

Assessment of the Use of CAL to Replace Remedial Biochemical Calculation Tutorials

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Introduction

A number of students at the early stages of our courses have problems with the correct use of units and basic concentration calculations. These problems are easily addressed by remedial tutorials.

A PC Computer Assisted Learning (PCCAL) package from Bath University (UK) on "Basic calculations" was loaded onto the Erasmus Darwin network. The programs were used initially with a small group of second year part-time Bachelor of Science Biomedical students (11 students) to assess if the package could replace previously used remedial tutorial time.

The part-time students received one introductory tutorial on how to access the programs and their content. In addition, they also undertook a short pre-program test. For the following three weeks the students used the PCCAL program in the Erasmus Darwin computer resource room (ED290) in place of the remedial tutorial.

At the end of the tutorial sessions the students were again subjected to a short post-program test and a verbal feedback session. All the students showed an improved score on the test taken after using the computer programs. In the verbal feedback session the students enjoyed the fact that they could work at their own pace on the packages and that the material got progressively harder.

It was decided to test the programs' effectiveness with a larger group of students and to link the assessment of the packages to a pre- and post-computer session multiple-choice question (MCQ) test.

The computer programs

PCCAL: Basic Calculations in Pharmacy (SI units, Moles and Molarity).

These programs are *Authorware*-based programs that lead the students through progressively difficult problems. There is very little self-assessment associated with these programs.

To complement the PCCAL programs, a series of self-assessment tests using *Question Mark* were constructed. These self-assessment tests were installed on the Erasmus Darwin network and the students were directed to use the *Question Mark* tests to assess their progress. If they achieved low scores they were to continue with the PCCAL programs and then evaluate their progress using the *Question Mark* tests.

***Question Mark* tests constructed were:**

- "Units"; randomly accessed 20 questions from a bank of 300 questions;
- "Easy conc."; randomly accessed 20 questions from a bank of 1,000 questions; and
- "Hard conc."; randomly accessed 20 questions from a bank of 300 questions.

Methodology

A group of 48 first year HND students at the first tutorial were given a 15 question MCQ test comprising questions on units and concentration calculations that could be found in the *Question Mark* tests.

After the test they were informed of their score and that they would be again tested in four weeks with the same format of questions. This second test comprised 20% of the module mark. The students were also given information on how to access the PCCAL and *Question Mark* programs.

Results

There were 16 students who improved between 10-100%, in this group eleven students scored 70% or better in the final test. Twenty-one students improved 100% or more and 9 students did not show any improvement in their score.

| | MCQ score (Prior to computer use) | MCQ score (After computer use) |
|--------|--------------------------------------|-----------------------------------|
| Miss B | 46 | 29 |
| Miss B | 54 | 86 |
| Mr B | 31 | 86 |
| Mr C | 38 | 36 |
| Miss C | 31 | 86 |
| Mr C | 31 | 100 |
| Miss C | 31 | 100 |
| Miss C | 62 | 36 |
| Mr C | 31 | 79 |
| Mr C | 38 | 79 |
| Miss D | 54 | 50 |
| Mr D | 54 | 79 |

| | | |
|--------|----|-----|
| Miss D | 38 | 93 |
| Mr E | 38 | 57 |
| Mr F | 77 | 100 |
| Mr G | 54 | 64 |
| Mr G | 23 | 93 |
| Mr G | 38 | 79 |
| Miss H | 31 | 86 |
| Mr H | 31 | 64 |
| Mr H | 54 | 50 |
| Miss H | 46 | 79 |
| Mr H | 23 | 36 |
| Mr L | 54 | 79 |
| Mr M | 69 | 86 |
| Mr M | 54 | 36 |
| Miss M | 38 | 86 |
| Miss M | 31 | 100 |
| Miss O | 62 | 57 |
| Mr O | 62 | 64 |
| Mr P | 38 | 79 |
| Miss P | 62 | 79 |
| Mr P | 38 | 79 |
| Miss P | 46 | 100 |
| Mr R | 54 | 100 |
| Miss R | 38 | 86 |
| Mr R | 46 | 79 |

| | | |
|--------------------------------------|----------------|----------------|
| Mr S | 46 | 79 |
| Mr S | 77 | 57 |
| Mr S | 31 | 57 |
| Miss S | 69 | 50 |
| Miss S | 38 | 43 |
| Mr S | 23 | 71 |
| Mr T | 38 | 43 |
| Ms U | 46 | 100 |
| Ms W | 54 | 93 |
| Miss B | 46 | 29 |
| Miss B | 54 | 86 |
| Mean (\pm Stdev) | 45 (\pm 14) | 73 (\pm 21) |

Conclusions

The results show that computer aided learning can in this instance replace traditional teaching practices. The method of pre-testing to demonstrate to the students their deficiencies and post-testing with the reward of module marks, produced a significant improvement (paired T-test = $p < 0.001$) in the MCQ score for the test after the students had used the computer-based programs.

Further work is currently under progress to improve the method of delivery and assessment of basic calculations tests.

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