

IMPLEMENTING A COMPUTER TRAINING PACKAGE TO ACCOMODATE AN INCREASINGLY COMPUTER LITERATE COHORT

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Abstract

This paper serves as both an example and a warning to academics seeking an alternative to traditional instructional methods for an increasingly computer literate cohort. Survey results confirmed that Graduate Diploma students were entering the Information Technology course with existing spreadsheet and database skills, but not to the extent that these applications could be totally withdrawn from the curriculum. A CBT package was introduced to satisfy training of skills but initially created a greater workload for academics due to inflexibility of the product and unanticipated technical problems. A second CBT package promising greater flexibility in access, student control and centralised monitoring was then trialled. The second package also led to unanticipated technical problems. Some strategies are suggested to aid the smooth implementation of a CBT packages if this is to be the chosen method for teaching application software skills.

Keywords

Computer Based Training (CBT), Higher education, Skills training, Case studies, Tools for learning

Introduction

Society is becoming increasingly computer literate in the use of application software, particularly word processing, spreadsheets and databases. Spreadsheet software is used as a tool in both primary and secondary school curricula. With this in mind, this case study both questions whether training in introductory spreadsheet and database software applications should be part of a Graduate Diploma in Information Technology (GDIT) curriculum, and details the implementation of two types of Computer Based Training (CBT) packages in the same course. The core unit in the course combines an introduction to information systems concepts and language and an introduction to programming. The question asked was "Did the increasing computer literacy of the students entering the course negate the need to devote four hours of lecture time to these software applications?". The main cohort of students in the GDIT had a first degree in a non-computing discipline, usually business, engineering or education. The unit catered for both full-time and part-time local and international students. The information systems part of the course incorporated the teaching of basic skills in the use of spreadsheets and databases. Initially two one-hour lectures were devoted to each application, the first covering the introductory concepts and the second the more advanced functions and application of the software. Students were assessed on their competency via an assignment in the case of the use of spreadsheets, and with examination questions in the case of the use of databases. The introduction of a CBT package to take over the training in introductory concepts introduced a third party into the debate; the CBT training company. This created further complications related to the level of technical support provided. The paper concludes with some valuable recommendations to academics considering implementing a CBT package in their course.

Background literature

Over half the students leaving primary school have confidence in using spreadsheets (57%) with the percentage growing to 84% on leaving secondary school (Meredyth, Russell, Blackwood, Thomas & Wise, 1999, p.4). There is ongoing debate about the role that skills training has to play in the overall scope of learning at university (IFETS-2448, 2001). This debate contributed to the perception that devoting lecture time to the teaching of commercially available spreadsheet and database applications was not a pedagogically sound practice. There was also an awareness that the curriculum in information systems education needs to be relevant to business needs to ensure that graduates are both well prepared and flexible (Amini, 1993, p.2) while maintaining the perspective of education as opposed to skills training. Westfall (1997) stated that information technology education is “fundamentally different from other academic disciplines ... the definition of literacy, in terms of what a person needs to know is also different” and is involved with knowledge about characteristics and functionality of information systems as well as skills. Westfall recognised that the imparting of motivation to stay up-to-date in the field is most relevant in computer literacy (Westfall 1997, p.3). The imperatives for 21st Century Education include

Increased capacity and efficiency - through enabling institutions to cater for the learning of a relatively large number of students at once. ... Easy accessibility - by removing distance barriers and catering for a variety of learners’ prior educational experience, physical abilities, and time commitments / lifestyles. ... A resource-based emphasis - enabling more student control over what, where, when and how they study and permitting non-linear learning” (Nichols cited in IFETS-394, 2001).

In acknowledgement of the evolving nature of the field, coupled with the desire to keep the curriculum relevant and the belief that skills training was not the best use of lecture time, a change was made to the curriculum of this introductory unit. A commercial CBT package was adopted to take over the introductory skills lectures and allow more time for the investigation of case studies.

Justification of implementation of first package

An entry skills survey modelled on the national survey used by Meredyth et al, (1997) asked students to estimate the level of their general computing skills, spreadsheet skills and database skills. The survey was conducted in Semester 1, 2001 in the first lecture. 90 valid surveys were collected. The survey results are summarised in the following table.

