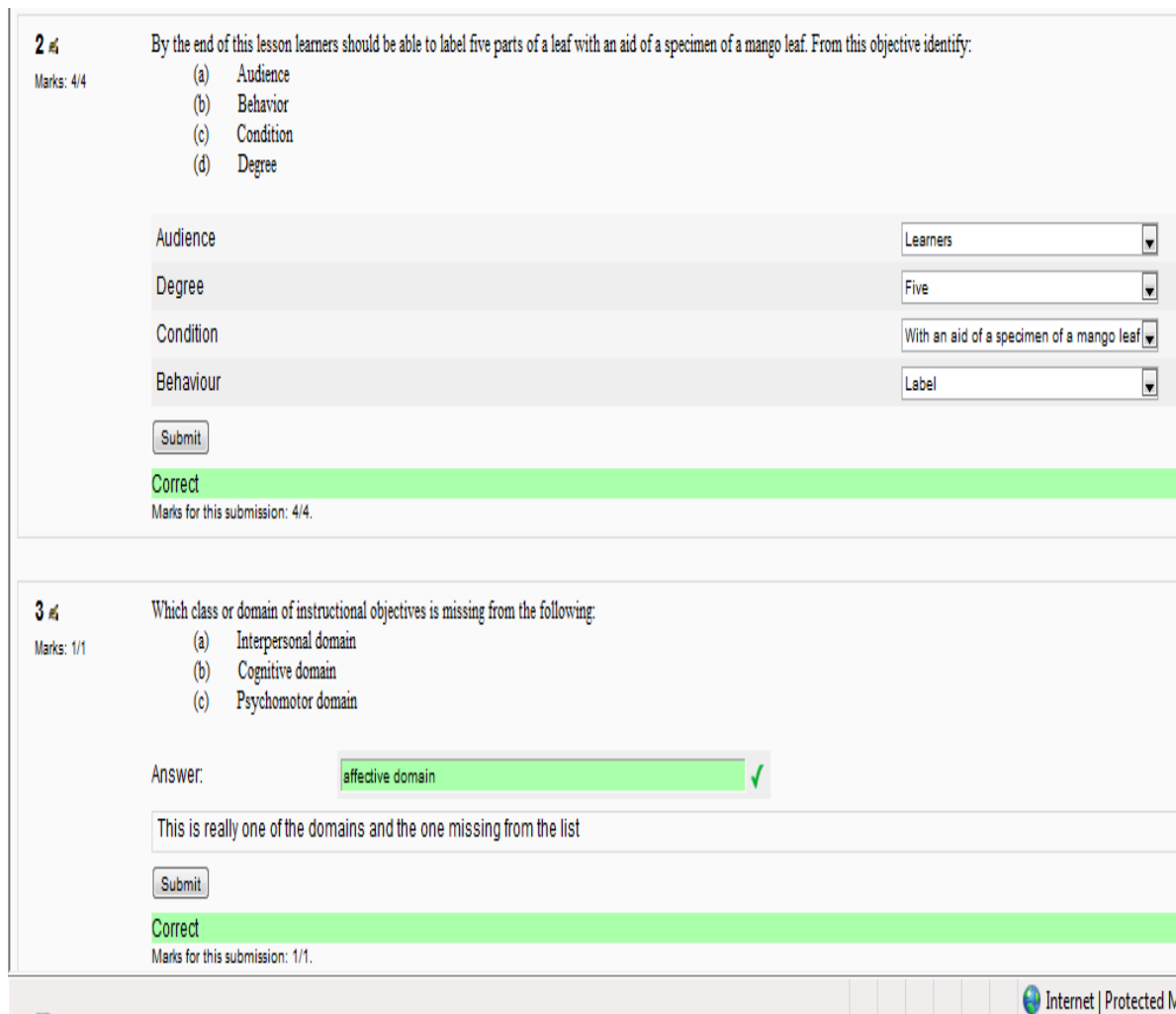Figure 5. Screen Shot for the Online Experimental Contents

Figure 6. Screen Shot for the Online Quiz

(e) Instruments for data collection:

The following instruments were used for data collection namely pretests and posttests (table 5 and 6), participant questionnaires (table 11 and 12), comments from expert reviewers, comments from experimental users (non-participating students) and from the research participants themselves.

(f) Research scope and limitations:

The target audience for this research were second year Domasi College of Education students studying through distance for the 2010/2011 school session. All the planned research activities except for the one on one formative evaluation were done but not as scheduled. This was the case because of other scheduled activities at Domasi College of

Education which resulted in the postponement of the opening date for the distance education residential program for the school year 2010/2011. As a result of this, there was high attrition rate towards the end of the research activities since students who were the participants to the research activities had a divided attention between research activities and academic work.

(g)   Data analyses:

Both quantitative and qualitative data analyses were used to interpret the data that was collected from the participants. Quantitative data was used to test the hypotheses while the qualitative data was used to explain other emerging issues during the research activities. Quantitative data was obtained from the participant scores after attempting a pretest and posttest before and after studying the experimental contents and from the participant questionnaires. Qualitative data was obtained from the questionnaires which were being administered to participants upon completion of the study of the contents and writing of posttests. Qualitative data was obtained from the section of general comments of the questionnaire. T-Test was used for data analysis where it was expected that there will be better results for those studying online as compared to those studying using paper based instructional materials.

There were three hypotheses to test in this research; (1) Online mode of content delivery in distance education will result in better learning outcomes than paper based mode, (2) Online instructional materials will result in increased interactivity among learners, learners with contents/system and learners with lecturers than paper based instructional materials, and (3) Online instructional materials will result in prompt feedback to learners' tasks than paper based instructional materials.

To test Hypothesis (1), t-test with differences between pretest and posttest was performed for both topics. The alpha level for significance tests was set at .05 to control Type I error. Prior to the main effects analysis, the group equivalence was checked with t-test of pretest for two topics. To examine Hypotheses (2) and (3), questionnaire results were analyzed.

Chapter four

Results

The results were obtained using pretest and posttets where posttest results (learning outcomes) were used for comparing which one of the two modes of content delivery in distance education was more effective than the other. Questionnaire results were also used to find out how participants rated the two modes of content delivery in distance education by determining which of the two methods of content delivery (online and paper based) was more interactive and resulted in prompt feedback than the other. The results are as tabulated below under descriptive statistics.

Descriptive Statistics

Pretest and posttest scores for two topics are summarized in Table 5 and 6 below. During pretest group A (studying an online version) had an average score of 25.95 while group B (studying paper based version) scored 24.82 in topic 1. In topic 2 group B (studying an online version) scored 27.69 while group A studying the paper based version scored 25.00. During posttest, group A (studying online version) scored a lower average score (52.25%) while group B (studying paper based version) scored a relatively higher average score (63.00%) in topic 1. In topic 2 group B studying online version of the instructional materials scored a higher average score (50.15) while group A studying a paper based version scored a relatively lower average score of 45.50.

Table 5 Summary of pretest/posttest mean scores and standard deviations for topic 1

Group	Pretest			Posttest		
	Number of participants	M	SD	Number of participants	M	SD
A (Online)	20	25.95	10.61	20	52.25	22.26
B (Paper-based)	22	24.82	14.13	22	63.00	19.31

Note. The full scores for pretest and posttest were converted to 100 points.

Table 6 Summary of pretest/posttest mean scores and standard deviations for topic 2

Group	Pretest			Posttest		
	Number of participants	M	SD	Number of participants	M	SD
B (online mode)	13	27.69	5.76	13	50.15	12.92
A (paper based)	16	25.00	9.63	16	45.50	23.32

Note. The full scores for pretest and posttest were converted to 100 points.

Hypothesis (1):

Online mode of content delivery in distance education will be more effective than paper based mode. Pretest and posttest results were used to test this hypothesis.

There were two topics to test Hypothesis (1). First, the group equivalence was examined with t-test on pretest for two topics. Then, to test the hypothesis, t-test using differences between pretest and posttest was performed for both topics.

Group Equivalence

Table 7 and 8 below show no significant differences on pretest scores for two groups for topic 1 and 2. As for topic 1, level of significance set at alpha level 0.05 showed no significance between two groups in topic 1 ($t(40) = 0.278$, $p>0.05$)). For topic 2, level of significance set at alpha level 0.05 showed no significance between two groups in topic 2 ($t(27) = 0.869$, $p>0.05$)).

There was no significance in pretest t-scores for both group A and B for both topics 1 (ASSURE Model) and 2 (Visual Principles) which indicated group equivalence i.e. group A and B were initially equal before studying the experimental contents.

Table 7 Group Equivalence Test for Topic 1; t-Test for Pretest

	N	M	Var	df	t	p
Online	20	25.95	112.47	40	0.278	0.782
Paper based	22	24.82	199.58			

Table 8 Group Equivalence Test for Topic 2; t-Test for Pretest

	N	M	Var	df	t	p
Online	13	27.69	33.23	27	.869	.393
Paper based	16	25.00	92.80			

Online and Paper-based Modes Effectiveness Comparison

In order to compare which of the two modes of the content delivery was more effective than the other, differences between pretest and posttest were used for t-test (Table 9). The t-test results show significance for topic 1(t (40) = -2.12, p < .05)), but no significance was found in topic 2 (t (26) = .60, p > .05)).

Table 9 Online and Paper Based Modes Comparison Test for topic 1 and 2; t-Test for Pretest and posttest

	t	df	p
Topic 1	- 2.124	40	.045*
Topic 2	.596	26	.556

Note. p* < .05.

Group A and B were significantly different on posttest for Topic 1 (p < 0.05). However, against the hypothesis, group B studying with Paper-based mode scored higher than group A studying with online mode (Table 9). For topic 2, significant difference was not found. Thus, Hypothesis (1) was rejected for both group A and B.

Table 10 Online and Paper Based Modes Comparison Test for topic 1 and 2

		Online	Paper-based
Topic 1	Group	A	B
	Mean of Differences between pretest and posttest	5.8	8.41
	SD	3.82	4.11
Topic 2	Group	B	A
	Mean of Differences between pretest and posttest	6.08	5.13
	SD	3.23	4.80

It was also found that those studying an online version of topic 1 had a lower mean difference between pretest and posttest of 5.8 compared to those studying the paper based version who had a mean difference of 8.41 between pretest and posttest. On the other hand, in topic 2 those studying an online version had a higher mean difference between pretest and posttest of 6.08 while those studying the paper based version had a relatively lower mean difference of 5.13 (Figure 10). This indicates that paper based mode was more effective for topic 1 than an online mode. For topic 2 it indicates that the two modes (online and paper based) were not significantly different.

Hypothesis (2) & (3)

Table 11 and 12 summarises the participants' responses to questionnaire items which were used to test hypothesis 2 and 3:

Hypothesis 2:

Online instructional materials will result in increased interactivity among learners, learners with contents/system and learners with lecturers than paper based instructional materials:

To test this hypothesis item 1 and 3 were used. Item 1 (This instructional material makes you easily exchange ideas in group discussions) had a mean rating of 3.00 for an online delivery mode of topic 1 as compared to a mean rating of 3.13 for the paper based delivery mode of the same item (Figure 11). For the same item for topic 2, an online delivery mode had a mean rating of 2.59 while the paper based delivery mode had a mean rating of 3.00 (figure 12).

For the same hypothesis 2, item 3 (This instructional material makes you to interact with the lecturer more frequently during group discussions) had a mean rating of 2.55 for an online delivery mode for topic 1 as compared to 2.75 for the paper based delivery mode (Figure 11).

For the same item for topic 2, an online delivery mode had a mean rating of 2.65 while the paper based delivery mode had a mean rating of 2.42 (figure 12).

<u>Hypothesis (3)</u>:

Online instructional materials will result in prompt feedback to learners' tasks than paper based instructional materials:

To test this hypothesis, item 4 was used. Item 4 (This material gives feedback to you more quickly during quiz) had a mean rating of 3.82 of an online delivery mode for topic 1 compared to 2.50 for the paper based delivery mode (Figure 11). On the other hand the same item had a mean rating of 3.35 for an online delivery mode of topic 2 compared to a mean rating of 1.83 for the paper based delivery mode (Figure 12).

