Teaching secondary science with data loggers: the NSW experience

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Teaching secondary science with data loggers:
the NSW experience

A thesis submitted in partial fulfillment of the
Requirements for the award of the degree

Doctor of Education

from

University of Wollongong

by

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BSc (Macquarie), Grad Dip Ed (Sydney CAE), MEd (UWS)

Faculty of Education

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Teaching secondary science with data loggers: the NSW experience

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Research Thesis for Doctor of Education degree

Teaching secondary science with data loggers: the NSW experience

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Declaration

I, Kenneth Raymond Silburn, declare that this thesis, submitted in partial fulfilment of the requirements for the award of Doctor of Education, in the Faculty of Education, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other institution.

Ken Silburn
Date 8 October 2008
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Abstract

Many countries have identified an urgent need to revitalise the way science is taught in secondary schools in an endeavour to increase the number of students electing to study science at senior school and continuing into science-related study at university.

Recent changes to the New South Wales Higher School Certificate Stage 6 Science syllabuses have resulted in a shift towards the use of data acquisition and analysis technology in the science laboratory. Combined with the increase in technology available to schools and the decrease in cost associated with its use, data acquisition equipment and analysis software, such as data loggers, are now seen as an essential part of the science curriculum.

The recent introduction of data loggers into the education system has been implemented despite a lack of empirical research into their effective use. This study addresses this gap in literature by investigating the implementation and use of data loggers in the secondary science classroom from the viewpoint of both students and teachers.

The purpose of the study was to describe how teachers use data acquisition and analysis technology to support student learning in secondary physics. The study also sought to develop descriptions of effective practice in the use of data loggers in secondary physics teaching and also identified the purposes of the different approaches taken by teachers. An anticipated outcome of this research is an improved understanding of how teachers can better facilitate increased student learning through the use of appropriate technology in the classroom.

The study was guided by three key questions:
(1) What is the current impact of data loggers in secondary school physics classrooms?
(2) What factors influence the ways teachers use data loggers with their classes?
(3) What are the implications for integrating data loggers into the physics curriculum?
A mixed method design combining qualitative and quantitative approaches including a combination of survey, interviews and case study research methods was used. Data were collected by surveys and interviews with students and teachers, and classroom observations. Student focus group interviews were carried out under supervision of an appropriate adult, in consultation with the principal.

The study incorporated the researcher’s own school as well as nine other schools in the Campbelltown and Liverpool School Districts of Sydney, New South Wales. Professional people identified as being leaders in the area of data logging and education also were interviewed to triangulate findings from the schools.

The study found that despite the rhetoric exalting their virtues, the implementation of data logger use in NSW schools has not been effective. Survey results indicated that data loggers were almost only used in the senior years of high school. Even though many teachers could identify the advantages of using data loggers in their classes they were not confident in using this technology, and cited a lack of professional development, the cost and scarcity of equipment, and the complexity and problems associated with classroom management of such equipment.

The study also identified cases of best practice and highlighted strategies used by teachers to use data loggers to extend students’ knowledge. The findings have implications for the future implementation of data loggers in schools and suggest avenues for further research.
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