Does online assessment give a true picture of the competency level of students?

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Abstract: - This paper reflects on a section of a Masters Degree study, which covers the implementation of a blended learning approach to the computer literacy students at the Vaal University of Technology (VUT). The purpose is to determine if online assessment gives an accurate picture of the competency level of students in computer literacy. An experimental group was introduced to e-learning and also assessed using the e-learning package. The results of students were noted throughout. In the analysis of the results it was found that students had adapted well to online learning. An interesting result was noted in the section on spreadsheets, where the online assessment showed mastery of this section of the work, while the written assessment, which was used for comparison with the control group, showed no mastery. Reasons for this will be investigated in the next phase of this study.

Key Words: Online learning, online assessment, e-learning, blended learning, Instructor Led Training

1 Introduction

Currently all computer skills training at the Vaal University of Technology (VUT) is conducted via Instructor Led Training (ILT) in the computer laboratories. ILT is seen as a traditional classroom activity, where training is mediated by a live instructor [5].   There is a very high demand for computer laboratories and the Computer End Using department occupies a large number of these venues. Management of VUT feels that valuable resources (laboratories and the expertise of lecturers) are occupied by offering computer literacy, which is on NQF level 4[2]. It was however noted that computer literacy is a critical skill for students and that the majority of first-year students are not computer literate.

In an effort to offer continued quality education in the midst of increased pressures faced by educational institutions, a collaborative decision was taken by VUT management and the Computer End Using department to investigate alternatives for the offering of computer literacy [2]. E-learning is thus investigated as an alternative instructional strategy.

The move to online and computer based assessment (CBA) is a natural outcome of the increasing use of information and communication technologies to enhance learning [6].

This approach also introduced a new approach to assessment, in the form of online assessment. Successful online assessment is most likely if that assessment is aligned with teaching and learning objectives. In other words, there should be a strong relationship between the purpose of online assessment and the intended outcomes of the programme. In the light of the above, it can be argued that computer literacy should be one of the first "online assessed" programmes at VUT.

A large number of studies were already conducted on the successful implementation of e-learning at various institutions worldwide, but the general perception amongst lecturers were that the majority of students enrolled at the VUT would not be able to cope with e-learning.

At VUT at least 95 percent of students are from the previously disadvantaged groups. It is mostly black students who come from the dysfunctional, racist educational system [1]. Only 4.4 percent of students at VUT practise English as first language. This study was thus specifically undertaken to see if the VUT students would be successful users of an e-learning programme.

According to Kruse [5], online means the operation of a computer while connected to a network. Assessment is the process of collecting information about a learner's skills in order to make decisions about their learning programme. It is a process that should continue throughout a learner's programme, and includes the following:

- Diagnostic assessment – a structured assessment to establish a learner's level of skills and any additional support needed. This is also called 'screening'.
- Formative assessment – a continuous process of review conducted throughout the program to build up a profile of the individual learner and to monitor and review their progress against targets set in the ILP.
- Summative assessment – a final review of learning at the end of a learner's programme to measure the 'distance travelled' [7].

2 Design

Population: Approximately 2500 students from all faculties of the university must complete the computer skills course.

Intervention: A quasi-experimental design was used to divide students into groups. It is commonly used in the evaluation of educational programmes when random assignment is not possible or practical [4][8]. Using this design, learners were divided according to classes into two study groups, an experimental and a control group. Two classes did e-learning and two classes was taught in the traditional way.

Each class had approximately 30 students. Both groups received 2 hours scheduled time on their timetables in the computer laboratories. The experimental group used both of these hours to work on the e-learning package. The control group received lectures and did some practical exercises from the prescribed book during these two hours. The lecturer to student ratio in all the groups was never more than 1:30. Both groups wrote a "traditional" paper-based test on all three sections of the work (Operating systems, Word Processing, Spreadsheets), which was scheduled beforehand. In addition the e-learning groups also completed a number of online assessments. Although the instructor was available during the scheduled time and during consultation hours, for the experimental group (EG), no active teaching took place, whereas with the control group (CG) the instructor taught for the two hours. There were no tutors available in class to help with problems; the lecturer was available in class. The EG was given an initial training session on how to use the

software package. The study was conducted over one semester (six months).