Table 11 Summary of Participants Rating of the two Modes of Content Delivery (Online and Paper Based) for Topic 1

Delivery mode	Group	Item number	Questionnaire item	No idea 0	Strongly disagree 1	Disagree 2	Agree 3	Strongly agree 4	Mean
Online	A	1	This instructional material makes you easily exchange ideas in group discussions	0(0%)	1(9.09%)	0(0%)	8(72.73%)	2(18.18%)	3.00
		2	This instructional material makes you more motivated to read the instructional contents	0(0%)	1(9.09%)	0(0%)	8(72.73%)	2(18.18%)	3.00
		3	This instructional material makes you to interact with the lecturer more frequently during group discussions	0(0%)	2(18.18%)	3(27.27%)	4(36.36%)	2(18.18%)	2.55
		4	This material gives feedback to you more quickly during quiz	0(0%)	0(0%)	0(0%)	2(18.18%)	9(81.82%)	3.82
		5	It is easy for you to navigate through online contents	0(0%)	0(0%)	0(0%)	3(27.27%)	8(72.73%)	3.73
		6	Online instructional material has good visual appeal	0(0%)	0(0%)	0(0%)	1(9.09%)	10(90.91%)	3.91
Paper	B	1	This instructional material makes you easily exchange ideas in group discussions	0 (0%)	1(12.5%)	0(0%)	4(50%)	3(37.5%)	3.13
		2	This instructional material makes you more motivated to read the instructional contents	0 (0%)	0(0%)	3(37.5%)	3(37.5%)	2(25%)	2.88
		3	This instructional material makes you to interact with the lecturer more frequently during group discussions	0 (0%)	1(12.5%)	2(25%)	3(37.5%)	2(25%)	2.75
		4	This material gives feedback to you more quickly during quiz	0 (0%)	3(37.5%)	1(12.5%)	1(12.5%)	3(37.5%)	2.50
		5	It is easy for you to navigate through paper based contents	0 (0%)	1 (12.5%)	0(0%)	4(50%)	3(37.5%)	3.13
		6	Paper based instructional material have good visual appeal	1(12.5%)	1 (12.5%)	0 (0%)	4 (50%)	2 (25%)	2.63

Table 12 Summary of Participants Rating of the two Modes of Content Delivery (Online and Paper Based) for Topic 2

				Item rating					Mean
				No idea	Strongly disagree	Disagree	Agree	Strongly agree	
Delivery Mode	Group	Item Number	Questionnaire item	0	1	2	3	4	
Online	A	1	This instructional material makes you easily exchange ideas in group discussions	1(5.88%)	1 (5.88%)	5 (29.41%)	7(41.18%)	3(17.65%)	2.59
		2	This instructional material makes you more motivated to read the instructional contents	0 (0%)	1 (5.88%)	0 (0%)	7(41.18%)	9(52.94%)	3.41
		3	This instructional material makes you to interact with the lecturer more frequently during group discussions	0 (0%)	1(5.88%)	8(47.06%)	4(23.53%)	4(23.53%)	2.65
		4	This material gives feedback to you more quickly during quiz	1(5.88%)	1 (5.88%)	0 (0%)	4(23.53%)	11(52.94%)	3.35
		5	It is easy for you to navigate through online contents	0 (0%)	1 (5.88%)	1(5.88%)	4(23.53%)	11(52.94%)	3.47
		6	Online instructional material has good visual appeal	1(5.88%)	0 (0%)	0 (0%)	9(52.94%)	7(41.18%)	3.67
Paper based	B	1	This instructional material makes you easily exchange ideas in group discussions	0 (0%)	2(16.67%)	1 (8.33%)	4 (33.33%)	5(41.67%)	3.00
		2	This instructional material makes you more motivated to read the instructional contents	0 (0%)	3(25%)	3 (25%)	4(33.33%)	2(16.67%)	2.42
		3	This instructional material makes you to interact with the lecturer more frequently during group discussions	0 (0%)	3(25%)	3(25%)	4 (33.33%)	2(16.67%)	2.42
		4	This material gives feedback to you more quickly during quiz	0 (0%)	4 (33.33%)	7 (58.33%)	0 (0%)	1(8.33%)	1.83
		5	It is easy for you to navigate through online contents	0 (0%)	0 (0%)	5 (41.67%)	4 (33.33%)	3 (25%)	2.83
		6	Online instructional material has good visual appeal	0(0%)	1 (8.33%)	6 (50%)	4 (33.33%)	1 (8.33%)	2.42

Detailed summary of the questionnaire ratings have also been presented in graphical form in the figures that follow. *Note: An item "No idea" had no statistical significance in this research.* Below is the summary of questionnaire items by participants in a graphical form.

Summary of Questionnaire Ratings for Topic 1

Figure 7 shows that 10 participants agree with an item that an online version of the instructional material makes participants easily exchange ideas in group discussions against 1 participant who disagrees with it. Figure 8 shows that 7 participants agree with an item that a paper based version makes participants easily exchange ideas in group discussions against 1 participant who disagrees with it.
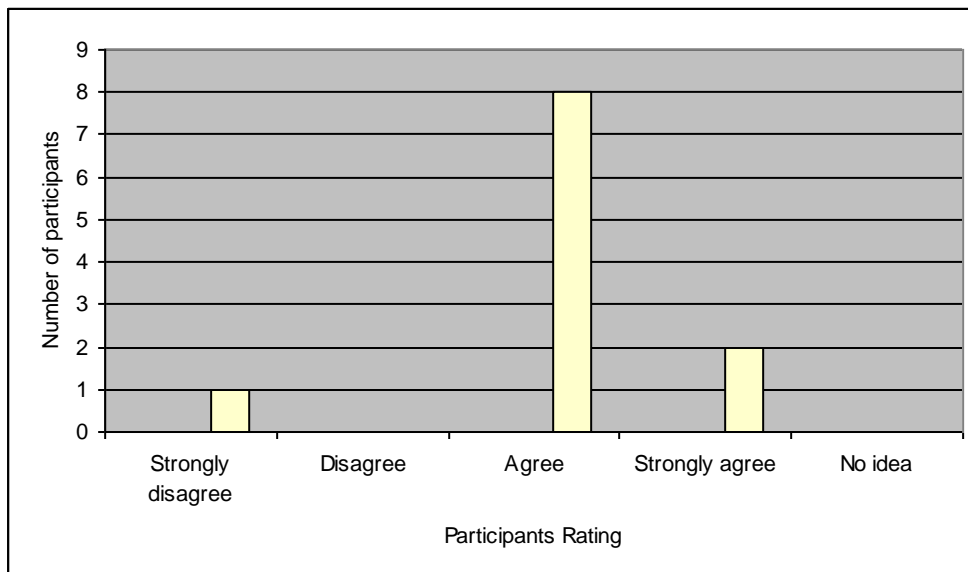
Figure 7. This instructional material makes you easily exchange ideas in group discussions
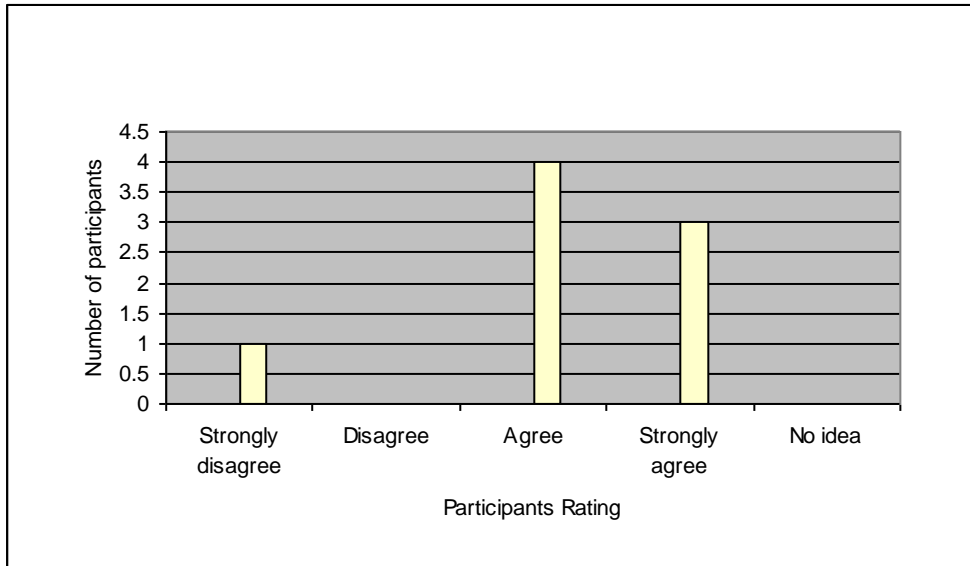
Figure 8. This instructional material makes you easily exchange ideas in group discussions

In figure 9 below 10 participants agreed with an item that an online version of this instructional material made them more motivated to read the instructional contents against 1 participant who disagreed with this item. On the other hand in figure 10 show that 5 participants agreed that a paper based version of this instructional material made them more motivated to read the instructional contents against 3 participants who disagreed with the item.
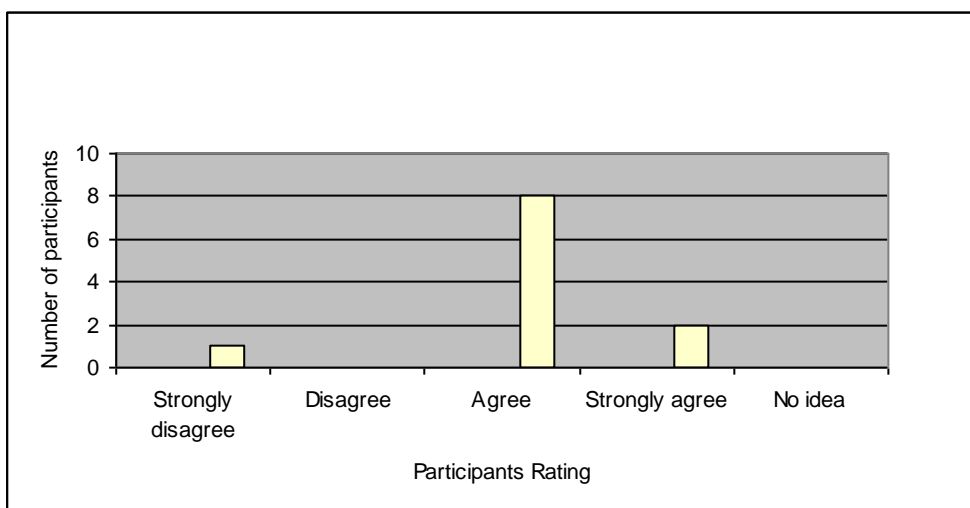
Figure 9. This instructional material makes you more motivated to read the instructional contents
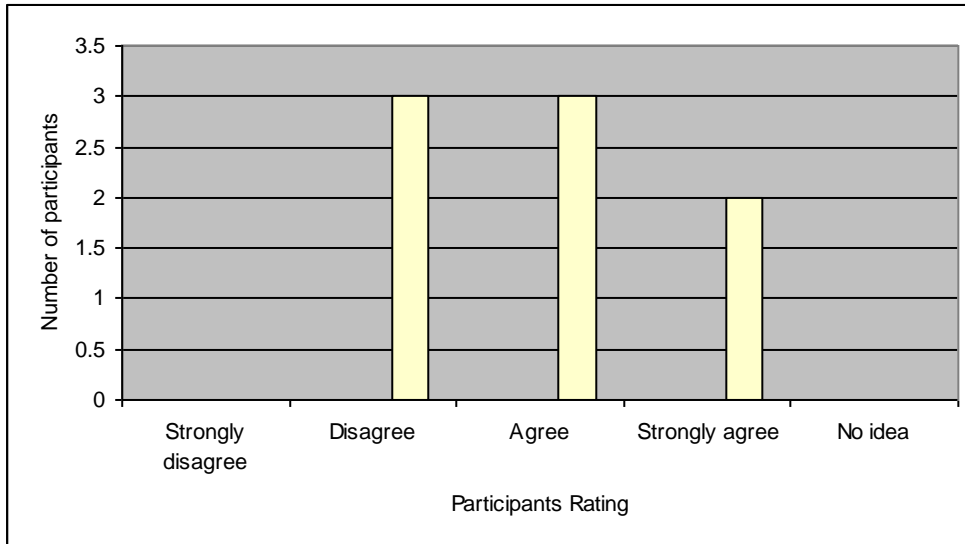
Figure 10. This instructional material makes you more motivated to read the instructional contents

Figure 11 shows that 6 participants agreed with an item that an online instructional material of ASSURE Model enabled them to interact with the lecturer more frequently during group discussions against 5 participants who disagreed. On the other hand figure 12 shows that 5 participants agreed with the item that paper based instructional material of ASSURE Model enabled them to interact with the lecturer more frequently during group discussions against 3 participants who disagreed.
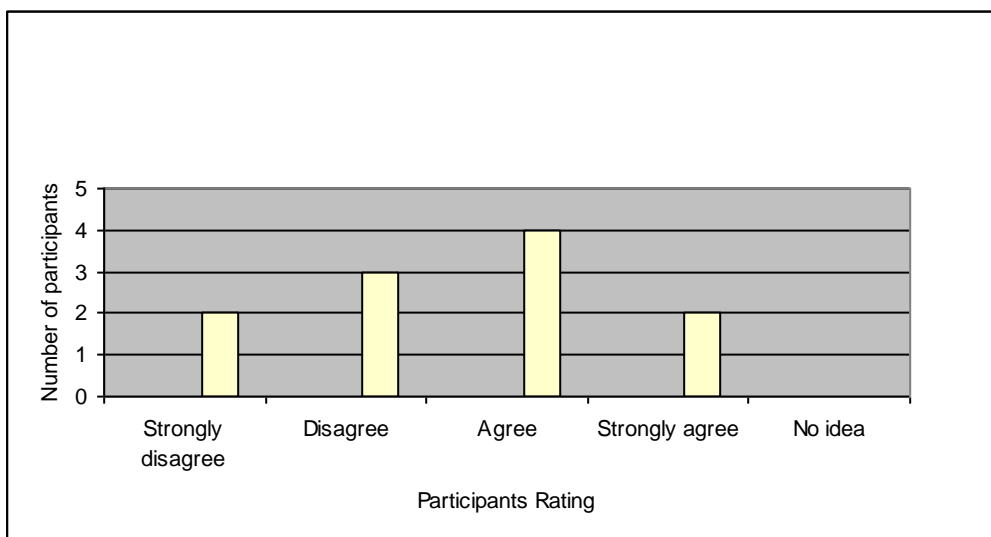
Figure 11. This instructional material makes you to interact with the lecturer more frequently during group discussions
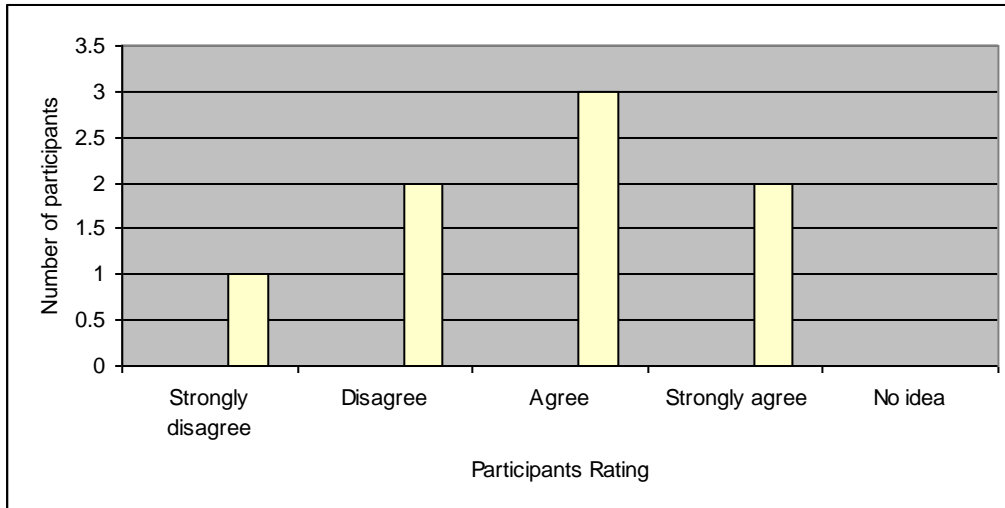
Figure 12. This instructional material makes you to interact with the lecturer more frequently during group discussions

