MULTIPLE CHOICE TEST RANDOMIZER

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Abstract: Computer Aided Assessment (CAA) has been deployed in higher education to administer examinations in which the responses are electronically recorded, assessed, or both. This study developed and assessed the Multiple Choice Test Randomizer. Specifically, it achieved the following objectives: Identified the preferred delivery method of assessment of the Students; identified the preferred type of test of the Students; identified the procedures of Testing Administration and Scoring; Developed the Multiple Choice Test Randomizer (MCTR); and determined the usability of MCTR.
The study found out that 50.86% of the responses were computer aided, 43.43% were paper and pencil, 4.5% were board work and 1.4% was others; 45.14 of the responses were multiple choice, 22.29% were true or false, 17.14% were essay 14.86% were matching type and .57% were others; Test papers were distributed by the professors to students; Incremental Build Model is used in software development and software was usable.
The researcher concludes that the Students prefer computer-aided; Students prefer multiple choice tests; testing administration is manual; Incremental Build Model is an effective tool in software development HTML, CSS, PHP and MySql were effective tools; and software was evaluated usable.

INTRODUCTION

Computer Aided Assessment (CAA) has been deployed in higher education for the past five decades. Computer software was first created to test the behavior of student's machine-language submissions. CAA is a method of administering examinations in which the responses are electronically recorded, assessed, or both. It offers an easy-to-use environment for preparing questions, conducting exams, and administering results.
CAA makes possible a detailed analysis of test results with minimal effort. This can be used to identify areas within the course where the students have difficulty, as a result alerting professor to the possible need to adapt their teaching. Or maybe it could be used to identify trends and patterns within the student group. Questions which are not successful at discriminating between students can readily be identified and improved for future years.

derby.ac.uk (2014) states that computer assisted assessment is the application of computers to assessment processes, including delivery of tests, capture of responses and marking by either computer or human marker. These tests can be used for both summative and formative assessment with most tools providing a variety of feedback and question options allowing for the inclusion of rich media such as animated diagrams, videos and simulations for added authenticity.

Bull, et al. (2002) summarized the uses of CAA: a.) diagnostic because it is used in ascertaining students' skills levels prior to learning events, b.) formative because it is carried out during a learning event and c.) Summative because it is carried out at the end of the learning event

According to economicsnetwork.ac.uk (2014), CAA may be stand alone and specific to certain machines within a computer laboratory based on a local network (intranet) or as is increasingly common, web-based.

Web-based is software you use over the internet using a web browser. According to Desousa (2008), Web-based application has four core benefits. These are the following: 1) Compatibility. Web-based applications are far more compatible across platforms than traditional installed software like web browsers. 2) Efficiency. Everyone hates to deal with piles of paper unless they do not have any other alternatives. The benefit of web-based solution makes services and information available from any web - facilitated Personal Computer (PC). 3) Security of live data. Normally in more complex systems, data is moved about separate systems and data

sources. In web - based systems, these systems and processes can often be merged by reducing the need to move the data around. Web - based applications also provide an additional security by removing the need for the user to have access to the data and back end servers. 4) Cost Effective. Web - based applications can considerably lower the costs because of reduced support and maintenance, lower requirements on the end user system, and simplified plans

According to economicsnetwork.ac.uk (2014), the Georgia Department of Education (GaDOE) is providing the 2013-2014 release of the Georgia Online Assessment System (OAS). The OAS represents a dedicated resource for schools, districts, classroom teachers, students and parents that allows for ongoing classroom instruction and student learning.

The site allows educators to have access to test items aligned to the state mandated curriculum to develop assessments that inform teaching and learning. It allows students and parents transparency on the expectations placed on students relative to improving student achievement.

The Abra State Institute of Sciences and Technology (ASIST) is the only state college in the province of Abra. It is an agricultural school that offers Bachelor of Science in Agriculture and Bachelor of Science in Forestry. Moreover, it also offers science and technology courses such as Bachelor of Science in Mathematics (BSMath), Bachelor of Science in Biology (BSBIO), Bachelor of Science in Information Technology (BSIT). In addition, it also offers the courses Bachelor of Science in Secondary Education and Bachelor of Science in Elementary Education. Based on the records in the office of the Registrar, there are 1900 students, as of June 2014 who are enrolled in all courses including the high school students. Faculty workload shows that a faculty member handles a maximum class size of fifty students.

Assessment and evaluation are important parts of the teaching and learning process. Professors in the Abra State Institute of Sciences and Technology are required to conduct diverse forms of assessments. However, the administration of assessment is tiresome and cumbersome because the assessment is done manually. Based on observations, students oftentimes tend to talk with their seatmates. This make the professors keep on roaming around the room and try to warn the students and most of the time this would drain their energy.