Age Groups (N 90)	Basic Computer Skills	Advanced Computer Skills	Basic Spreadsheet Skills	Advanced Spreadsheet Skills	Basic Database Skills	Advanced Database Skills
21-24 (N18)	18	18	18	3	12	4
25-34 (N45)	45	45	42	10	36	16
35+ (N27)	27	27	26	9	21	15

Table 1: Results of Entry Skills Survey, Semester 1, 2001

The basic computer skills included creating documents, deleting files, printing, saving, using a mouse and keyboard, starting and closing a program. The advanced computer skills included playing computer games, drawing, searching the internet, sending e-mail and using a multimedia package. All the students across the age groups believed that at entry level they possessed basic and advanced computer skills regardless of age. Basic spreadsheet skills included creating a spreadsheet, opening, closing and saving a spreadsheet, cell formatting, using arithmetic operators and simple formulae. Advanced spreadsheet skills included the use of analysis functions, insertion of graphs or charts, creation of macros and using protection of sheets and formulae. 95% of students believed they possessed basic spreadsheet skills while

only 24% claimed they had advanced skills. Basic database skills included opening, closing, editing and searching a database. Advanced database skills included the creation of reports, generation of queries, and linking databases. 69% of students claimed they possessed basic database skills while 39% had advanced skills.

There appeared to be no correlation between age and possession of advanced skills. Contrary to expectations, the younger students did not perceive themselves to be the most skilled. However another interpretation to this anomaly is that the younger cohort have had greater exposure to computers, spreadsheets and databases than the older cohorts, and their interpretation of what constitutes advanced skills is different in that it comprises of a much higher standard. In general the survey results indicated that students considered themselves very computer literate as well as competent users of spreadsheet applications at a basic level if not quite so competent with databases.

These survey results led to the implementation of a computer based training package to the curriculum in the second semester of 2000. The particular package chosen was touted via booksellers, available to the university at no cost, and provided to students on compact disc at the minimal cost of \$5. Initially this appeared to be solution to free up lecture time as well as cater for individual learning styles and differential skills on entry. The freeing up of lecture time enabled a greater investigation of the uses of the software in information systems in organizations satisfying the need for a relevant and up to date curriculum.

Evaluation and outcome of first CBT package

The benefit of using the CBT package was that a comparison could readily be made between pre-test and post-test results. Not all students completed the pre-test however, for a variety of reasons such as late enrolments and non-attendance at non-compulsory tutorials. The result of the 60 students who participated in the pre-test and the final test are shown in the following chart.