Figure 13 shows that 11 participants agreed with an item that an online instructional material of ASSURE Model gave them feedback more quickly during quiz against no body who disagreed with the item. On the other hand figure 14 indicates that 4 participants agreed with an item that a paper based instructional material of ASSURE Model gave them feedback more quickly during quiz against 4 participants who disagreed.
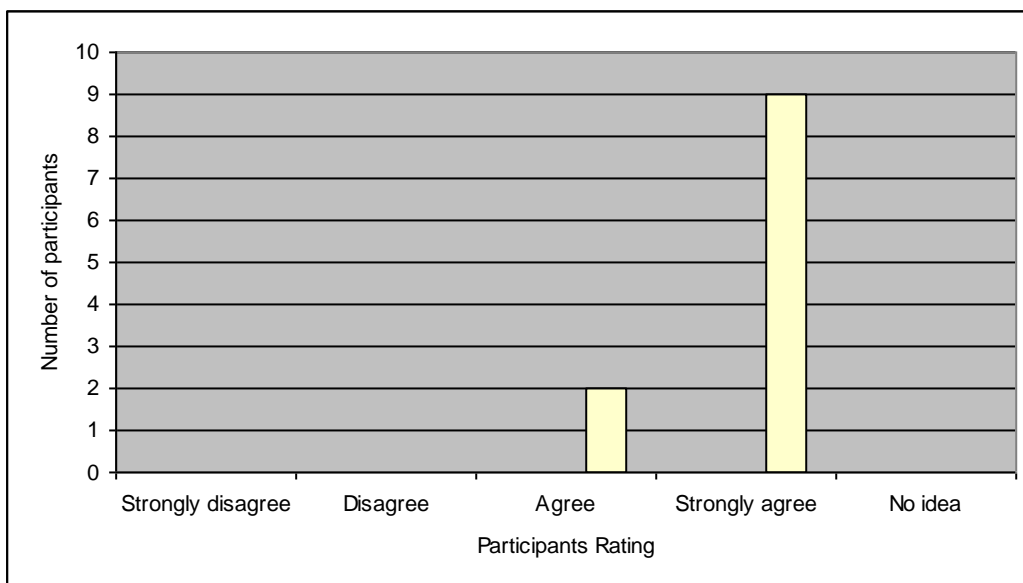
Figure 13. This material gives feedback to you more quickly during quiz
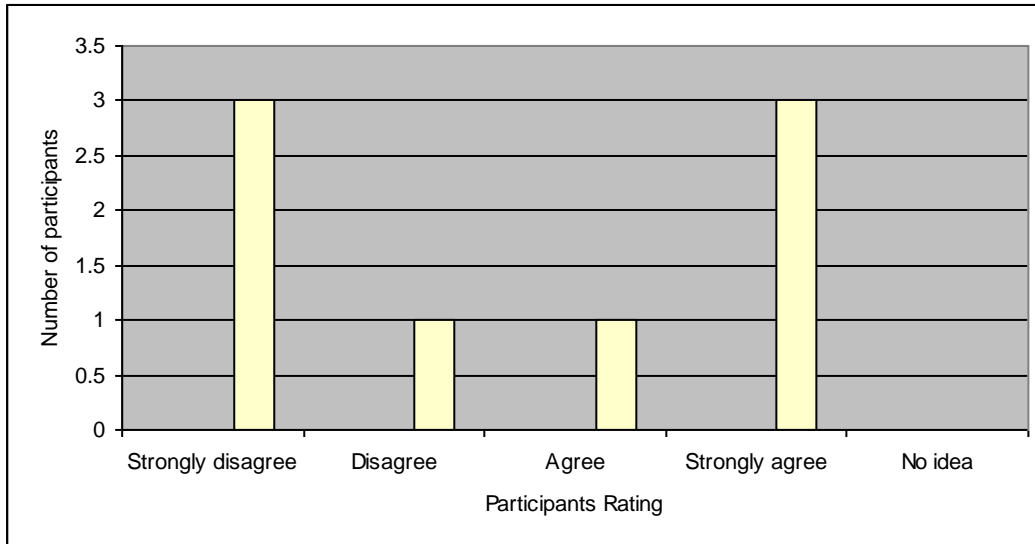
Figure 14. This material gives feedback to you more quickly during quiz

Figure 15 shows that 11 participants agreed with an item that an online instructional material of ASSURE Model was easy for them to navigate through against no body who disagreed. On the other hand 7 participants agreed with the item that a paper based instructional material of ASSURE Model was easy for them to navigate through against 1 participant who disagreed in figure 16.
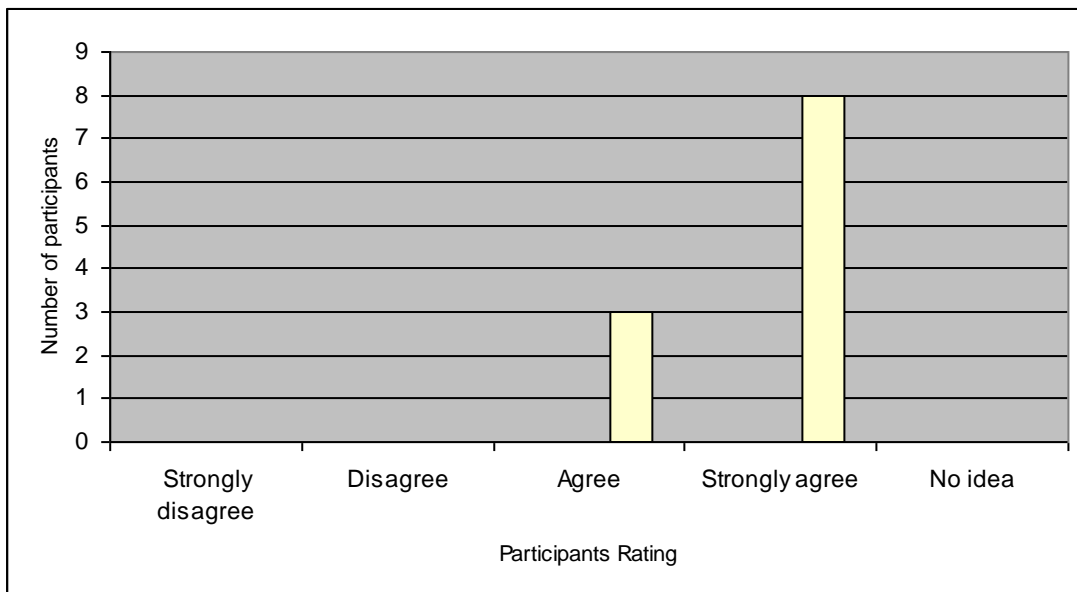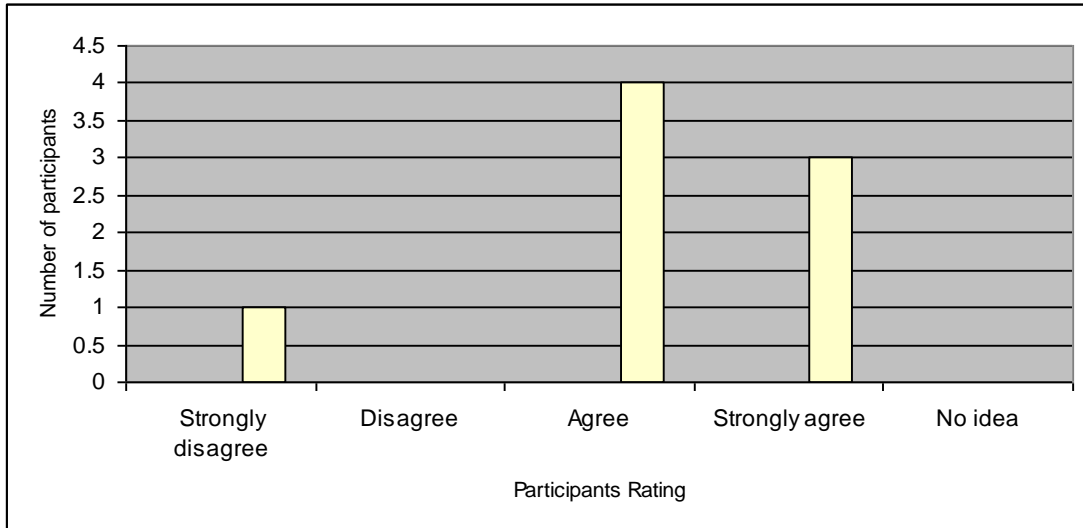

Figure 15. It is easy for you to navigate through online contents

Figure 16. It is easy for you to navigate through paper based contents

Figure 17 shows that 11 participants agreed with an item that an online instructional material of ASSURE Model had good visual appeal against no body who disagreed. On the other hand 6 participants agreed with an item that a paper based instructional material of ASSURE Model had good visual appeal against 1 participant who disagreed in figure 18.
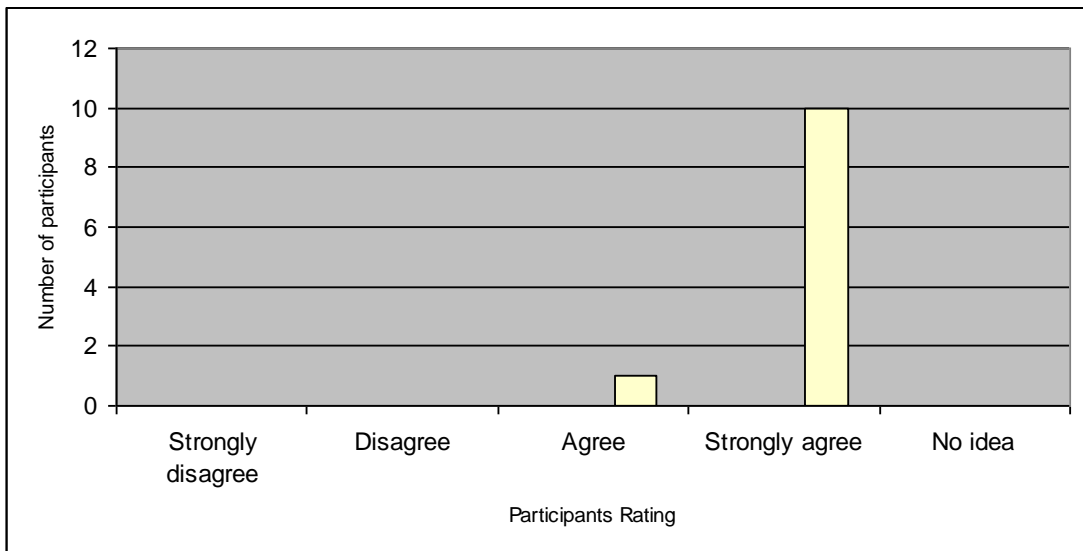

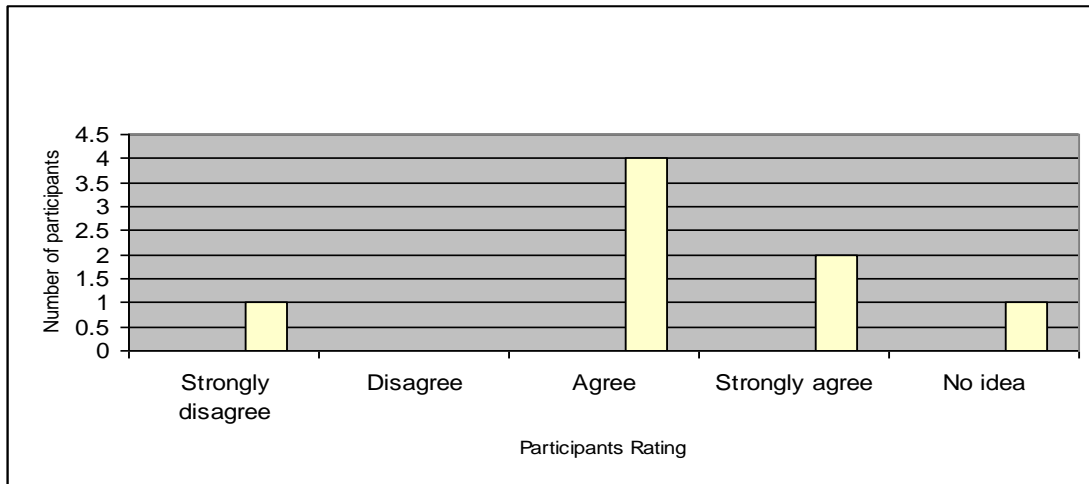Figure 17. Online instructional material has good visual appeal

Figure 18. Paper based instructional material has good visual appeal

Questionnaire responses for topic 2 (Visual Principles):