The researcher sought the opinions of three professors from the IT Department and has this to say, “In lecture class having fifty students, most of the students tend to communicate to each other either by words or by signal in order to send and receive answer(s). If a student caught several times doing it and seems to ignore warnings, he/she is asked to move out of the room and take another form of exam later.”

After the examination proper, hardship of the professors is not yet over because it is only the beginning. Individual checking and scoring of examinee’s test paper is even harder. It challenges the professor’s patience and perseverance to stay awake late at night to finish the task. Errors and inconsistencies in scoring are often times encountered. Delays in checking and scoring due to hard to read penmanship prolongs the distribution of examination result.

In response to the above scenarios, the development of Multiple Choice Test Randomizer (MCTR) concept was born to provide a software solution that the Professors and Students need. MCTR is a web-based application running on PHP, Apache and MySQL.

This study developed the Multiple Choice Test Randomizer. Specifically, it achieved the following objectives: a) Identified the preferred delivery method of assessment of the ICT Students. b) Identified the preferred type of test of the ICT Students. c) Identified the existing procedures of Testing Administration and Scoring. d)Developed the Multiple Choice Test Randomizer (MCTR); and d) Determined the usability of Multiple Choice Test Randomizer in terms of: Usefulness, Ease of use, Ease of learning and Satisfaction.

THE STUDY

The inputs of the study were preferred delivery method of assessment, preferred type of test of the ICT students, procedures of the existing testing practice, and components of multiple choice question. The process box shows the activities of the researcher from determining of respondents, validation of data, constructing of the software until usability testing of the software. Lastly, the output box displays the outcome using the inputs and executed by the processes.

The respondents were two hundred fifty one (251) ICT students and five (5) Faculty members.

The freshmen and the sophomore students of both amalgated (curriculum is synchronized with other state university and colleges in the Cordillera Administrative Region) and ladderized of ICT Department were chosen as the respondents on the preferred type of delivery method of assessment and preferred type of test as they are still to be in the adjustment period in the college way of life while respondents to determine the usability of the developed Multiple Choice Test Randomizer, worthy to be used by the entire college, were the third and fourth year ICT students and ICT faculty members. The third and fourth year ICT students were chosen because they have Software Engineering and Software Analysis and Design subjects wherein software development life cycles are discussed and the fact that they are also required to submit simple application programs and test its usability at the end of the semester. The ICT faculty members, too, were tapped to do usability test of the software because they have the expertise on software development, user interface design, and because they are the direct or hands-on users of the software.

Test paper provides the information on components of Multiple Choice Test (MCT).
The CSIT faculty members also provided the procedures on administration and scoring.
The researcher personally floated and collected the questionnaire to ensure a one hundred percent (100%) retrieval.

Data Instrumentation

For objective 1, the study used a survey questionnaire validated by ten Agriculture and Education students. It was administered to the students to identify the preferred delivery method of assessment.

For objective 2, the study used a survey questionnaire also validated by ten Agriculture and Education students. It was administered to the students to identify the preferred type of test.

For objective 3, the study used interview and observation. It was conducted to the ICT faculty members to determine the procedures on the existing testing administration and scoring. The study also used documentary analysis on test paper having multiple choice test format. It was administered to determine the components of Multiple Choice Test (MCT).

For objective 4, the software was created using the Incremental Build Model. The model consists of four stages Analysis, Design, Code, and Test.

Data Analysis

Data from the respondents were interpreted using frequency count based on the highest number of responses of the preferred delivery method of assessment and type of test of ICT students.

The usability of MCTR was tested with the application of USE questionnaire. Responses from the students and Faculty members were interpreted with the Likert Scale and descriptive ratings as shown in table 2.

Table 2 Lickert Scale

Point of Scale	Mean Rating	Descriptive Equivalent Rating (DER)	Descriptive Interpretation
5	4.20-5.00	Strongly Agree Usable	
4	3.40-4.19	Agree	Usable
3	2.60-3.39	Neutral	Usable
2	1.80-2.59	Disagree	Not Usable
1	1.00-1.79	Strongly Disagree	Not Usable

The variables with responses within the mean range of 2.60 to 5.00 were interpreted as Usable while those variables with responses within the range 1.00 to 2.59 were interpreted as Not Usable.

FINDINGS

50.86% of responses from the ICT students were computer-aided and only 43.4% were Paper and Pencil. This implies that the preferred delivery method of assessment of the students is computer-aided. It is by this reason that the researcher decided to create a computer aided assessment tool such as MCTR.
Yet, this is in contrast with the study of Sheader,et.al (2006) where more students were “confident” about paper-based work as a method of assessment (91%) and only 50% made the same claim for CAA.