3 Implementation

The implementation stage will be discussed under the following headings:
1. Access and usage
2. Quality of teaching and learning
3. Technical and administrative

3.1 Access and usage

- No inherent unfairness could be established where some learners were significantly less familiar with computers than other learners. All learners were first years, coming from a "normal" schooling system. Before proceeding, a training session on how to use the computer and the software, was conducted.
- In a pilot study where all the learners completed questionnaires it was found that 77 percent of the students did not have computer access at home. For this reason a laboratory was made available outside the scheduled class-time.

3.2 Quality of teaching and learning

- All the training and assessment were done through simulation. The following figures are printouts of screen captures of the learning sessions. In the *Teach Me part* (Figure 1), the learner reads through the explanation and looks at the graphical presentation. The *Show Me* (Figure 2) gives a simulation of how it must be done. The *Let Me Try* (Figure 3) gives the learner the opportunity to implement what has just been learned.

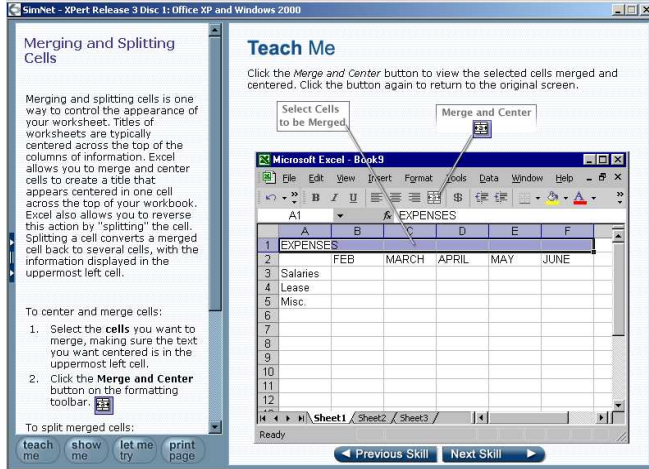Fig.1 – Example of the "Teach Me" section of the training

Fig. 2 – An Example of the "Show Me" section of the training
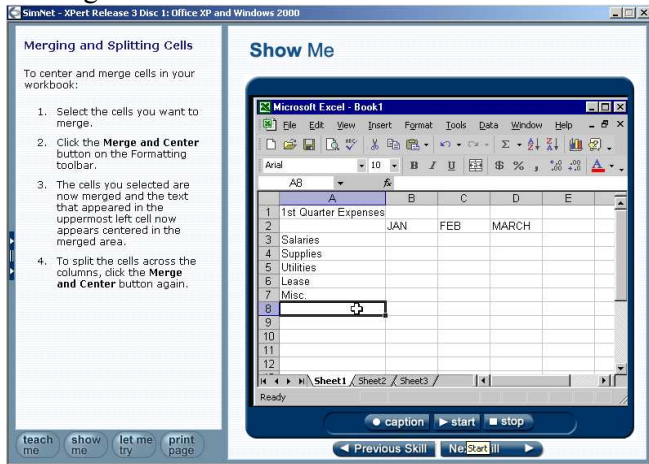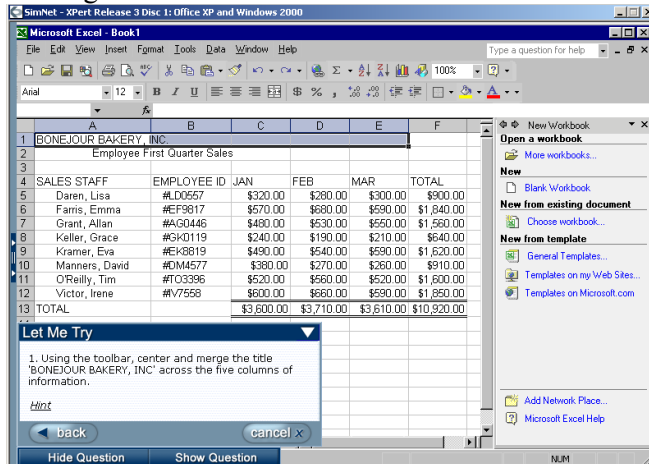

Fig. 3 – An Example of the "Let Me Try" section of the training

- Extra opportunities to work on the software in the laboratory, other than the 2 hours scheduled,

were provided. Flexible access and pace of work were incorporated in the programme.