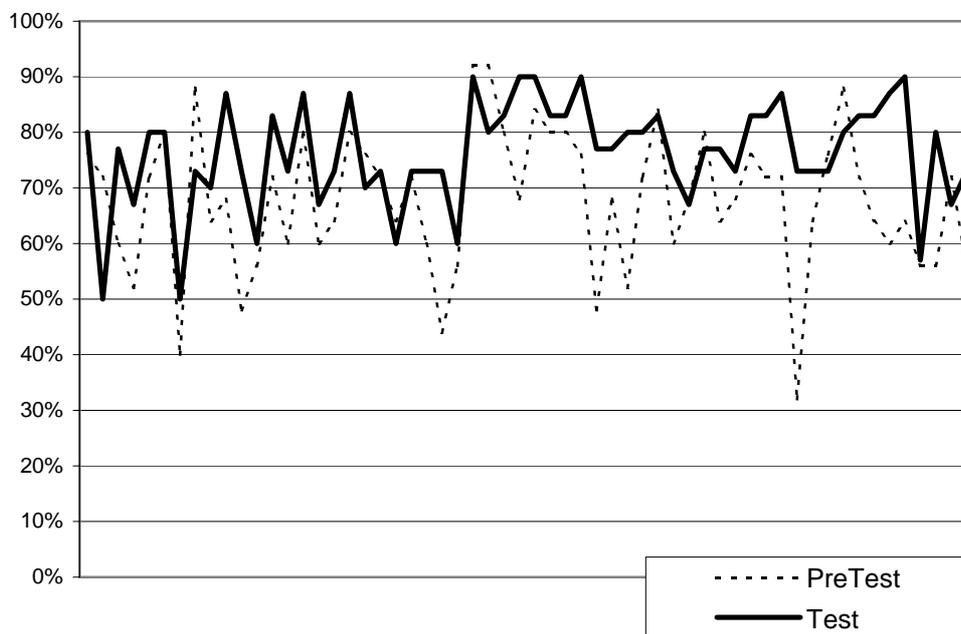


Chart 1: Comparison between pre-test and final test scores

The majority of students improved over the 4 weeks with no-one failing to achieve a pass standard. Some students scored a lower mark in the final test than that achieved in the pre-test. This could be ascribed to two parameters that were invoked in the test environment, a time limit and an inability to change answers once they were submitted.

However, this particular CBT package did not prove to be the desired solution for providing self-paced training and assessment. Approximately 20% of the students voiced reservations about its use. Some expressed outright anger, not an emotion that is desired in the tertiary education environment. The complaints were overwhelmingly related to the inflexibility of the product. Many spreadsheet applications have a myriad of ways that tasks can be performed; via mouse click, keyboard hot keys, drop down menus, and a combination of these. Many of the postgraduate students had already developed their own ways of using several functions and as one of the more vociferous noted:

“With the inflexibility of [CBT package name] and the countless ways functions can be attempted which results in getting to the same result this was quite frustrating. Are we being tested on the functionality of [CBT package name] or the functionality of spreadsheets?”

And another:

“I have effectively ‘unlearned’ a number of commands because they wouldn’t work.”

Several technical problems contributed to the administrative workload for the subject convener. Firstly, while students were provided with their own compact disc of the CBT program packaged with their textbooks, it did not work across all computer platforms easily; it was not “Mac” friendly. This required e-mailing the support centre in America for assistance and added further complications to student usage. Due to time differences, it took several days to solve the problem and created undue stress on the student given the short time span (4 weeks) between pre-test and final test attempt.

Further to this students did not read on-screen commands, so when the question specifically asked them to use the drop down menu they still tried to use the mouse or their own preferred method of doing the task. This meant they received an incorrect response in the test environment. The pre-test environment allowed several attempts at a question while in the actual test only one attempt was possible. This was not a fault of the system but due to a parameter that had deliberately been set and written into the introductory screen for the test. Once more the students did not read the on-screen instructions.

A more important issue was the technical problem of some machines freezing mid-test. This was unpredictable and not as easily solved. In these cases the student could not restart on another computer because only one log-in was permitted without restrictions on access being lifted by the administrator. Another technical glitch was realised after a test was written on a laptop that had a different screen configuration to the laboratory machines. This caused problems with viewing a complete question on the screen in the laboratory and required students to use the scroll bars and in some cases the questions did not appear in their entirety.

When the CBT was first implemented there were concerns regarding the possibility of security breaches. The Computer Systems Officer (CSO) alerted conveners to the fact that student results were kept in XML format, which could have resulted in a more capable student (or friend) editing results via a text editor package and uploading the edited result.

Overall the use of a CBT package, or this one in particular, created a lot of extra work for the academics and did not make the teaching of the application easier. The number of negative comments and technical issues resulted in the database application being tested in the traditional format as a tutorial problem submitted electronically for assessment, not via the CBT which added to correction workload but reduced the number of complaints and technical problems.

Implementation of second package

After this first relatively negative experience with a CBT package, an investigation was conducted on other available packages to ascertain their suitability. As part of this project the School of Information Technology (IT) approached a prominent American based company with a long-standing reputation for delivery of quality CBT programs. On viewing their material it was apparent that a combination of

existing database and spreadsheets modules would satisfy the requirements of the GDIT course and a demonstration was requested. The representative demonstrated the software on her own laptop, which was not a good idea for reasons that will become apparent later. The units were slightly restricted in their functionality but offered more operational flexibility than the previous utilized CBT. At the technical level it was identified that the software requirements for receiving and viewing were minimal and that the technical support for the uploading and set-up of the system would be more than sufficient. On completion of the demonstration and subsequent discussion, the product was deemed by all to be more than adequate, offering a solution that was student driven, flexible and with a student progress reporting facility that was secure.