On the hand option “others” got the lowest responses. Two respondents indicated “actual or practical testing”. This means that the respondents preferred assessments of skills by means of application.

45.14 % of the responses from the ICT students were Multiple Choice. This implies that the preferred type of question of the students is Multiple Choice Test (MCT). This also entails that students tend to like a type of test in which it requires a less of writing especially so when the assessment period is limited. It further implies that students like to perform an assessment which limits error on grammar and spelling. Taking a Multiple Choice Test generally improves students’ performance (Carrier &Pashler, 1992)

Like ELE, an online software packages designed to deliver assessment to students of university of Exeter (as.exeter.ac.uk, 2014), the MCTR provides multiple choice among question types. Multiple Choice Test, if done correctly, students can quickly respond to many items, allowing wide sampling and coverage of content (Carrier &Pashler, 1992).

On the other hand option “others” got the lowest responses which is .57 % of the total responses. One respondent indicated enumeration. This means that the respondent is fond of memorizing lessons.

Based on personal interviews with faculty members, observation and personal practice, the administration of testing begins when the Professor formulates and encodes questions. The standard components of Multiple Choice Question are item number, question, options based on the test paper analysis. Printing of the questionnaire is done next. The professor may either reprint or photo copy in order to reproduce the questionnaire.

The testing administration proper is the actual distribution of test paper to the examinees. Afterwards, the test papers are collected by the professor. Individual checking and scoring of test paper is next. It is in this part where professors spend a lot of time. It is also in this part wherein error and inconsistencies of scoring occur. Test result is distributed to the students a week after the exam date.

The software was developed by dividing the whole program into four separate modules. The four modules were: a) formulation and encoding of question, b) registration and validation, c) user log in and validation, d) testing and scoring and e) result.

In encoding questions, It is suggested that user must have to follow the format in Figure 5. First column contains the question, followed by options form a to d. The next column fifth column contains the correct answer . Lastly, the sixth column contains the item number for each question.

After, the encoding of questions. Save the file in csv format by clicking the save as type drop down list, then, select CSV (comma delimited). Type the file name and click Save button.

The Uploading of questions to MCTR begins in typing www.andwesign.org/gui/upload.php. Select the drive where your file is located. Type the complete filename including the .csv file extension. Click upload.

The welcome page is the very first page that MCTR serves to all the computers that request for the service. It displays a text greeting along with the capabilities that it may offer for the user. Multiple users may be served at the same time.

The Registration form and validation is responsible for allowing users to input personal information. It ensures that all the needed user information is present and the information is stored only once. However, it greatly suggested that user a must only use up 6 characters and not to input an email account in the username textbox. Users should also use single name only. When having two names like excel Philip, It is suggested that user must use underscore or dash to make the single word only.

The User login form and validation form is responsible for accepting username and password. It ensures only the authorized users permitted by the Professor to register in the system may take the exam and has not taken the exam yet. Otherwise, the software returns back or displays in the screen the result of the exam.

The testing and scoring is responsible for fetching the all the questions that were encoded by the subject teacher. It systematically randomized the questions so that there will be no same question may be posted on the screen at the same time. This effectively eliminates the issue of cheating among seatmates. It also ensures consistent and reliable scoring and recording.

In addition, another feature of MCTR that is present in this page is the reminder of the user of how many questions are still left to answer. The number of items decreases by one every time the user clicks the submit button.

The result module is responsible for displaying the recorded score. It displays the correct number of items over the total number of items together with the corresponding percentile. The result module shows the number of examinees who took the exam. Moreover, the software also prints the personal details arranged in alphabetical manner, the number of correct items, the total number of times and the corresponding percentile score of all the users.

The MCTR Usability

Table 3.Usability of MCTR in terms of Usefulness

Indicator	Mean	Descriptive Equivalent Rating	Descriptive Interpretation
It helps me be more effective	4.83	Strongly Agree	Usable
It helps me be more productive	4.59	Strongly Agree	Usable
It is useful	4.66	Strongly Agree	Usable
It gives me more control over the activities in my life	4.39	Strongly Agree	Usable
It makes the things I want to accomplish easier to get done	4.68	Strongly Agree	Usable
I saves me time when I use it	4.74	Strongly Agree	Usable
It meets my needs	4.44	Strongly Agree	Usable
I does everything I would expect it to be	4.5	Strongly Agree	Usable
Overall mean	4.6	Strongly Agree	Usable

Table 3 discloses the insights of the respondents as to usefulness of the developed Multiple Choice Randomizer. The respondents strongly agreed with the mean rating of 4.6 described as Usable. This means that users think that the software would help them to be effective and productive and found the software beneficial to them.
This finding was concluded from the individual indicators which were all rated as Strongly Agree. The highest mean rating of 4.83 implies that the users strongly agreed the software helps them to be more effective. However the indicator “It gives me more control over the activities in my life” was rated lowest with the mean rating of 4.39 described as Usable.