Figure 19 above show that 10 participants agreed with an item that an online instructional material of Visual Principles made them easily exchange ideas in group discussions against 6 participants who disagreed. On the other hand in figure 20, 9 participants agreed with an item that a paper based instructional material of Visual Principles made them easily exchange ideas in group discussions against 3 participants who disagreed.
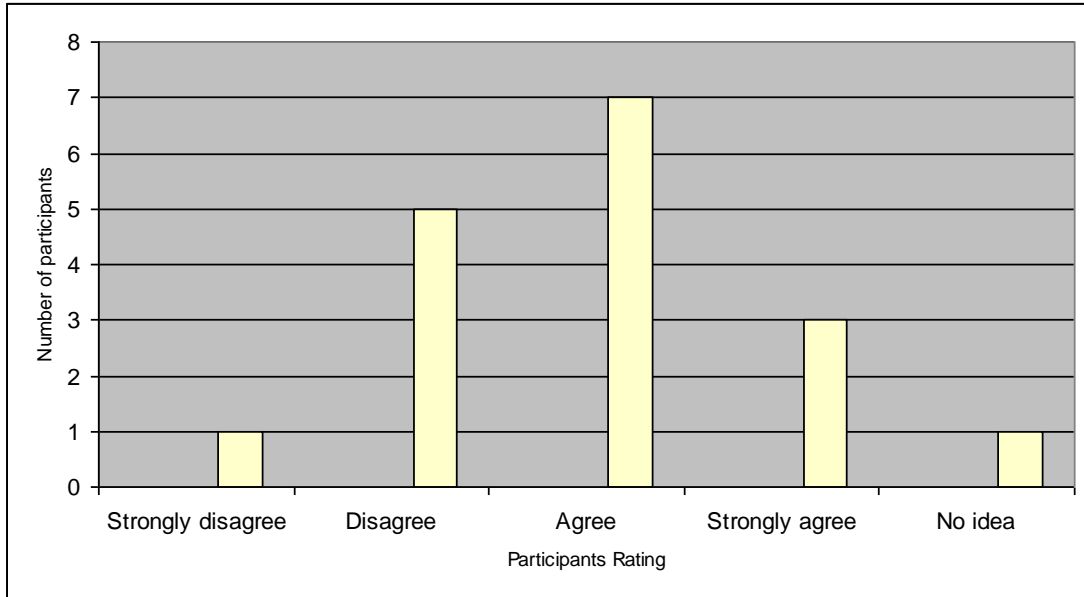
Figure 19. This instructional material makes you easily exchange ideas in group discussions
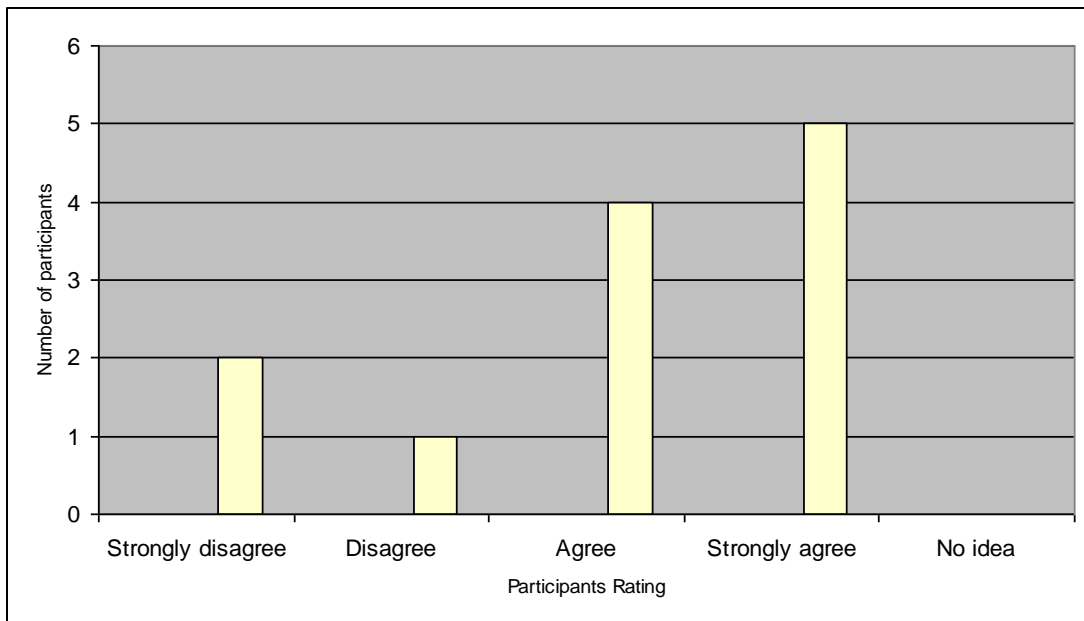

Figure 20. This instructional material makes you easily exchange ideas in group discussions

Figure 21 below show that 16 participants agreed with an item that an online instructional material of Visual Principles made them more motivated to read the instructional contents against 1 participant who disagreed. On the other hand 6 participants in figure 22 agreed with an item that a paper based instructional material of

39

Visual Principles made them more motivated to read the instructional contents against 6 participants who disagreed.
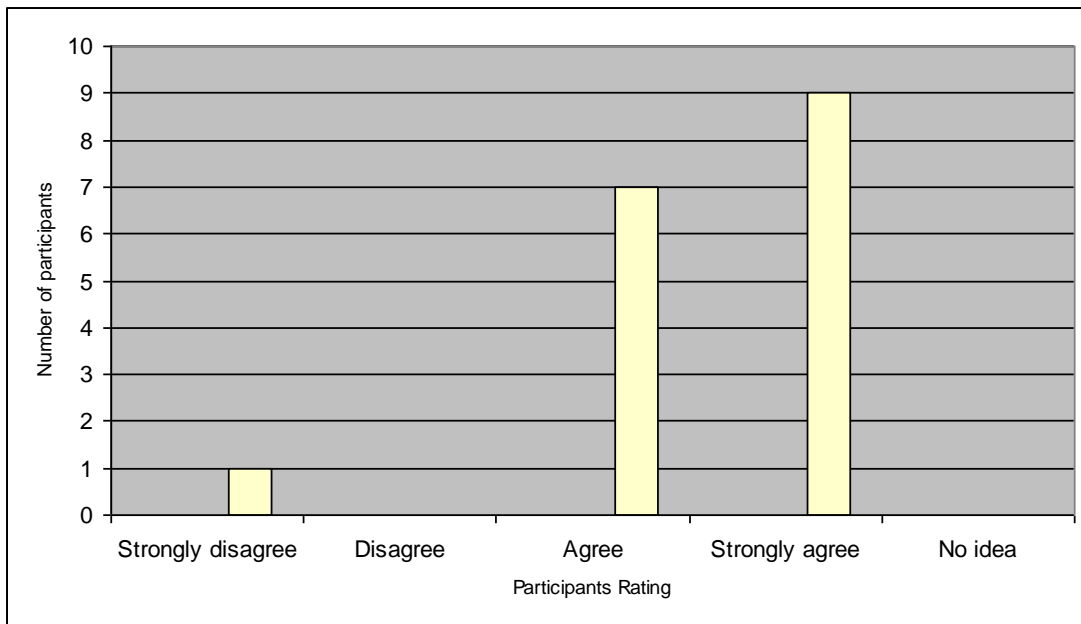

Figure 21. This instructional material makes you more motivated to read the instructional contents
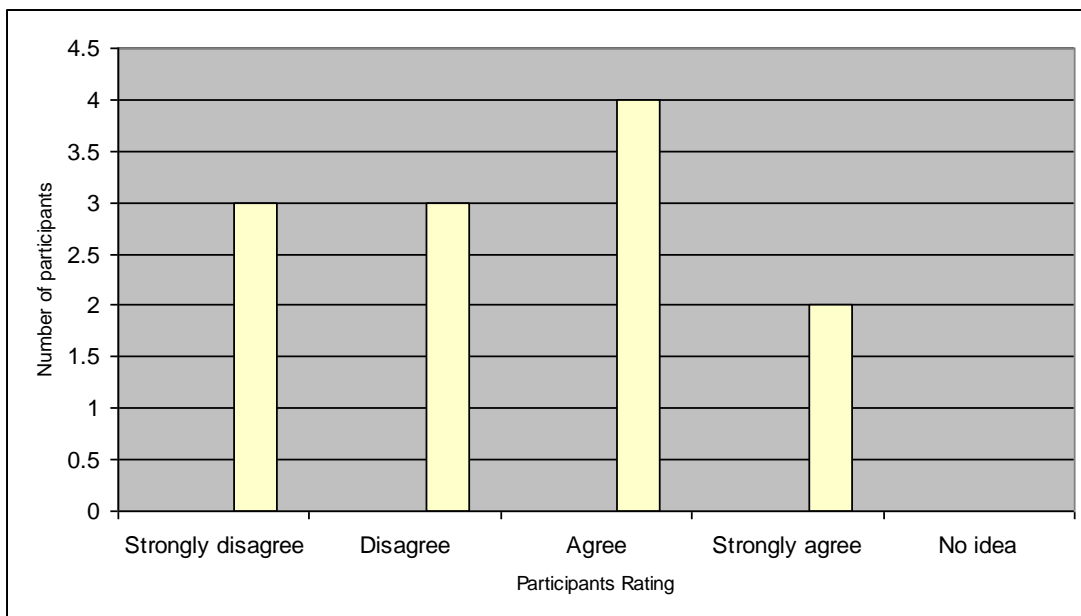

Figure 22. This instructional material makes you more motivated to read the instructional contents

Figure 23 below show that 8 participants agreed with an item that an online instructional material of Visual Principles made them interact with the lecturer more frequently during group discussions against 9 participants who disagreed. On the other hand 6 participants agreed with an item that a paper based instructional material of Visual Principles made them interact with the lecturer more frequently during group discussions against 6 participants who disagreed in figure 24.
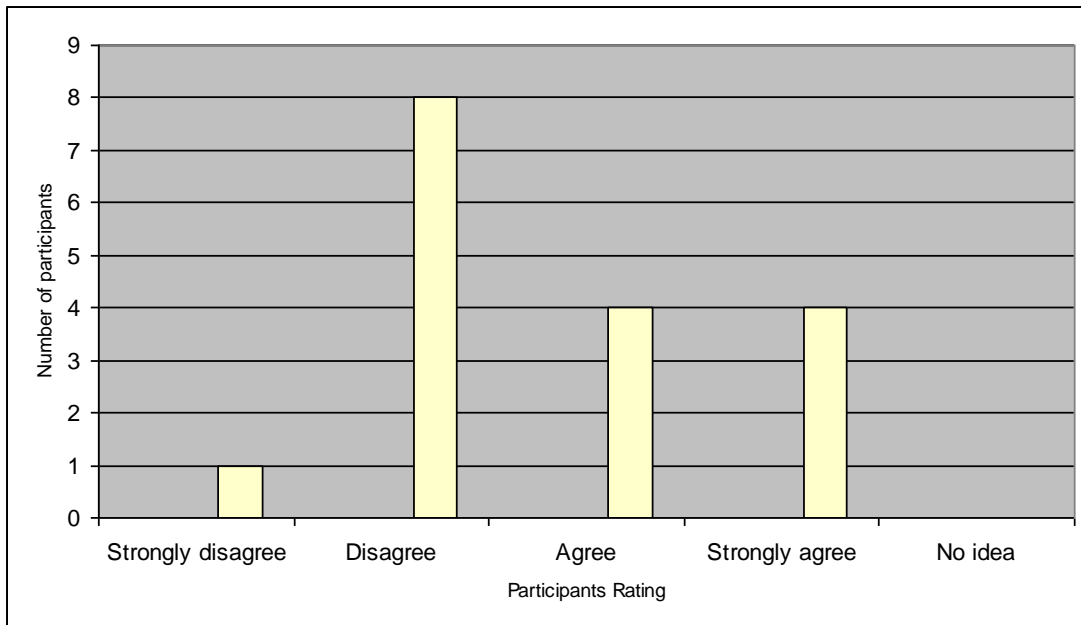

Figure 23. This instructional material makes you to interact with the lecturer more frequently during group discussions
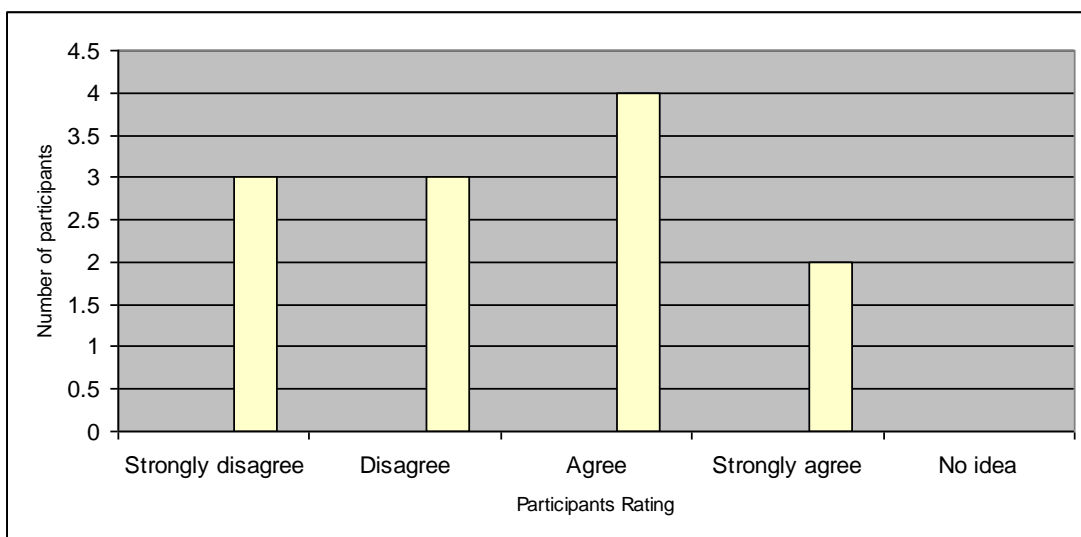