- Opportunities for diagnostic, continuous and formative assessments were provided. Tests could be done as many times as desired, with the necessary feedback (Fig. 4).

Fig. 4 - Assessment done with feedback
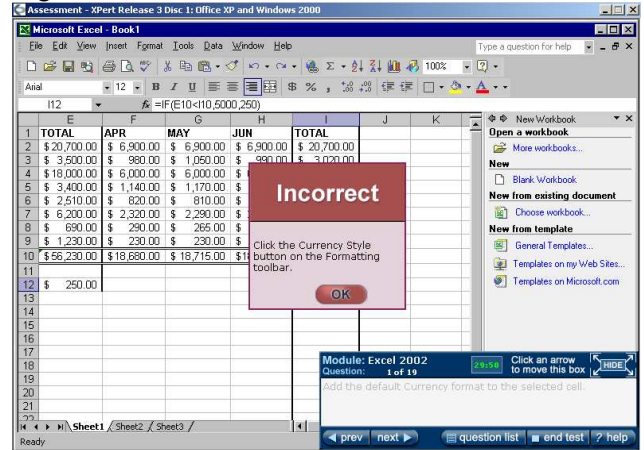
- For the summative assessment, learner identity was verified by means of student cards to ensure that the individual learner's performance or submission was reliable.
- Potential dishonesty was minimised by question randomisation.
- Higher-order learning was incorporated by simulation and application of knowledge.
- In order to prepare adequately, online practice examinations with rapid feedback, were provided in the same format as the real exams.

3.3 Technical and Administrative

- Access to the necessary e-learning package on the file-server was frequently lost due to technical difficulties. The instructor, being present during the scheduled periods, was available to assist with these problems. Should e-learning be implemented in student centres, technical staff will need to be available to help students with similar problems.
- Although the instructor was available during consultation hours, little use was made of this facility as learners preferred to wait for the scheduled time on their timetables.
- Results are stored automatically so problems of learners forgetting to write their names on tests etc. did not exist.

4 Analysis

Learners in the experimental group completed three summative online assessments and three written summative assessments. Learners in the control group completed only the three written summative assessments. Learners in the control group did not complete the online assessments, as they were not registered on the system to access these assessments. The written assessments of both groups and the online assessments of the experimental group were analysed to determine if online assessment results were satisfactory and if learners really mastered the content of the programme.

Fig. 5 – Comparison of averages for the experimental group and the control group for Operating Systems, Word Processing and Spreadsheets.
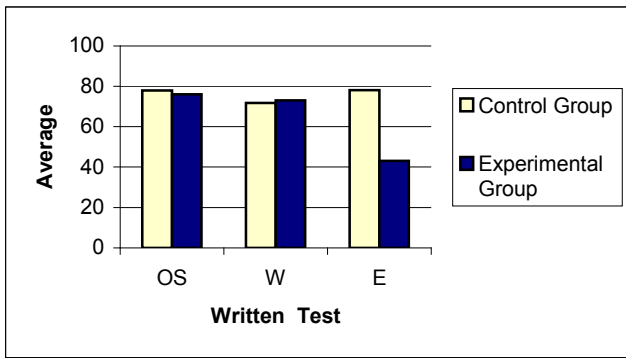
In fig. 5 the averages of the control group for the three sections of the work (Operating Systems (OS), Word (W), and Excel (E)), were compared. For Operating Systems and Word the experimental group and the control group performed the same. For Excel the experimental group achieved substantially lower marks than the control group. One reason for this can be that in Excel the use of formulas and functions are on a higher cognitive level and need more explanation than for Operating Systems and Word. It might be that the online learning didn't address this aspect sufficiently. In a follow up study during the next semester this aspect will be investigated and the reasons identified so that interventions can be made to prevent a reoccurrence.

The next three graphs show an analysis of the data of the experimental group only. To improve readability, the graphs include only a third of the population, since the data for the remaining two thirds of the population show exactly the same trend. Every learner in the experimental group completed six assessments. Learners who haven't completed all six assessments were deleted from the dataset for the purpose of these graphs.