This program was identified as a strategic initiative for both the School of IT and the associated company and a reduced cost was agreed on. The School of IT was prepared to pay for the program in full and did not pass on the costs to the students. It was envisaged that on successful completion a student payment model would be formulated similar to the previous CBT system.

The vendors of this CBT package claimed that the Web based delivery permitted students to complete the pre-tests and final course tests at their convenience and their results would be recorded automatically on a central database. A selling point used was that a minimum reliance on the supportive software offered full flexibility, permitting the student to have access at home and in both university laboratories. The vendors also promised platform and operating system transferability along with a visit from a representative from their technical department to ensure a successful product installation.

On the signing of the agreement the installation of the system commenced. It was the responsibility of the School of IT technical department to install the student management system and the unit files centrally and then to download them into the university laboratories. At this stage the only vendor technical support given was via the email and despite initial agreement no company representative was sent to assist in the installation. After the installation it was discovered that the program could not be viewed because the browser configuration was in direct conflict with the requirements of numerous other core subjects. At this time the company's technical staff could not supply a solution and demonstrated that their personal knowledge of the operation of the system was extremely limited. Time was running out and with only two days to go before the first laboratory sessions, the company offered a solution that involved the installation of their own viewing software at no additional cost. This problem may have been avoided if the representative had demonstrated the package on the university system and not her own laptop.

Another technical problem arose because the program was required to run in laboratories across the university that were not in the control of the School of IT and due to an internal oversight the installation requests were not made through the correct channels. The late identification of the viewer did not assist the project, as the formal request requires a lead-time of weeks to be considered, justified and then implemented if deemed necessary. No one in the company could inform us of the browser set-up requirements until contact was made with the main technical advisor based interstate.

The preliminary student sessions were postponed to accommodate the non-readiness of the CBT package, and when the technical problems were solved the result was that two distinct versions of the software were in operation across the various laboratories. This caused a degree of confusion with many students who changed between the laboratories depending on timetabled classes and study time.

Another problem was the mechanism to supply the software to students who intended on utilizing it remotely, either in their workplace, at home or at a community centre. These students quickly highlighted the extensive download time required as it was proving to be an expensive exercise through their home Internet Service Provider. In addition the set-up requirements after a successful download were quite complex and often beyond the capability of these users (remembering that their backgrounds were non Information Technology). As is often the case the students who needed the package to use remotely were often those who had minimal exposure to computers and consequently could not complete the installation.

Finally a self-installing CD version of the CBT package that utilized the companies viewing software and able to fully install the program to a hard drive was produced and loaned to students free of charge. At least half of the 120 enrolled students took advantage of this offer. Due to the difficulty of the required

set-up it was decided that the CD would not install a system that enabled the remote user to interact with the file servers database to record their results. This meant that they could only complete the practise tests at home and were required to attend the universities laboratories to complete the formal tests for grading. The ability to use this CBT package remotely while providing centralised result maintenance could therefore not be invoked, reducing the flexibility of the product.

Evaluation and outcome

Once more the unanticipated technical problems led to increased academic workload dealing with the vendor, the technical staff in the university, and confused and sometimes disgruntled students. In this case, however, persistence ensured that the product was used for the whole semester. Students were able to complete both tests (spreadsheet and database) at the end of the semester. The results clearly show that the use of the CBT produced the required academic and skill based outcome, that students passing this unit of study be competent to intermediate level in spreadsheet and database applications.