Figure 24. This instructional material makes you to interact with the lecturer more frequently during group discussions
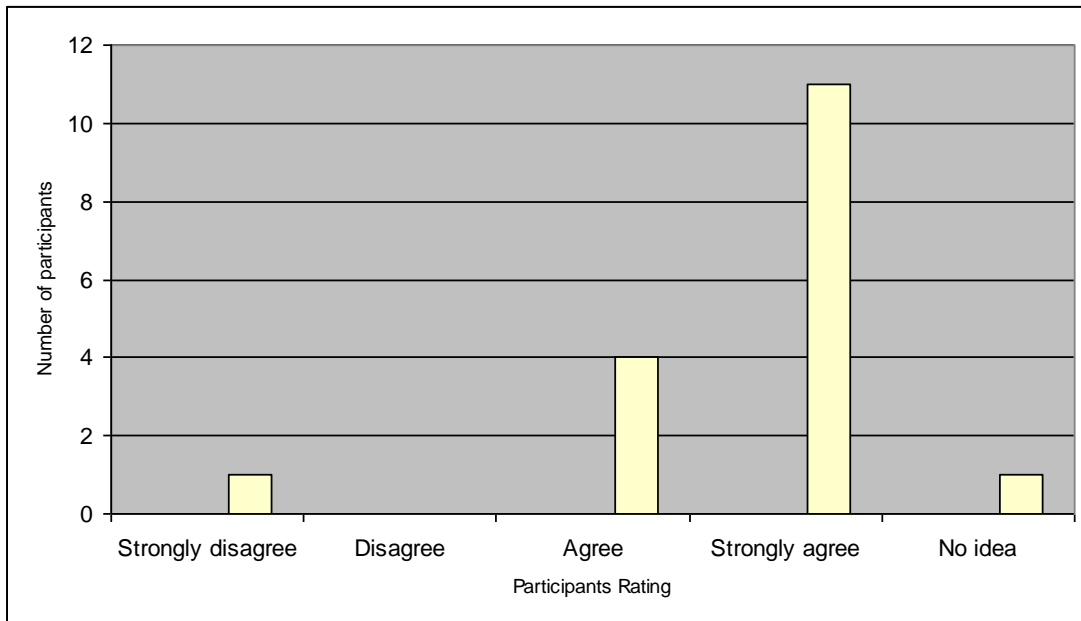
Figure 25. This material gives feedback to you more quickly during quiz
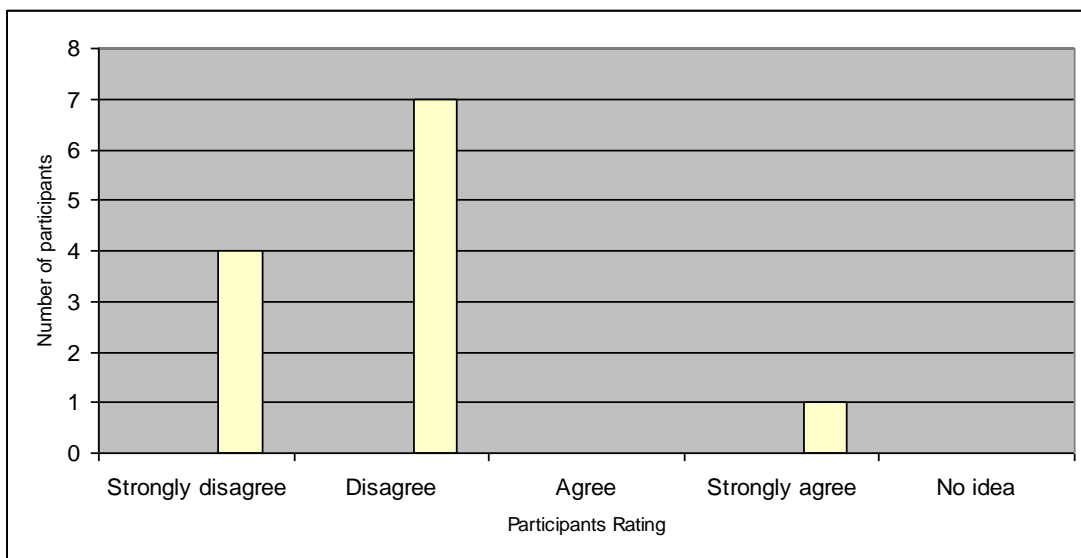
Figure 26. This material gives feedback to you more quickly during quiz

Figure 25 above show that 15 participants agreed with an item that an online instructional material of Visual Principles made them have feedback more quickly during quiz against 1 participant who disagreed. On the other hand, in figure 26, 1 participant agreed with an item that a paper based instructional material of Visual Principles made them have feedback more quickly during quiz against 11 participants who disagreed.
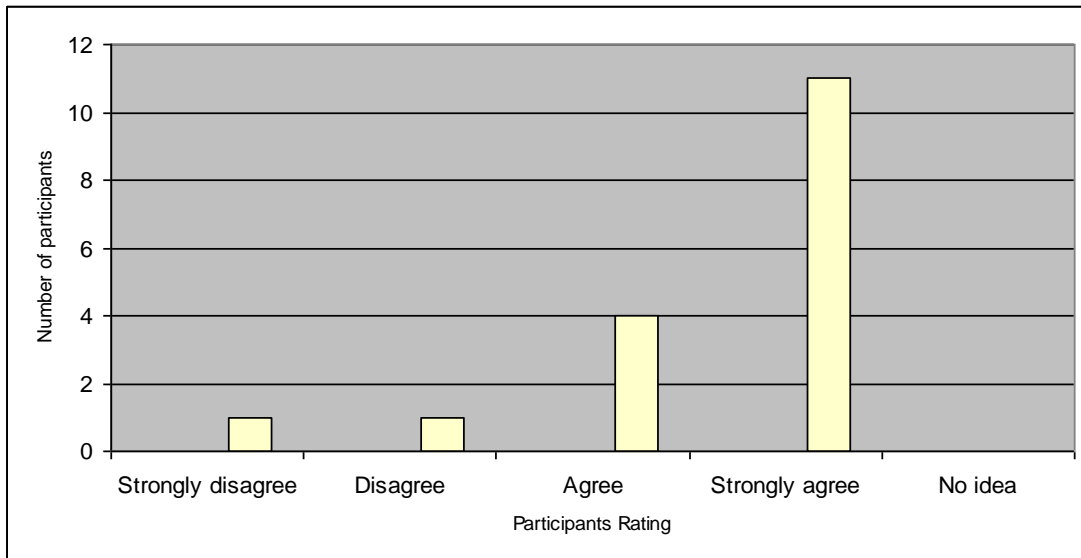
Figure 27. It is easy for you to navigate through online contents
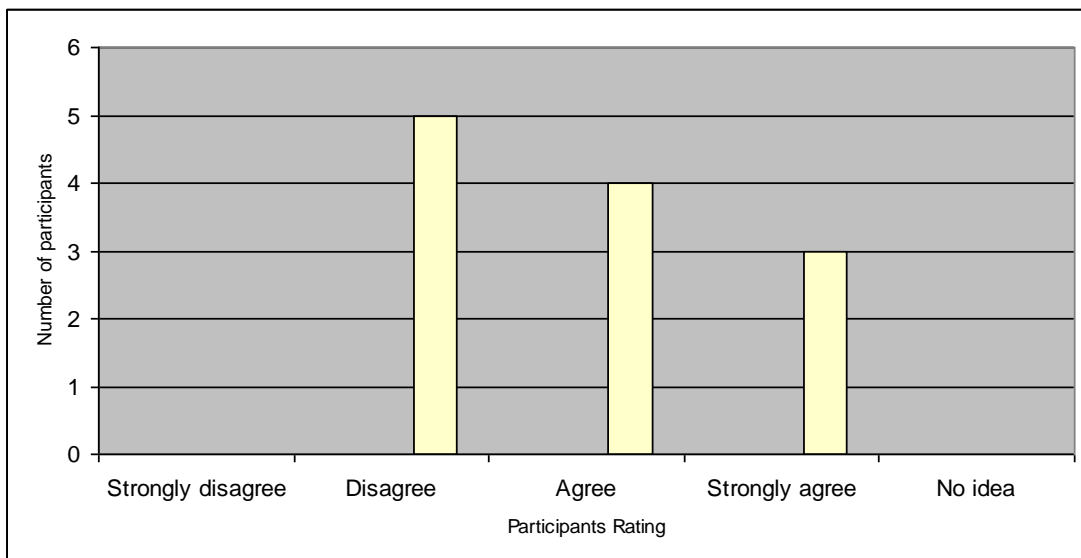
Figure 28. It is easy for you to navigate through paper based contents

Figure 27 above show that 15 participants agreed with an item that an online instructional material of Visual Principles made them easily navigate through the contents against 2 who disagreed. On the other hand, in figure 28, 6 participants agreed with an item that a paper based instructional material of Visual Principles made them easily navigate through the contents against 5 who disagreed.
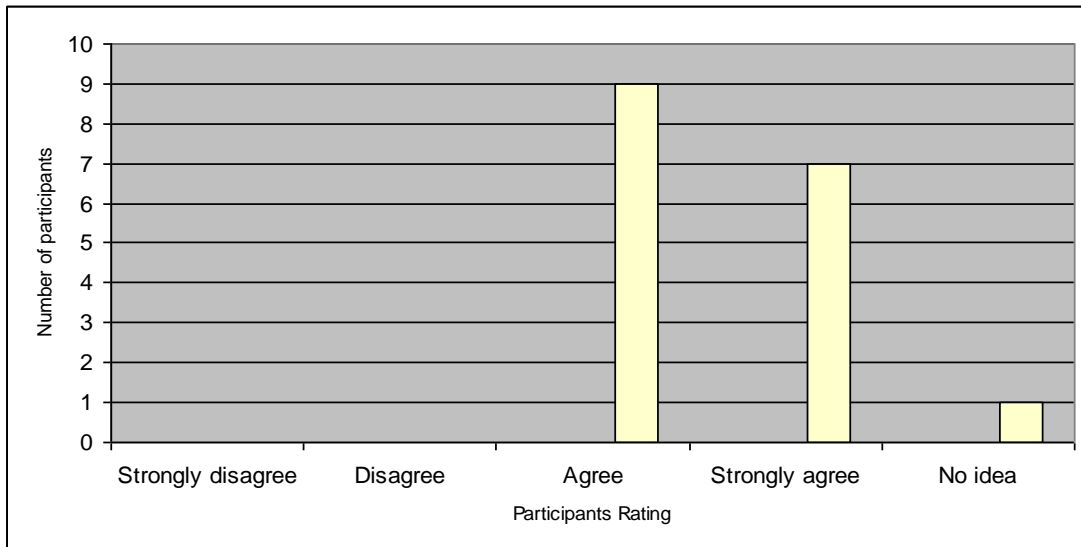
Figure 29. Online instructional material has good visual appeal
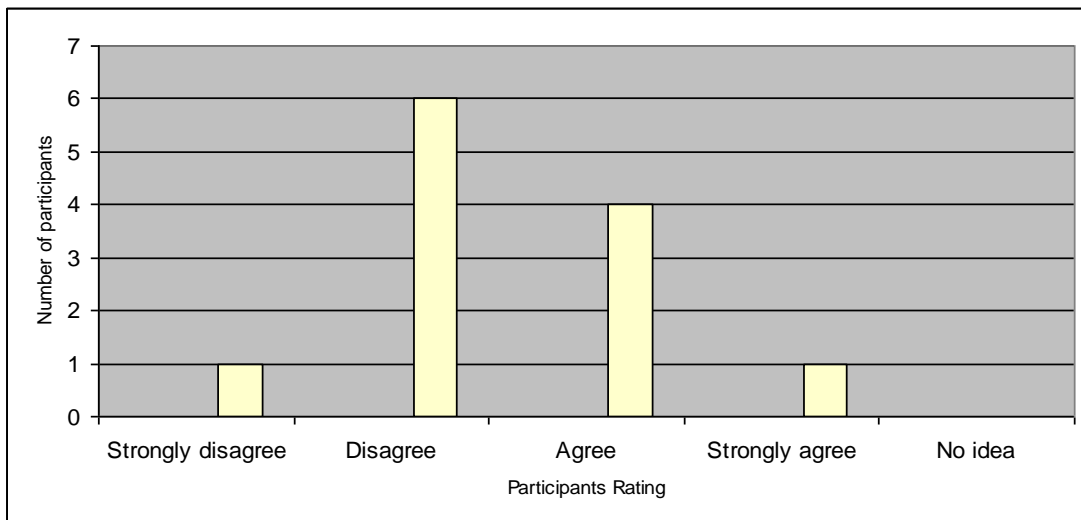
Figure 30. Paper based instructional material has good visual appeal

Figure 29 above show that 16 participants agreed with an item that an online instructional material of Visual Principles had good visual appeal against no body who disagreed. On the other hand, in figure 30, 5 participants agreed with an item that a paper based instructional material of Visual Principles had good visual appeal against 7 who disagreed.

Pretest/posttest results for the experimental contents:

The figure below summarise the mark distribution of participants and individual participant scores during an experimental period.

Both pretests and posttests were paper based. They were only the delivery modes of the instructional contents which were online and paper based.