Fig. 6 shows a comparison of the results of the written assessment and the online assessment of Operating Systems. It can be seen that learners achieved more or less the same result for both these assessments.

In fig. 7 the results of the written and online assessments for Word are shown. Again, the results correlate well.
For Excel (fig. 8), the written and online assessment results indicate a substantial difference. From the online assessment result a learner could make the assumption that he/she has mastered the Excel programme, but the written assessment result indicates the contrary.

Fig. 6 - Comparison of the results of the written assessment and the online assessment of Operating Systems
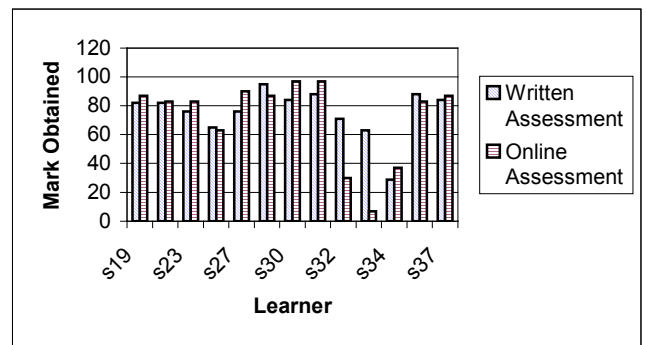

Fig. 7 - Comparison of the results of the written assessment and the online assessment of the Word Processing
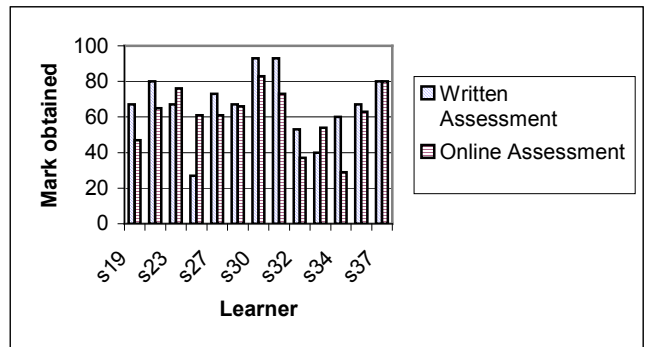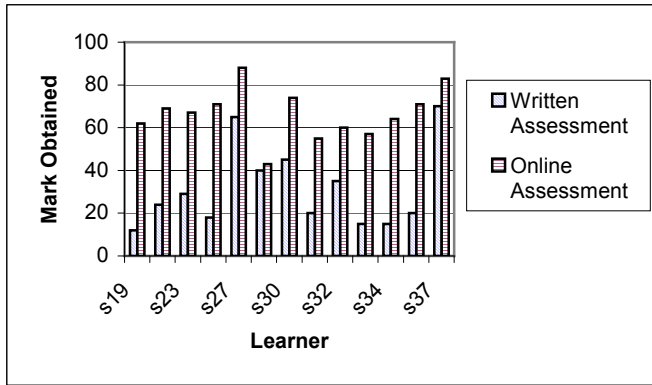
Fig. 8 - Comparison of the results of the written assessment and the online assessment of Spreadsheets.

In the following scatter plot graphs, the correlation coefficient [3] is calculated to determine if there is a correlation between the online assessment and the written assessment. If a correlation is found, the assumption could be made that, if a learner performed well in the online assessment, this learner has mastered the programme.