Table 4. Usability of MCTR in terms of Ease of Use

Indicator	Mean	Descriptive Equivalent Rating	Descriptive Interpretation
It is easy to use	4.85	Strongly Agree	Usable
It is simple to use	4.84	Strongly Agree	Usable
It is user friendly	4.68	Strongly Agree	Usable
It requires the fewest steps possible to accomplish what I want to do with it	4.53	Strongly Agree	Usable
It is flexible	4.54	Strongly Agree	Usable
Using it is effortless	4.48	Strongly Agree	Usable
I can use it without written instructions	4.5	Strongly Agree	Usable
I don’t notice any inconsistencies as I use it	4.31	Strongly Agree	Usable
Both Occasional and regular users would like it	4.36	Strongly Agree	Usable
I can recover from mistakes quickly and easily	4.41	Strongly Agree	Usable
I can use it successfully every time.	4.69	Strongly Agree	Usable
Overall mean	4.56	Strongly Agree	Usable

Table 4 shows the perceptions of the respondents on the software in terms of Ease of Use. The users strongly agreed as verified by the mean rating of 4.56 described as Usable.
Of the 11 indicators under this category the indicator “It is easy use” was rated by the respondents as the highest with the mean rating of 4.85 described as Usable. It means that users find the software straightforward. On the other hand, the indicator “I don’t notice any inconsistencies as I use it” was rated lowest with the mean rating of 4.31 described as Usable. This means that users found using the software reliable.

Table 5. Usability of MCTR in terms of Ease of Learning

Indicator	Mean	Descriptive Equivalent Rating	Descriptive Interpretation
I learned to use it quickly	4.76	Strongly Agree	Usable
I easily remember how to use it	4.65	Strongly Agree	Usable
It is easy to learn to use it	4.73	Strongly Agree	Usable
I quickly became skillful with it	4.65	Strongly Agree	Usable
Overall mean	4.7	Strongly Agree	Usable

As to ease of learning, table 5 reveals that the respondents strongly agreed as proven by the mean rating of 4.7 interpreted as Usable.

The indicator "I learned to use it quickly" was evaluated as the highest with the mean rating of 4.76 and described as Usable. This means that the respondents learned to use the software fast. While indicators "I easily remember how use it" and "I quickly became skillful with it" were rated as lowest with the mean rating of 4.65 and described as Usable. This means that users were already "experts" in using the software even in a short span of time. This also means that the users were accustomed to computers that they can easily manipulate software.

Table 6 Usability of MCTR in terms of Satisfaction

Indicator	Mean	Descriptive Equivalent Rating	Descriptive Interpretation
I am satisfied with it	4.76	Strongly Agree	Usable
I would recommend it to a friend	4.75	Strongly Agree	Usable
It is fun to use	4.71	Strongly Agree	Usable
It works the way I want it to work	4.55	Strongly Agree	Usable
It is wonderful	4.74	Strongly Agree	Usable
I feel I need to have it	4.7	Strongly Agree	Usable
It is pleasant to use	4.51	Strongly Agree	Usable
Overall mean	4.44	Strongly Agree	Usable

Table 6 displays the respondents rating on usability of MCTR in terms of Satisfaction. The Indicator "I am satisfied with it" was rated as the highest with the mean rating of 4.76 and described as Usable. This means that the respondents were contented. They are comfortable with the features, graphical user interface, and the user experience.

On the other hand, the indicator "It is pleasant to use" was rated as the lowest with the mean rating of 4.7 and described as Usable. This means that users enjoyed while using the software. This maybe because it was their first time using such type of examination in their school lives.

Table 6 displays the overall rating of usability in terms of satisfaction was 4.44 and described as strongly agree and interpreted as usable. The table further shows that the descriptive equivalent rating of the weighted mean was Strongly Agree. This means that the users were satisfied in using the software.

CONCLUSIONS

The preferred delivery method of assessment of the ICT Students is computer-aided.
The preferred type of test of the ICT Students is on multiple choice tests.
The existing testing administration is manual and paper-based.
Incremental Build Model is effective tool in software development. HTML and CSS are tools that can be used in the design of user interface. PHP and MySQL are tools that can be used to create a computer-aided assessment.
The software was evaluated usable.

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