Further reading

NCET, *IT Works: Stimulate To Educate*, NCET, 1994.

Martin, R., "Schoolchildren's Attitudes towards Computers as a Function of Gender, Course Subjects and Availability of Home Computers", in *Journal of Computer Assisted Learning Volume 7*, Number 3, September 1991.

Scaife, J. and Wellington, J., *Information Technology in Science and Technology Education*, Open University Press, 1992.

Contact

Dr Robert Musker, Keith Reardon and Philip Hearne, Cornwallis School, Hubbards Lane, Linton, Maidstone ME27 4HX
Tel: 01622 743152 Fax: 01622 741866
Philip Poole, Department of Education, Christ Church College, North Holmes Road, Canterbury CT1 1QU
Tel: 01227 782247 Fax: 01227 785761

Using computers to improve performance in science

DR ROBERT MUSKER, KEITH REARDON AND PHILIP HEARNE,
CORNWALLIS SCHOOL, MAIDSTONE, KENT
PHILIP POOLE, CHRIST CHURCH COLLEGE, CANTERBURY, KENT

AIM

To ascertain whether computers can improve the results of students in a Year 10 science programme and whether students in other subjects can benefit.

SUMMARY OF FINDINGS FOR THIS CASE STUDY

- A difference was observed in academic performance in science tests using an enriched IT curriculum.
- Boys and girls studying the enriched IT curriculum outperformed their peers in the control group.
- Girls obtained marginally higher results than boys in the academic science tests in this study.
- The majority of the students surveyed perceived the use of IT in lessons as being able to enhance their learning.
- The majority of students agreed very strongly that they enjoyed using computers in science lessons.
- The girls in this study had less access to home computers and were less confident than the boys in using computers in science lessons.

A research project commissioned by the Teacher Training Agency as part of the Teacher Research Grant Scheme 1996/97

Objectives

In the short term we wished to ascertain whether an enriched IT science curriculum could lead to an improvement in academic performance or motivation of Year 10 students at Cornwallis School. Any useful findings from this project were to be passed on to the science teachers at this and similar schools. We would also be looking for any other benefits of implementing an enriched IT curriculum. In the long term, our aims were to implement a larger research project with students of a range of abilities in a number of subjects, and to assess whether there are any gender differences in the use of IT at Cornwallis School.

Improvement in academic performance

The results of the class with an enriched IT curriculum were about 2.66 per cent higher than those of the control group. This small increase was more than a quarter of the total improvement shown by this group. This was due to girls and boys performing marginally better in the enriched IT group relative to the control group (see table 1).

The improvement of boys and girls in academic tests in the course of the study

Group	Boys	Girls	Overall
A	10.96	13.20	12.00
B	8.00	11.04	9.34
Increase	2.96	2.16	2.66

Figures show percentage increases from baseline tests

The biggest increase was shown by the girls in the enriched IT group. This study has only a small sample number (50), but bearing in mind that any increase in academic performance is worth pursuing – especially when observed in both girls and boys – a further study with a larger sample and a comparison of different abilities would be beneficial. The possible reasons for the increases are assessed in the following sections.

"IT has been found to allow flexibility for an individual's learning needs."

Significant changes within the groups' IT use

Students' use and perceptions of IT in science lessons were gauged with questionnaires at the start and the end of the study. Each student was also interviewed to clarify any points of interest.

Group A, the IT group, thought it used IT a lot more. Group B, not surprisingly, stated its use of IT had decreased. The IT group perceived a greater use of computers for spreadsheets, word-processing and especially sensors (data-logging equipment). The control group's perceptions showed that its use of most software had not changed, except for the use of sensors. It should be noted that sensors are almost exclusively used by the science department.

Why is science more fun with computers?

The enriched IT group enjoyed its science lessons more than the control group. Interestingly, the enriched IT group showed an increased enjoyment of using computers. Both groups thought computers made science lessons more interesting and would improve their performance in science tests. Students gave the following reasons for why computers made science more interesting:

- *they allow students to work independently;*
- *they make tasks easier;*
- *they are more entertaining than 'normal' lessons;*
- *they are more visual.*

IT has been found to allow flexibility for an individual's learning needs. For example, in 1994 the National Council for Educational Technology (NCET) pointed out that students can work at their own pace and go over work they are unsure of with a computer.

Why will computers improve performance in science tests?

More than 90 per cent of students in this study thought that using computers in science would improve their test results. They reasoned that this improvement would be due to:

- *learning in a different, more visual way;*
- *IT providing a good way of going over their work;*
- *an improvement in the presentation of their work (particularly for boys).*

The NCET has shown that IT can provide an extra stimulus for learning because information can be put across in different and new ways. Furthermore, IT can make difficult concepts easier to understand, because they can be put forward in a more visual manner. IT also enables students to have results quicker and easier and, therefore, allows them more time for interpretation.

Why are boys more confident using computers?

Boys in both groups were considerably more confident in using computers in the classroom without supervision. More than 85 per cent of boys and 52 per cent of the girls in this study had access to home computers. Furthermore, 68 per cent of boys used the computing facilities in school in their own time, while only 20 per cent of girls did. Almost all the boys said, "I am confident in using computers because I have a computer at home." Martin's 1991 study indicated that boys are more likely to have home computers than girls and that, if students do have computers, they are more enthusiastic and confident users of IT in school.

Summary

There was an increase in the academic performance of the enriched IT group. Furthermore, the group's proficiency and confidence in the use of IT increased. The students also thought IT in the classroom stimulated learning. Owing to time constraints, we did not address other aspects of when IT can help in teaching, such as group work and classroom management.

It is hoped that in further studies we can ascertain whether students perform better overall in an enriched IT curriculum and which groups would benefit the most.

About this study

The study was undertaken at Cornwallis School, Maidstone, which is a grant-maintained, non-selective school with technology college status. The two sample classes were of similar ability and were taught with the same material and lesson objectives, with the exception that one group had IT integrated into many of its lessons (about 40 per cent) where it was appropriate. The two classes were given the same competence test at the start and at the end. The students also filled out questionnaires at the start and end of the study. All students were interviewed during the course of the study to expand on the answers given in the questionnaires.

"IT can provide an extra stimulus for learning because information can be put across in different and new ways."

We would like to thank the Teacher Training Agency, the NCET and Derek Greenslade.