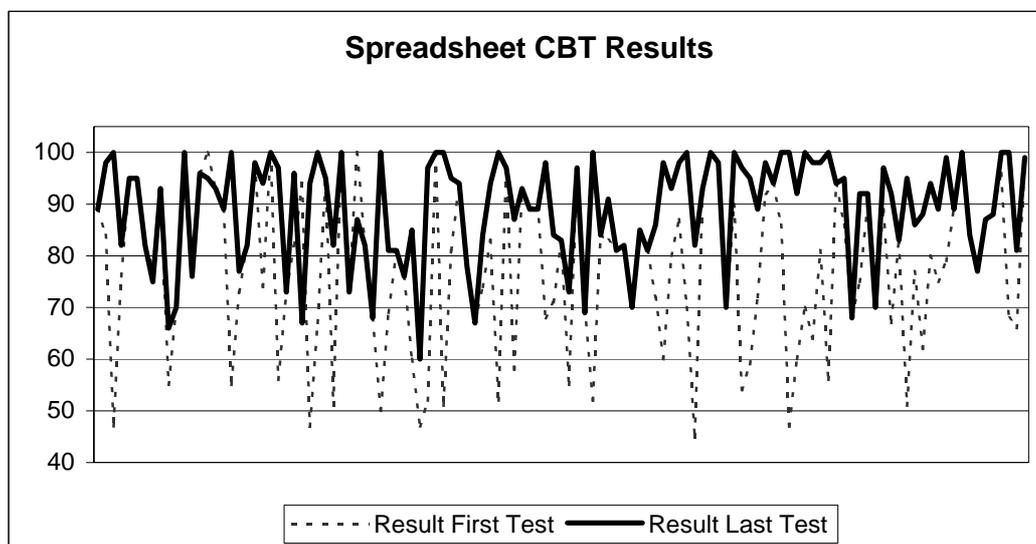


Chart 2 – Spreadsheet results – Second CBT Package

As shown in Chart 2, the majority of students achieved a better result after using the CBT package. Analysis of the results shows an average increase of 12% in points scored between the result of the first test taken and that of the final test. A correlation could not be drawn between the number of times students accessed the program and improvement in overall score because there was no way of monitoring student access on their home computers. The lowest recorded score in the first test was 45 and the lowest in the last test was 60. 81% of the students achieved a score of greater than 80% in the final test. Interestingly three students performed noticeably worse in the last test than in the first test. No explanation can be offered for this apart from the fact that the final test was operated in a timed controlled laboratory environment.

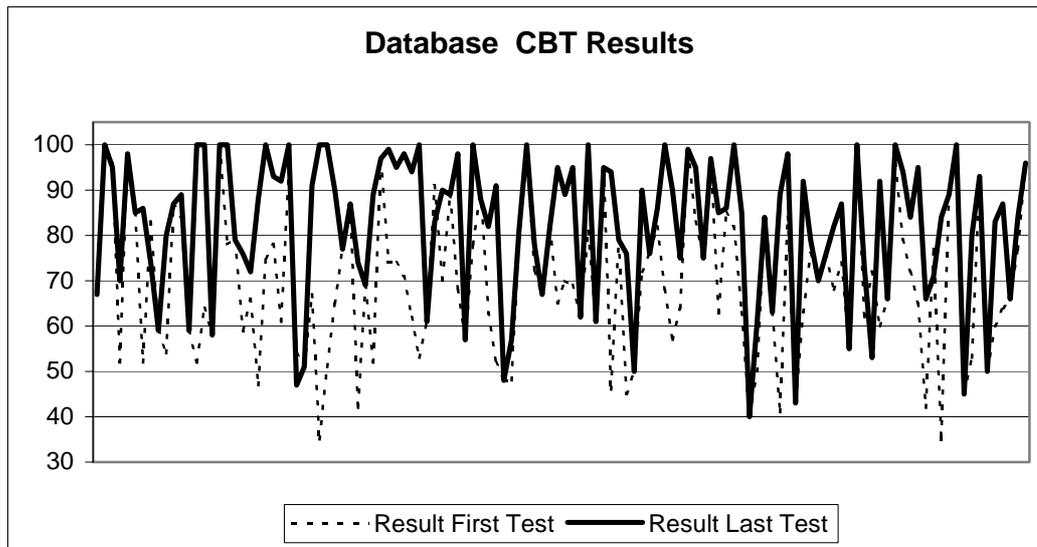


Chart 3 – Database results – Second CBT Package

The results in Chart 3 also confirm the usefulness of the second CBT package. In this case the minimum score in the first test was 35, and in the second was only 40, but the average increase between points is 13%. Five students failed to reach a pass standard of 50% and 63% achieved a score of 80% or greater in the final test. Of the 5 students who failed, the records show that they accessed the system less than 3 times, however there is no way of being sure that access times influence final result due to the installation of the CBT program on home machines.