Topic 1 Summary:
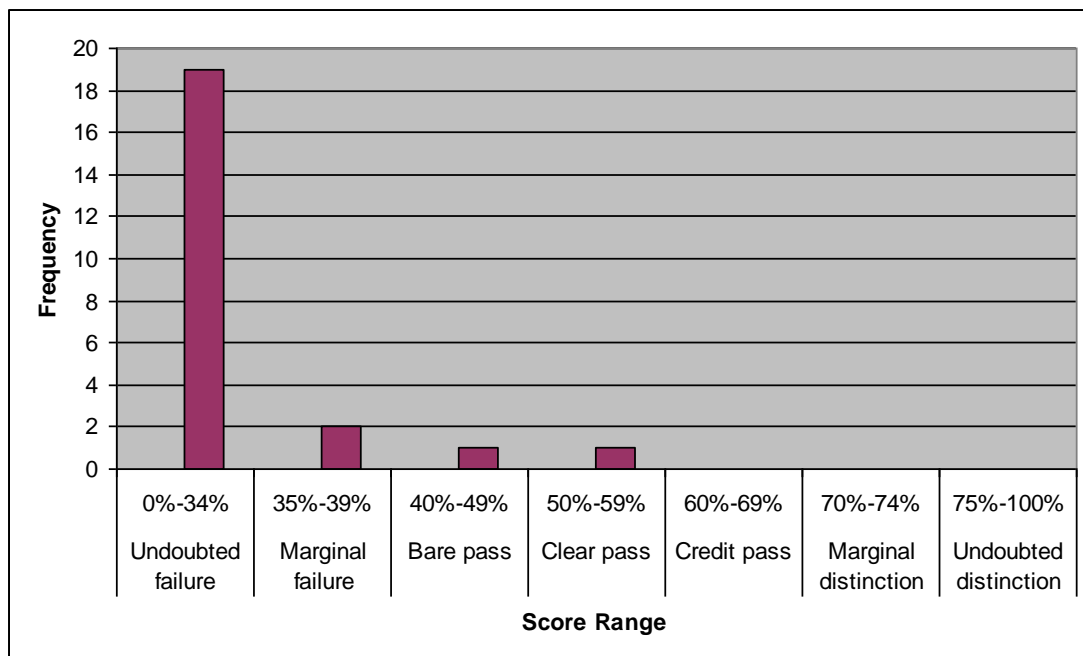
Figure 31. Mark Distribution: Topic 1 Pretest (online)
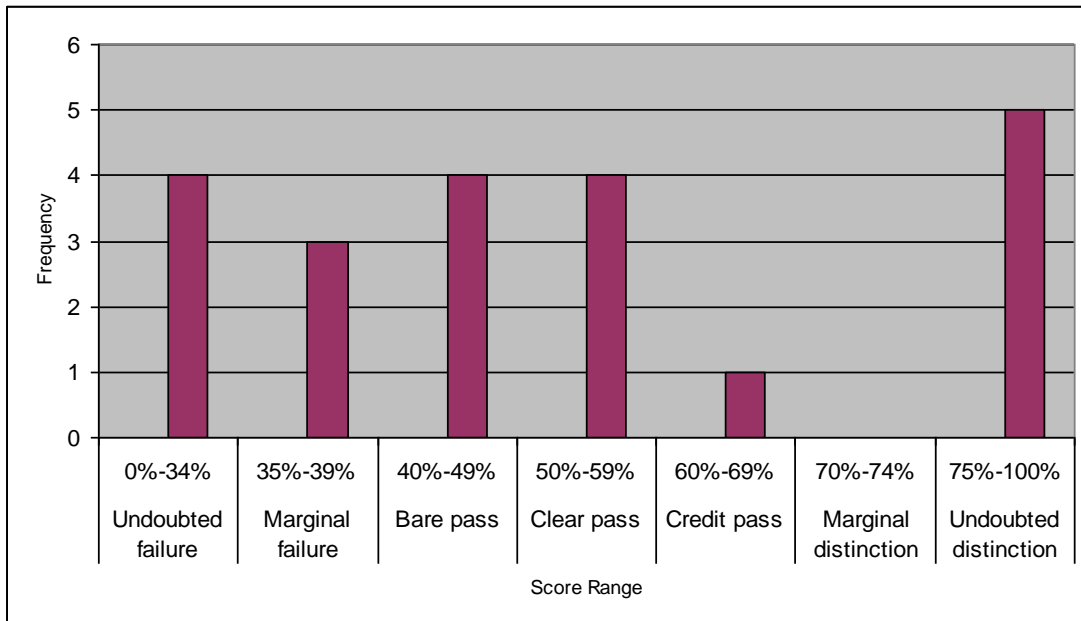
Figure 32. Mark Distribution: Topic 1 Posttest (online)
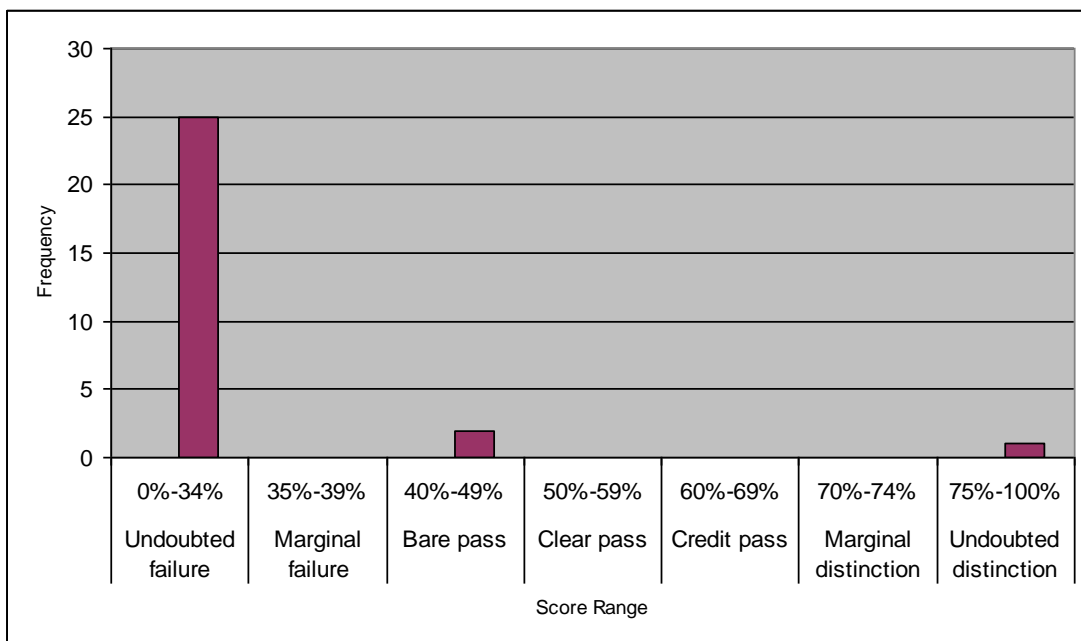
Figure 33. Mark Distribution: Topic 1 Pretest (paper based)
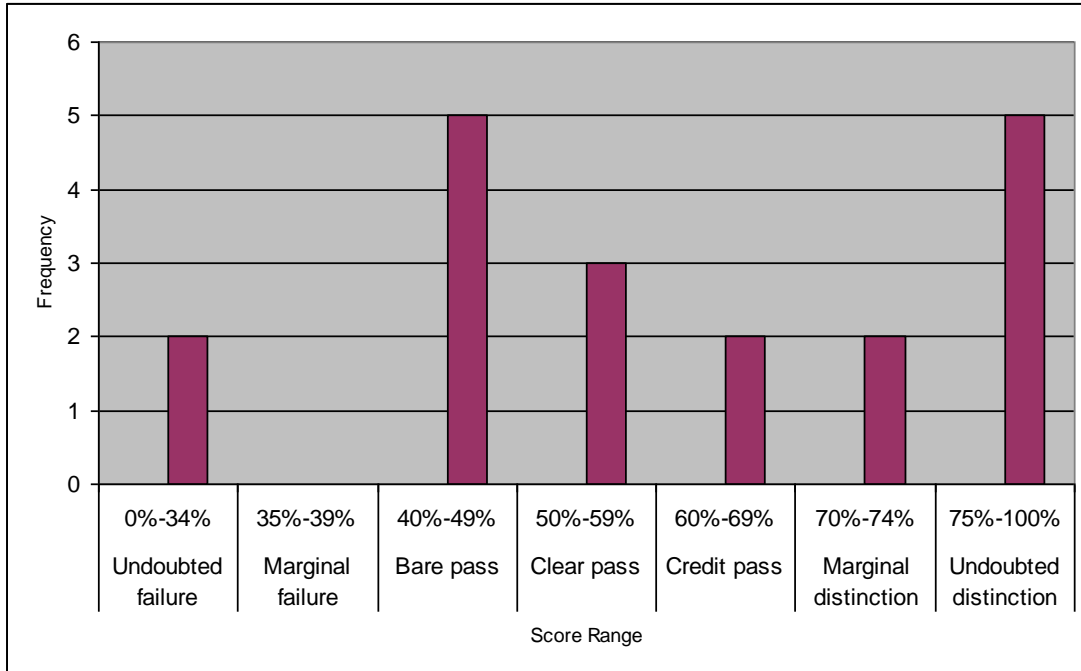
Figure 34. Mark Distribution: Topic 1 Posttest (paper based)

Note: The above graphical summaries (mark distribution) include everybody who attempted either a pretest or posttest or both.

Comparisons for pretest/posttest individual scores for topic 1:

Note: The below graphical summaries exclude participants who were absent in either of the two tests
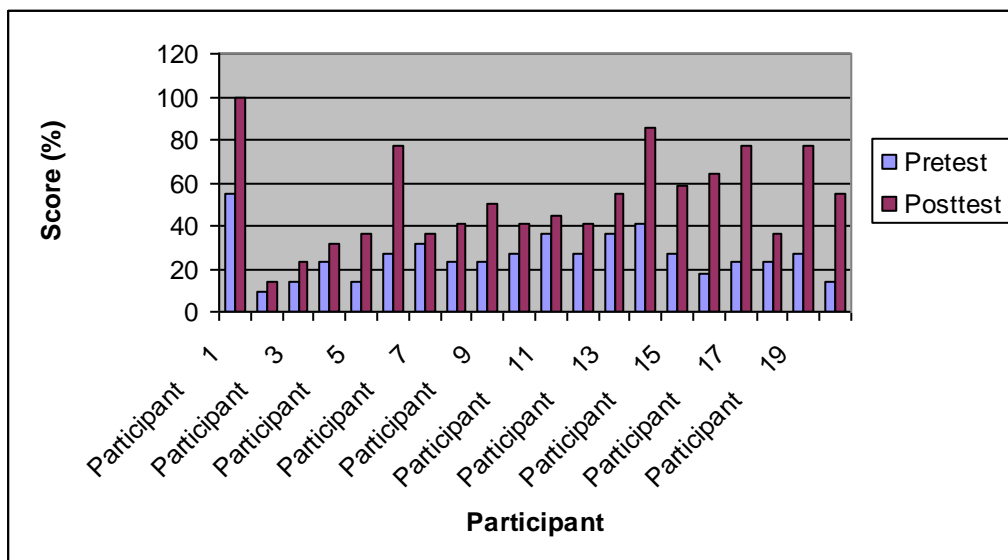
Figure 35. Topic 1 pretest/posttest comparison for online mode
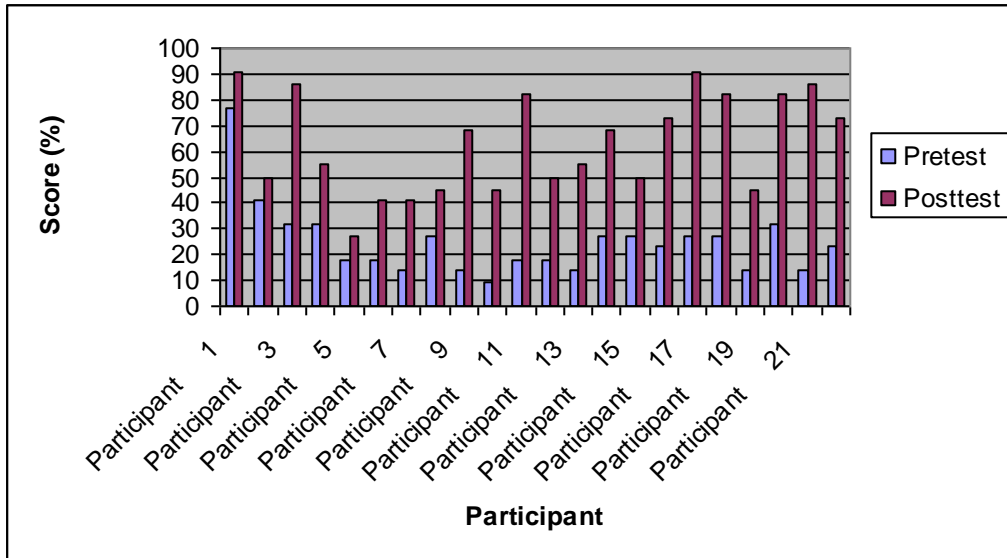
Figure 36. Topic 1 pretest/posttest comparison for paper based mode

Topic 2 Summary:

Note: The below graphical summaries (mark distribution) include everybody who attempted either a pretest or posttest or both.
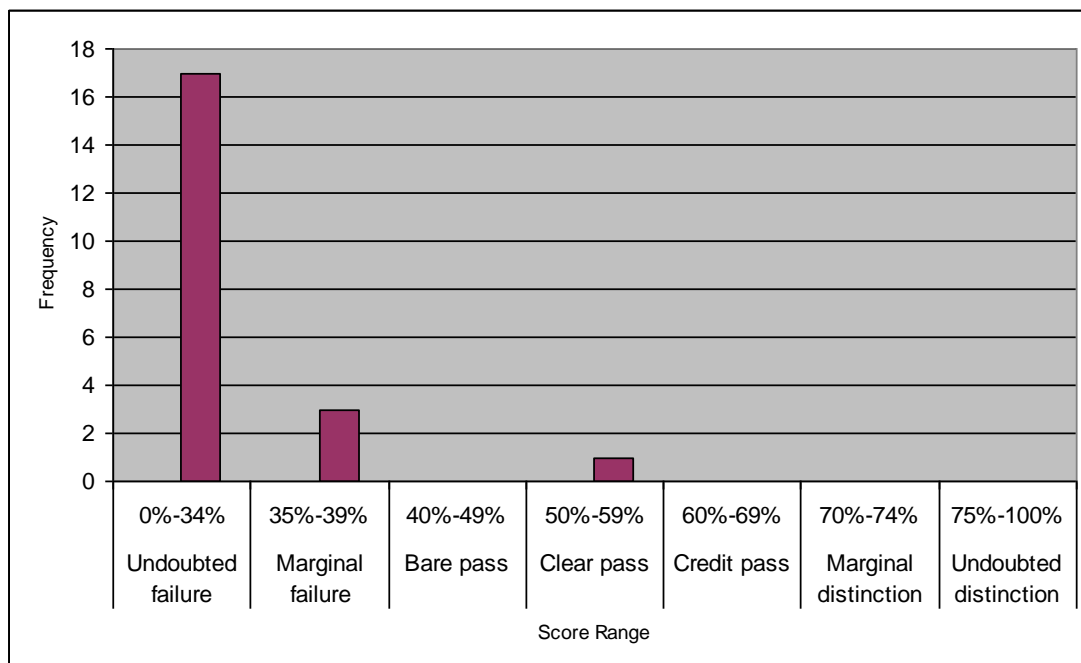
Figure 37. Mark Distribution Topic 2 Pretest (paper based)
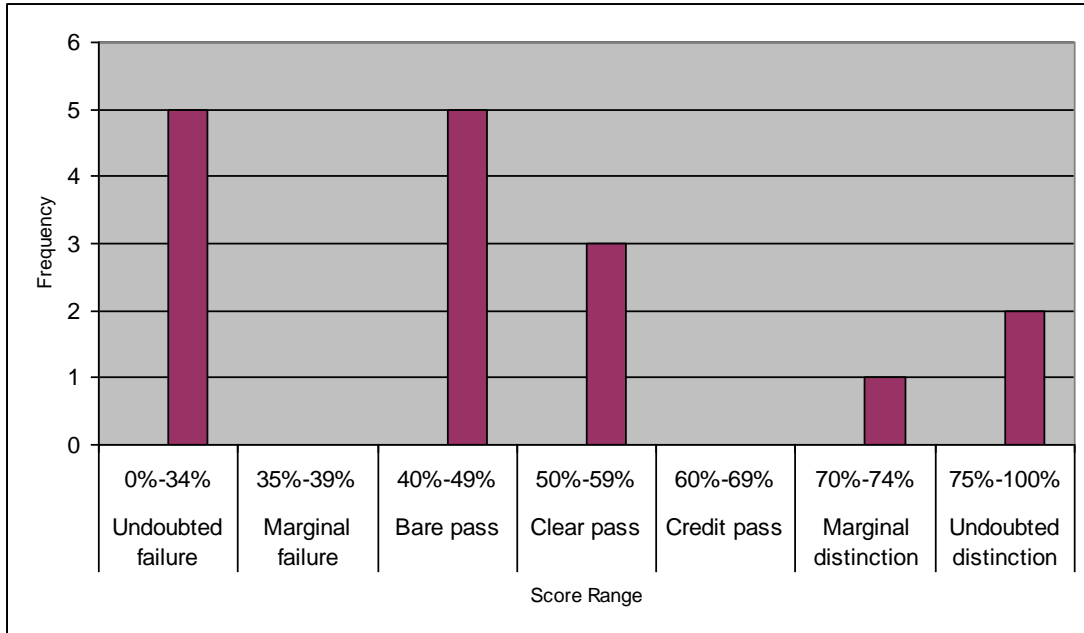
Figure 38. Mark Distribution: Topic 2 Posttest (paper based)
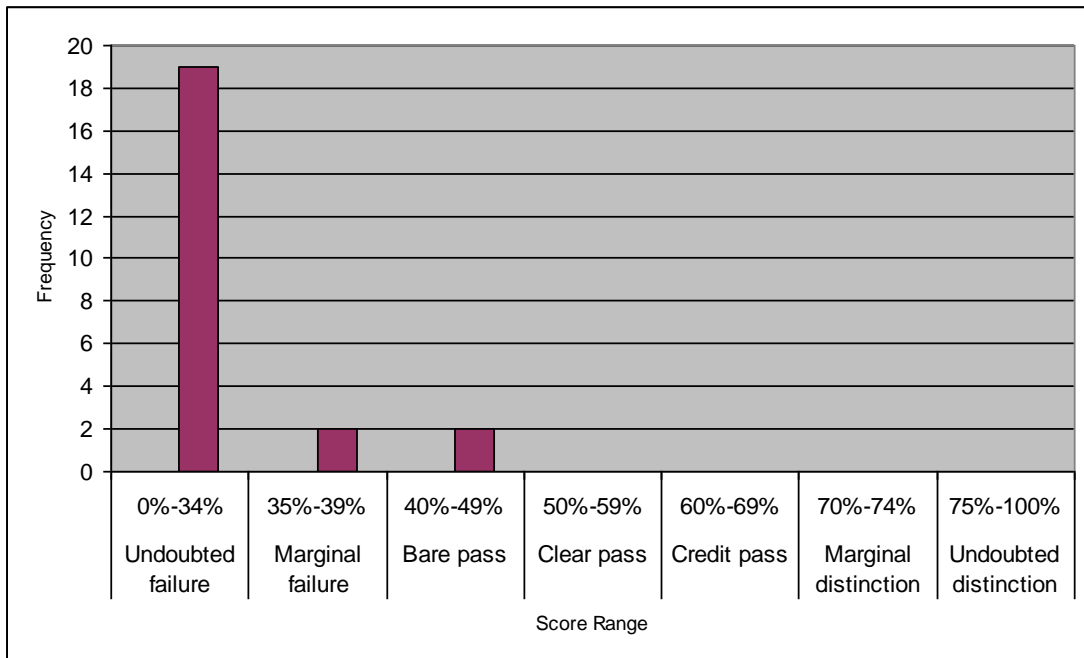
Figure 39. Mark Distribution: Topic 2 Pretest (online)
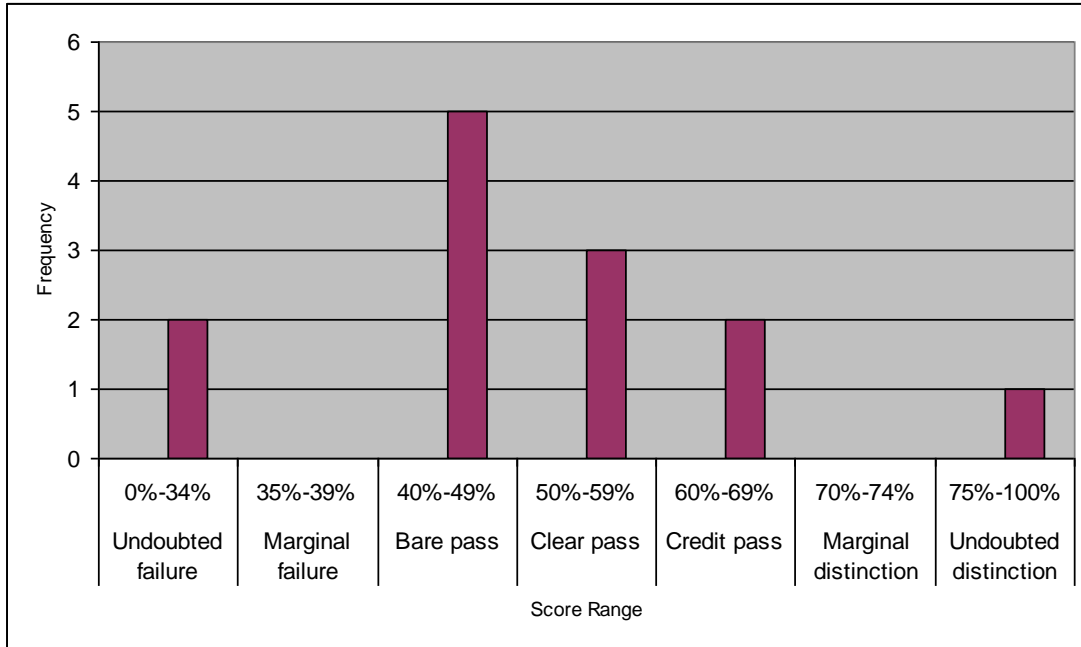
Figure 40. Mark Distribution: Topic 2 Posttest (online)

Comparisons for pretest/posttest individual scores for topic 2:

Note: The below graphical summaries exclude participants who were absent in either of the two tests
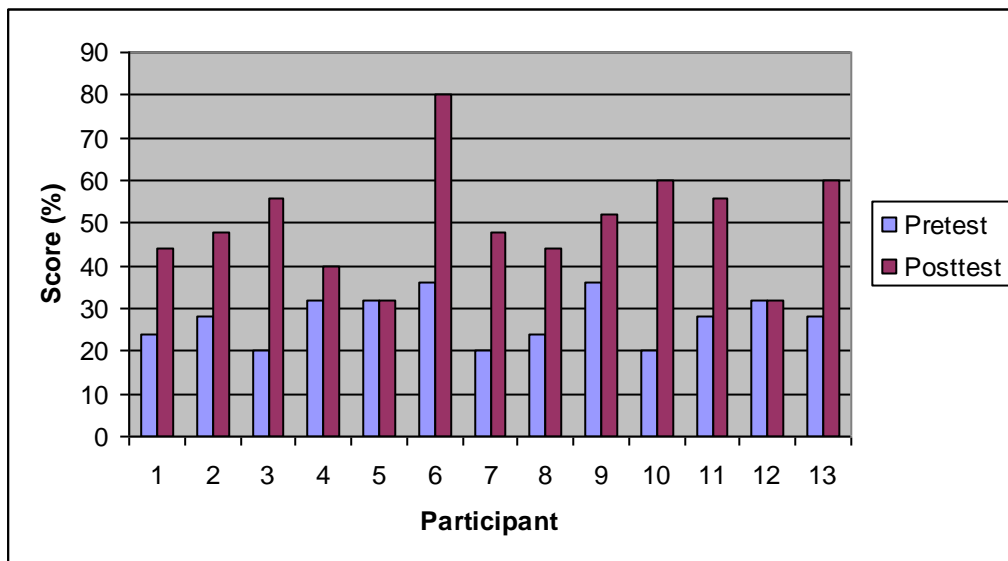
Figure 41. Topic 2 pretest/posttest comparison for online mode
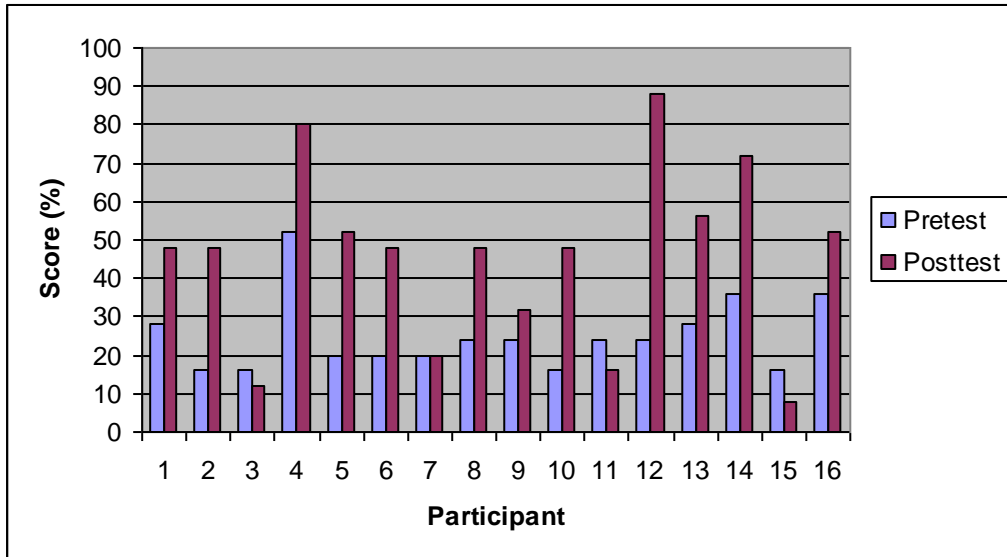
Figure 42. Topic 2 pretest/posttest comparison for paper based mode

Note: The scores were set at 100 maximum points

Chapter Five

Discussion of results

After t-test analysis for pretest, there was no statistical significance in the p-values for both group A and B which indicated that there was group equivalence for the experimental groups A and B before the participants studied the instructional materials hence the acceptance of null hypothesis.

Hypothesis 1 Results:

In order to compare which of the two modes of the content delivery was more effective than the other, differences between pretest and posttest were used for t-test (Table 9). The t-test results show significance for topic 1($t(40) = -2.12$, $p < .05$)), but no significance was found in topic 2 ($t(26) = .60$, $p > .05$)).

My expectation was that those studying online instructional materials would get a higher average score as compared to those studying paper based instructional materials. The research results for topic 1 proved contrary to my expectations while in topic 2 research results agreed with my expectation though the difference was not statistically significant according to the t-test results.

The reason might be the lack of anytime, anyplace feature in the online learning system during the research. In an ideal online learning environment, learners have access to learning contents anytime and anywhere. In this research context access to computers was limited because participants had no personal computers. They had to come to the computer laboratory to access the online contents which defeats the purpose of anyplace anytime learning of online distance learning.

The other reason for the contrary results to my expectation would be an effect of order. Group A began the studying of the contents online while group B started it on paper. Those studying on paper continued coming to the computer laboratory to learn basic ICT skills which I think enabled them to gain more ICT skills before starting studying the online contents in the following week. The other reason might be a factor of novelty effect where participants studying the online contents were more motivated to study the online

contents as compared to studying paper based contents which shows a mean response rate to motivation of 3.00 for those studying online version of a topic 1 against 2.42 when the same group studied the paper based version of topic 2. On the other hand those studying topic 1 on paper (group B) showed a mean response rate on motivation of 2.88 while studying on paper and 3.41 while studying an online version of topic 2 (Table 11 and 12).