Fig.9 – Scatter Plot of correlation between the online assessment and the written assessment of Operating systems
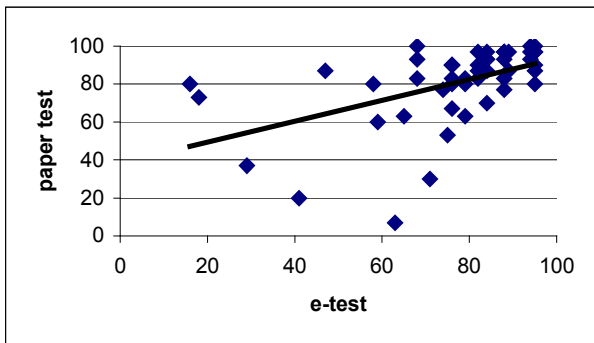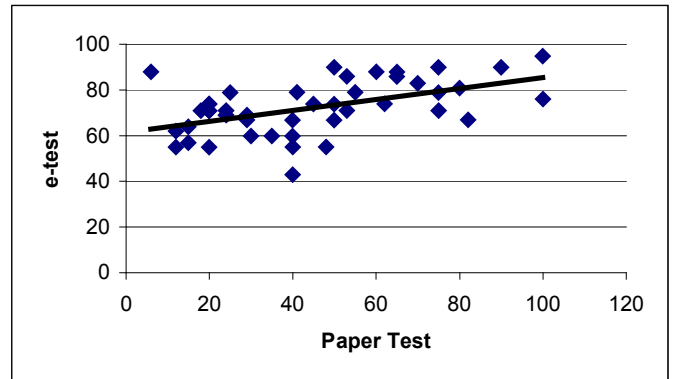

The correlation coefficient in figure 9 is 0.5. When the 4 largest outliers are deleted (figure 10) the correlation coefficient changes to a significant 0.7. Possible causes for these outliers can include poor class attendance, poor English language proficiency, or even personal problems. These causes will be investigated in a follow up study during the next semester. The assumption can thus be made that, if a student performed well in the online assessment, it is an indication that he/she mastered the Operating Systems section of the programme.

Fig.10 - Scatter Plot of correlation between the online assessment and the written assessment of Operating systems with biggest outliers deleted
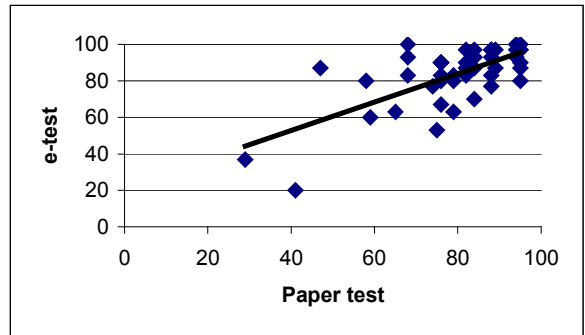
The same procedure as in fig. 9 and 10 was followed for the Word assessment, and the correlation coefficient for the population is 0.6. With the five largest outliers deleted, the correlation coefficient changes to 0.7. Again the assumption can be made that, if a student performs well in the online assessment, it is an indication that he/she mastered the Word section of the programme.

Fig.11 - Scatter Plot of correlation between the online assessment and the written assessment of Spreadsheets

The correlation coefficient for the Excel written and online assessment is 0.5 (figure 11), with not as many distinctive outliers. The distribution lies more towards the lower marks area for the written assessment. Here we cannot make the assumption that a good result for the online test indicates a mastery of the subject section.

The next three interval graphs determine the validity of the tests. If the online assessment and the written assessment give the same distribution the tests can be seen as valid. The following legends will be used for the interval graphs:
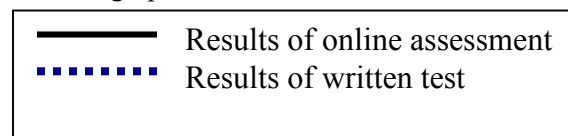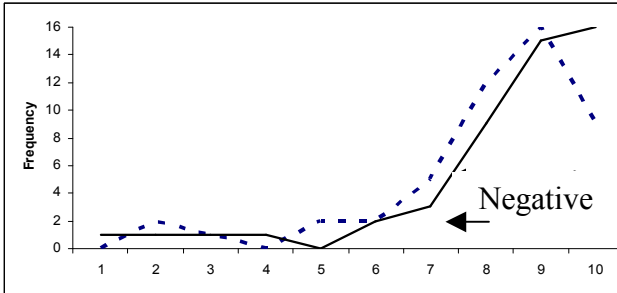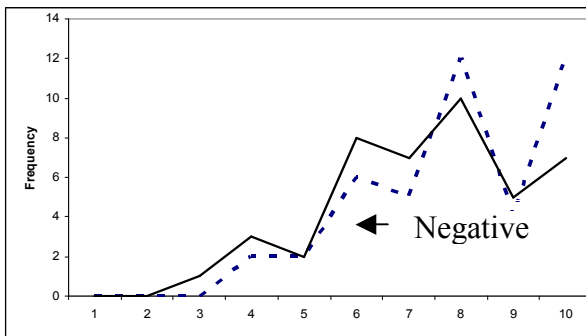
Fig.12 - Line graph for results of Operating Systems