A question was added to the Subject Evaluation Report issued towards the end of semester to all students present in each of the two lectures in the unit. This question was “Please comment on the suitability of Computer Based Training (CBT) to build core application skills”. The responses are shown in Table 2.

	Part-time students	Full-time students	%
Positive comment	21	4	36
Positive but commented on lack of reliability	6	2	12
Negative comment	2	2	6
No response	10	22	46

Table 2: Responses to Subject Evaluation Report question based on enrolment mode.

This package was intended to suit flexible access and various entry-skill levels. Generally the responses are in favour of the product, if somewhat tempered with comments on lack of reliability. One student wrote: “Found it very useful and recommend it for all assessment in the future” while another wrote: “This was a major negative. I would rather sit down with a book and learn the real product. This is not what I came here for”. Many students did not respond to this question at all, which is an unfortunate consequence of surveys. The obvious positive comments by far outweighed the obvious negative comments by six to one. The responses to this survey question helped influence the decision to continue with the CBT package for one more semester.

Third time lucky

The initial response to the use of this CBT was to abandon it and find another method of ensuring a base skill standard in students. The inclination to “throw the baby out with the bathwater” was strong. After much discussion the School of Information Technology took the stance that if the vendor agreed to the trial continuing for a second semester, at no extra charge, then the product would be included in the

curriculum. This agreement was reached and the intention now is to use the second CBT product in Semester 2, 2002. The view is that it would be a pity to have ironed out many of the problems without having a final run to fully attest to the value of the product academically.

Concluding Recommendations

This case study has shown that the majority of students are entering the GDIT with a working knowledge of spreadsheet and database software. The curriculum has changed to concentrate on the most relevant implications and uses of these packages rather than skill instruction. The original title of this paper included the clause “an example or a warning: you be the judge”. This case study can serve both as an example and a warning for the problems that might be faced when implementing a CBT package in the curriculum. It is often difficult to import a product from an external source into an environment very different from its origin with success. In the case of the second CBT, the consequential variations of instalments greatly affected the performance, flexibility and reliability of the product, generating frustration and extra work.

The cost issue will require some compromises to be made, as students are the least likely candidates to have the money to spend on purchasing these tools. We do not want to be faced with an environment that causes more division between those that can afford the software and those that cannot. In the past, information technology departments have made software available to students within the university and perhaps this will be the solution if a CBT package is made core to the curriculum. However, to allow for flexible access and delivery, an alternative will need to be sought.

Using this case study as an example, we leave a series of warnings. Always ensure that trials are carried out and run in a variety of situations and locations. It is extremely important to have strong technical expertise both in-house and from the vendor close at hand. While it is difficult to imagine every scenario, it is important to trial a CBT package in variety of platform and accessibility in an attempt to anticipate student use.

There are four recommendations that we would like to highlight for anyone considering the implementation of a CBT. Firstly to carefully consider amount of administration, set-up and trial time involved. It is difficult to hand over the responsibility to tutors, so usually the academic will need to carry out most of the preparation themselves. Secondly, be prepared for some hostility from experienced users. In most CBT packages the right mouse click function is disabled. Experienced users clearly miss this functionality and feel that they are forced to relearn the product by using different methods. Thirdly, don't over-estimate the amount of self-directed study that students are prepared to do. Even post-graduate students are sometimes lax in the dedication and amount of time taken to progressively learn a new product or skill. It was evident that many felt they could “cram” at the last minute, and did not access the package and progressively work through the modules. Lastly, the problems of using a CBT for the most computer illiterate students in the degree program is something to take in to account. Negative experiences can turn students away quickly, even if they are of a purely technical nature and nothing to do with the student.

By following some of these practical recommendations academic staff will be better prepared to deal with the problems that might occur when introducing a CBT package in to an academic curriculum.

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