

Enriching the UK Curriculum with Real Data

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1. Introduction

Involving teachers and students with the building blocks of a subject can motivate them to teach and learn that subject more effectively. See, for example, the Information and Communication Technology (ICT) resources for teaching subjects such as biology, chemistry and mathematics to students aged 11 – 16 in the ‘*Building Blocks for ...*’ series published by Birchfield Interactive (www.birchfieldinteractive.com). Key building blocks for the development of the subject *statistics* are data, with mathematics contributing some of the most important tools of construction. However, concentrating on the tools, rather than the blocks, can be counter-productive for students’ motivation, learning and development of statistical thinking skills. This is especially true when statistics is introduced and taught for the first time.

Cobb and Moore (1997) emphasise that a key contributor to statistical thinking comes from being involved in *data production*. Central to the *CensusAtSchool* project (www.censusatschool.ntu.ac.uk; Davies and Connor, 2004) is the production of *real* data that are intrinsically interesting to school students of all ages – in short, the students are motivated because the data are *theirs*.

2. Enrichment and Motivation

The aim of the ‘*AtSchool*’ projects including, *CensusAtSchool*, *ExperimentsAtSchool* and *SurveyAtSchool*, is to encourage students to view data and summary statistics and graphs drawn from them with healthy skepticism, whilst increasing their understanding. We use the real data that has been submitted via our online questionnaires to do this. We can produce graphs, which may look correct at first glance, but on closer inspection, and due to the involvement of the students in the data collection process, contain outliers, errors and oversights that students can not only spot, but also can explain how they came about and rationalize and justify. The student’s more direct involvement in the whole data handling cycle enables them to develop their statistical thinking skills in a real context. They naturally link the process to the outcomes and by using technology to provide the tools and techniques needed, the emphasis shifts to the data and their understanding of them. Providing real data in raw form also shifts the decision making process to the students themselves. They begin to ask questions such as: “How much data do I need?”; “I’ve got too much information here - Which variables should I be working with?”; “What type of table, graph or diagram will present the data best?”; “Do I need to find out more about where the data came from?”; “Will another sample give me the same results?”. In our experience the more questions the students start asking the greater the level of statistical awareness and understanding they will start to show.

3. Embedding in Government Education Strategies

In the UK the government has shown increasing awareness of the need to embed statistical understanding in students. The National Numeracy Strategy (1999) highlights the need to look for opportunities for drawing mathematical experience out of student's activities using data as starting points. Smith (2004) reports on 'the fundamental importance of Statistics and Data Handling' and how it should be taught by 'encouraging substantive involvement with *real life* problems'. The Secretary of State for Education, Charles Clarke, endorses the project saying '*The CensusAtSchool project goes to the heart of learning and encourages a positive attitude to statistics through using data that is both relevant and real*'. Indeed, in 2004 the government provided financial support to continue our *AtSchool* projects. Also, as part of its *Excellence in Schools* packs for 11 to 14 year olds the UK National Key Stage 3 Strategy makes use of a number of resources drawn from the *CensusAtSchool* project and highlights it on the government's *Raising Educational Standards* website (www.standards.dfes.gov.uk). In 2004 the Qualifications and Curriculum Authority endorsed our booklet, *A Toolkit in Data Handling for Projects*, based on the project web site. The Department for Education and Skills *Key Stage 4 subject network follow-up booklet: Spring 2005 Mathematics* comments '*It (the Toolkit) makes important links with the effective use of ICT to enhance the work (of CensusAtSchool)*'. These features encourage both teachers and students to become more skillful in statistical application.

4. Conclusions

A convincing argument can be made for teachers to take a data-production approach to teaching data handling and statistics in schools by pointing out the many benefits for them and their students. It is a relatively straightforward way to enrich the curriculum and there is strong evidence from the *AtSchool* projects that student involvement with *their* data provides excellent motivation for them to learn and develop statistical awareness. However, convincing a government to include a data-oriented approach in its strategies for learning and teaching is, in our experience, a very slow process. In the UK we are having some success at doing this through the gradual adoption by teachers of a real data approach in the classroom, which in turn has a positive knock-on effect on education policy makers at government level.

Our view is that the more we can convince teachers to take advantage of the power and richness of real data in teaching, the more likely we are to persuade governments to build such an approach into their learning and teaching strategies for data handling and statistics in mathematics and other subjects.

5. References

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