Written Test
Mean (px) = 76
Median (po) = 82
Standard Deviation = 19

Online Assessment
Mean (px) = 80
Median (po) = 87
Standard Deviation =21

Fig. 13 - Line graph for results of Word

Written Test
Mean (px) = 76
Median (po) = 80
Standard Deviation = 18

Online Assessment
Mean (px) = 69
Median (po) = 71
Standard Deviation =18

Fig. 14 - Line graph of results for the Excel learning unit
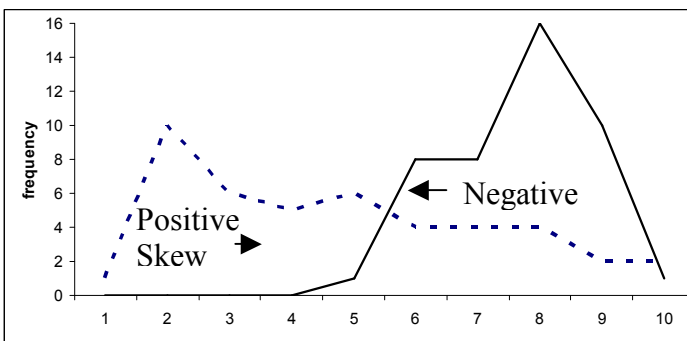
Written test
Mean written (px) = 45
Median (po) = 40
Standard deviation = 25

Online assessment
Mean (px) = 72
Median (po) = 71
Standard deviation = 25

5 Conclusion

The results of the online and written assessments of the Operating Systems and Word sections of the programme indicate a negative skew, with more or less the same distribution for the two tests (Fig.12 and Fig. 13). We can assume that the learner successfully achieved the specified outcomes of these modules.

In fig.14 the results of the online assessment clearly reflect a negative skew, which mean that many students earned very high scores and only a few students earned low scores. This is an indication of either a too easy test, or that the majority of learners have mastered the specified outcomes and are able to use Excel competently. When compared with the written Excel test that reflects a positive skew, it can be an indication that the learners either didn't master the outcomes of the learning unit or that the test was too difficult. The control group wrote the same written test, and scored quite well in it, so we can assume that the test was not too difficult. Although the online test has shown that students mastered Excel, the written test shows no mastery of the material. A possible cause for this distribution can be that the online assessment focused more on performing specific steps, while the written test was a more practical application for Excel. In the continuation of the study specific ways to counteract this tendency will be investigated, so that learners can master Excel just as well as they master the other two online learning units.

References:
[1] Cilliers, C. & Kilpin, M. 1997. Integrating study and thinking skills in a bridging program for disadvantaged freshmen at South African University. *International Journal of Special Education*, 12(1):4
[2] Du Pré, R. 2004. Meeting with the author. Vaal University of Technology.
[3] Easton,V.J. & McColl, J.H. 2005. Statistics Glossary. [Online].Available at: <http://www.stats.gla.ac.uk/steps/glossary/ paired_data.html>. Accessed: 03/11/2005
[4] Gribbons, B. & Herman, J. 1997. True and quasi-experimental designs. *Practical Assessment, Research & Evaluation*, 5(14):1-5.
[5] Kruse, K. 2004. e-Learning Glossary. [Online]. Available at: <http://www.e-learningguru.com/gloss.htm#I>. Accessed: 19/07/2004.
[6] Morgan, C. & O'Reilly, M. 1999. *Assessing Open and Distance Learners*. London: Kogan Page.
[7] SENET. 2004. Homepage. [Online]. Available at: <http://senet.lsc.gov.uk/guide2/assessment/definition. cfm>. Accessed: 29/07/2004.
[8] Shadish, W., Cook, T. & Campbell, D. 2002. *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*. Boston: Houghton Mifflin Company.