Participants studying the online versions of instructional materials also had the following complaints which might have affected their results. The orientation time for the online instructional materials was not enough. They said they needed more time for the orientation exercise especially in basic ICT skill training part since they were not conversant with such skills. They also indicated that the online study time was not enough due to the fact that most of the participants had not yet mastered and familiarized themselves with the online learning environment. They said much of the time when they had wanted to do the online study, there was no electricity or sometimes no internet network available.

The effect of order is clearly seen when we come to topic 2 where group A studying a paper based version scored a lower average score of 45.50% as compared to group B which scored an average of 50.15%. This might be the case because group B which studied topic 1 on paper might have gained more ICT skills as they continued coming to the computer laboratory for practice in basic ICT skills.

Hypothesis 2 Results:

On interactivity, participants' questionnaire ratings show that there was minimal or not enough online and paper based lecturer to learner interaction (item 3 on a questionnaire) with mean ratings of 2.55 and 2.75 respectively for topic 1 but higher learner to learner online and paper based interaction (item 1 on a questionnaire) of 3.00 and 3.13 respectively for the same topic 1.

For topic 2, participants' questionnaire ratings show that there was minimal or not enough online and paper based lecturer to learner interaction with a mean of 2.65 and

2.42 respectively and still minimal learner to learner online interaction of 2.59 but higher on paper of 3.00.

This is contrary to my expectations. This was due to limited implementation time. The lecturer might have replied late to participants' postings and group members also might have posted their contributions to the discussion topics late. The reason for this might be because of lack of full access to computers which also defeats the purpose of anyplace anytime learning of online distance learning. Participants had no personal computers and they had to come to the college computer laboratory to access the online contents. The other factors which might have led to these results would be frequent power outages during the research period, slow internet connectivity and minimal competencies in basic ICT skills.

Hypothesis 3 Results:

On feedback (item 4 on the questionnaire) for either version of the instructional materials, participants' questionnaire ratings show an overwhelming high rating of 3.82 for topic 1 online version and low rating for the paper based version of 2.50. For topic 2 participants questionnaire ratings also show a higher rating of 3.35 for the online version compared to 1.83 for the paper based version. This was inline with my expectation. This is a confirmation of results of previous studies which have shown that online quizzes, discussions are more effective by providing immediate feedback by the learning system.

Researcher's observations

Some participants lost their usernames and passwords and the researcher had to come in and reissue the same since he had a list of usernames and passwords which he created in advance for the research participants. There was insufficient time for the researcher because the distance residential program was postponed due to other activities which were taking place on campus. In view of this the research had to skip some important research activities such one on one formative evaluation. He instead just did small group formative evaluation. The other challenge was that the research was taking place during the residential session for the distance students. These resulted in

participants having divided attention and not study the research experimental contents thoroughly as anticipated. This was clearly seen when an increased attrition rate was observed especially towards the end of the research activities.

Suggestions for improvement

I suggest that if the similar research is to be conducted in the future, more subjects should be used in case some may drop out. I also suggest that the similar research be done in an actual school setting where some participants can study exclusively online and others exclusively on paper and let both sets of participants sit for the end of year examination and then compare examination results. I feel this is necessary because the participants would take the study seriously both online and on paper since they are to be rewarded at the end of study through certification. This will also give a researcher an ample time to observe and monitor the participants.

Chapter six

Conclusion

Performance results for the first topic (ASSURE Model) indicate that paper based method of content delivery was more effective than online method. This might be the case because participants had just been oriented to the online learning environment and had not yet been familiarized with it. In topic 2 (Visual Principles), it shows better performance for those studying online though the difference is not statistically significant. This would be the case because the participants might have familiarised themselves with the online learning environment when studying topic 2. This is contrary to my expectation (hypothesis 1) where it was expected to have better learning outcomes for the participants studying online versions of instructional materials.

For hypothesis 2 (interactivity of instructional materials) the results indicated that there was more learner to learner, learner to lecturer and learner to contents interaction for the paper based instructional materials than online instructional materials. This is also contrary to my expectation where it was expected to have more of the interactions for the online mode of instruction because of anytime, anyplace learning feature of online contents. This was not the case in this research because participants had limited access to online contents due to such factors as studying the online contents in the computer laboratory only, slow internet connectivity and frequent power interruptions. The other factor that might have affected interactions for those studying online would be the novel learning environment (online) which might pose some challenges as a new learning environment to individuals who are used to paper based learning environment. Additionally the majority of the research participants had no basic ICT skills as they were being oriented to the online learning environment.

By looking at the results of this research especially the inputs from the research participants' responses it shows that online learning is favoured by the participants as a better method of content delivery in distance education as compared to paper based method for hypothesis 3 (Online instructional materials will result in prompt feedback to

learners' tasks than paper based instructional materials). This was made possible due to the computer assisted learning feature in the learning system which provided an immediate feedback upon participant submission of a quiz item.

All in all, although hypotheses 1 and 2 are rejected, although there was still substantial learning and interaction in both modes of content delivery as seen above. For hypothesis 3 there was an overwhelming higher rating of an online mode than paper based mode. From these findings, it can therefore be concluded that online mode (e-learning) would be equally effective as a paper based delivery mode if the learning environments are conducive.

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Appendix:

Pretest/posttest questions

Pretest/Posttest for ASSURE Model

22 marks
Instruction: Answer all questions

1.   Which of the following is *not* included in Keller's motivational model?
        (a)   Attention
        (b)   Relevance
        (c)   Confidence
        (d)   Reinforcement
        (e)   Satisfaction   **(1 mark)**
2.   Which of the following is *not* a reason for stating objectives in the instructional process?
        (a)   To make appropriate selection of methods and media
        (b)   To know the individual differences among learners
        (c)   To help ensure proper evaluation   **(1 mark)**
3.   Which class or domain of instructional objectives is missing from the following?
        (a)   Interpersonal domain
        (b)   Cognitive domain
        (c)   Psychomotor domain   **(1 mark)**
4.   If media and technology are to be used effectively, there must be a match between the characteristics of the _____and the content of the methods, _____, and materials. In a classroom situation, the audience is the_____. The first step in the ASSURE model, therefore is analysis of your audience. It is not possible to analyze every trait of your learners. Several factors however are critical for making good media and methods decisions.
                (3 marks)
5.   By the end of this lesson learners should be able to label five parts of a leaf with an aid of a specimen of a mango leaf. From this objective identify:
        (a)   Audience
        (b)   Behavior
        (c)   Condition
        (d)   Degree   **(4 marks)**
6.   Name **three** steps that are followed in the selection of methods, media and materials   **(3 marks)**
7.   Explain **four** factors that are considered when selecting teaching materials
                                                                              (4 marks)
8.   Describe **five** factors that have to be considered when designing new materials
                                                                              (5 marks)

Pretest/Posttest for Visual Principles

25 marks
Instruction: Answer all questions

True/false items (Answer by writing either true or false at the end of the item)

1.   Visuals motivate learners by attracting their attention, holding their attention and generating emotional responses   **(1 mark)**
2.   Visuals prevent learning from taking place because they prevent learners from concentrating on teacher's instruction.   **(1 mark)**

Multiple Choice Items (Answer by circling the correct options)

3. Which one is not the role of visuals among the following?
    (a) To provide a concrete referent for ideas. Words do not look or sound (usually) like the thing they stand for but visuals are iconic. They have some resemblance to the thing they represent.
    (b) They motivate learners by attracting their attention, holding their attention and generating emotional responses
    (c) They simplify information that is difficult to understand. Diagrams can make it easy to store and retrieve such information
    (d) They also serve as an organizing function by illustrating relationships among elements, as in a flowchart or timeline **(1 mark)**
    (e) They do the work of the teacher when he/she is not available
4. What are the goals of visual design among the following?
    (a) Ensure legibility
    (b) Help in lesson planning
    (c) Help in learner assessment
    (d) Focus attention on the most important parts of the message
                                                                      (1 mark)
5. Which one is not an element of design from the following?
    (a) Balance
    (b) Colour
    (c) Line
    (d) Shape
    (e) Texture   **(1 mark)**

6. What are the principles of design from the following?
    (a) Balance
    (b) Unity
    (c) Contrast
    (d) Value   **(1 mark)**

Fill in question

7. Visuals provide for redundant_____, that is, when accompanying spoken or written verbal information they represent that information in a different modality, giving some learners a chance to comprehend _____what they miss _____. **(3 marks)**
8   Match the following descriptions with the right terms:
    (a) Brightness or dullness of a hue
    (b) The difference in appearance between the shape (object) with its background (space)
    (c) The center of interest or focus in a visual
    (d) The principle or rule of breaking down an image into nine (9) equal squares or parts **(4 marks)**
    Choose from the following terms!
    Rule of Thirds, Emphasis, Contrast, Value

9. List three functions of elements of design in a teaching process.
                                                                      (3 marks)
10. Describe four factors that affect the overall outlook of visuals.
                                                                      (4 marks)
11. Differentiate decoding and encoding of visuals   **(2 marks)**
12. Describe three factors that affect decoding of visuals.   **(3 marks)**

Answers to pretest/posttest question items

Answers to pretest/posttest Questions for ASSURE Model Course

1. (d)
2. (b)
3. Affective domain
4. audience, media, learners
5. Audience   =   learners
    Behaviour   =   label
    Condition   =   with an aid of a mango leaf
    Degree   =   five

6. (a)   Deciding on the appropriate method for the given learning tasks.
    (b)   Choosing a media format that is suitable for carrying out the method
    (c)   Selecting, modifying, or designing specific materials within that media
           Format

7. Any four of the following:

    Does it match the curriculum?
    Is it accurate and current?
    Does it contain clear and concise language?
    Will it motivate and maintain interest?
    Does it provide for learner participation?
    Is it of good technical quality?
    Is there evidence of its effectiveness?
    Is it free from objectionable bias and advertising?
    Is a user guide or other documentation included?

8. Any five of the following:
    Objectives: What do you want your students to learn?
    Audience: What are the characteristics of your learners/students? Do you
                 have pre-requisite knowledge and
                 skills to use or learn from the materials
    Cost: Is sufficient money available in your budget to meet the cost of
             supplies (videotapes, audiotapes
             etc.) you will need to prepare the materials
    Technical expertise: Do you have the necessary expertise to design and
                 produce the king of materials you
                 wish to use? If not, will the necessary technical assistance be
                 available to you? Try to keep your design within the range of your
                 own capabilities. Don't waste time and money trying to produce
                 slick professional materials when simple inexpensive products will
                 get the job done.
    Equipment: Do you have the necessary equipment to produce or use the
                 materials you intend to design?
    Facilities: If your design calls for use of special facilities for preparation or
                 use of your materials, are such
                 facilities available?
    Time: Can you afford to spend whatever time necessary to design and
             produce the kind of materials
             you have in mind?

Answers to pretest/posttest Questions for Visual Principles Course

1. True
2. False
3. (e)
4. (a), (d)
5. (a)
6. (a), (b), (c)
7. medium, visually, verbally
8. (a) Value
    (b) Contrast
    (c) Emphasis
    (d) Rule of Thirds

9. These include:

    Add surprise: Think of what grabs attention. You could think of unusual metaphor, etc!
    Add texture: Most visual are two dimensional. Think of how you can add a third dimension by using texture or actual material
    Add interactivity: Give an opportunity to the students to manipulate the materials. i.e. sensory interaction with the materials during the learning process.

10. These include:

    Proximity
    Directionals
    Figure-background contrast
    Consistency

11. Decoding means interpreting Visuals while encoding means creating Visuals

12. These include:

    Developmental effects: Age affects the ability of a learner to interpret the visual. Young learners interpret visuals in parts or section by section while older learners can interpret the visuals as a whole.

    Cultural effects: Sometimes the act of interpretation of visuals may be affected by the viewer's cultural background. Different cultural groups may perceive visual materials in different ways.

    Visual Preferences: In selecting visuals you have to make appropriate choices between the sorts of visuals that are preferred and those that are most effective. People do not necessarily learn best from the kinds of pictures they prefer to look at.

Questionnaire items

Questionnaire for research participants   August 20, 2010
(Revised Version)   107g8819
robert@st.gsis.kumamoto-u.ac.jp
Robert Chagwamtsoka Kalima

Choose your rating for each item given in the left column by ticking in an appropriate box

Part 1: For online version of Instructional materials

	Strongly disagree	Disagree	Agree	Strongly agree	No idea	If strongly disagree, give your reason
1. This instructional material makes you to easily exchange ideas in group discussion						
2. This instructional material makes you more motivated to read the instructional contents						
3. This instructional material makes you to interact with the lecturer more frequently during group discussions						
4. This instructional material gives feedback to you more quickly during quiz						
5. It is easy for you to navigate through online contents						
6. Online instructional material has good visual appeal to you						

7.   Suggest any improvements which you may want to be made to the online instructional materials.

        _____
        _____
        _____
        _____
        _____

Part 2: For paper based version of Instructional materials

	Strongly disagree	Disagree	Agree	Strongly agree	No idea	If strongly disagree, give a reason
8. This instructional material makes you to easily exchange ideas in group discussion						
9. This instructional material makes you more motivated to read the instructional contents						
10. This instructional material makes you to interact with the lecturer more frequently during group discussions						
11. This instructional material gives feedback to you more quickly during quiz						
12. It is easy for you to navigate through paper based contents						
13. Paper based instructional material has good visual appeal to you						

14.   Suggest any improvements which you may want to be made to the paper based instructional materials.

_____
_____
_____
_____
_____
_____
_____
_____