

MANAGEMENT AND THE USE OF ICT IN SUBJECT TEACHING

Integration for Learning

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Abstract: Improving teaching and learning in the classroom is the key issue facing educational leaders in UK secondary schools and information and communication technology (ICT) is being employed in a range of ways to support this endeavour. However, it is in everyday classrooms that the benefits of ICT for teaching and learning are most immediately felt and this is where the leadership vision will be secured. Many teachers feel the pressure to use ICT in their lessons but they are often faced with the problem of where and how it fits within existing teaching frameworks or understanding how it enriches pupils' classroom experiences. This paper argues that problems of ICT integration have a managerial dimension that relates to the planning and implementation of lessons. Drawing on experiences in science education, it presents frameworks that offer a means of analysing the beneficial features of ICT in relation to teaching and learning goals and identifying the skills of classroom application required to achieve these. It is suggested that many of these application skills find relevance in non-ICT activities that may be familiar and that teachers already possess professional skills that have relevance in ICT settings.

Key words: Integration, skills, teaching, learning

1. INTRODUCTION

Improving teaching and learning in the classroom is the key issue facing educational leaders in UK schools. The use of information and communication technology (ICT) in secondary school education is a focus of widespread interest. Developers of software and users of ICT often extol its virtues and some governments have invested high hopes (and significant

financial resources) in the anticipation that new technologies will deliver improvements in education. Yet, the use of ICT in classrooms is problematic and questions are beginning to be asked about exactly what ICT can deliver for education and how any benefits can be secured. This paper argues that integration of new technology into classroom practice is essentially a problem of management. It draws on experiences from science education in the England to tease out generic issues requiring a management focus for teachers employing ICT in subject teaching.

2. ICT AND ISSUES OF CHANGE

The use of information and communication technology in education is characterised by change. To take some aspects of the UK experience by way of example, the early appearance of microcomputers in secondary schools in the 1980s allowed teachers to begin to harness the calculating power of these machines to serve teaching purposes. This was especially the case in science education where some teachers had the specialist technical knowledge (and interest) to develop the potential application of new technology in teaching. For example, by linking the computer directly to apparatus for the purposes of making experimental measurements it became possible to collect data for graphical display in software.

Rapid technical developments in the speed, memory and display properties of computer hardware together with concomitant developments in software (much of it tailor-made for the education market) now provide teachers with ICT resources of considerable sophistication and educational potential. However, in England, as elsewhere, developments in ICT have taken place in parallel with rafts of other educational reforms and initiatives and this has sometimes created a climate that has overshadowed teachers' use of ICT. This appears to have been true even where initiatives have been in tune with the educational potential of new technology (Newton and Rogers 2001).

In society as in schools, burgeoning technology has understandably resulted in the technology itself becoming a focus of strong interest. It is perhaps inevitable that the acquisition of the latest technology in schools has trailed that available in the High Street and in many homes. This may have some unforeseen effects in terms of pupils' motivational responses to working in school with older computer technology than they may have in their bedrooms (Keele University / National Council For Educational Technology (NCET) 1997); nevertheless it is a reality in many schools and likely to remain so in the foreseeable future.

The capacity of English schools to accommodate developments in new technology has been constrained by uneven levels of resource and by a lack of ICT confidence in a significant proportion of schoolteachers. The government has sought to address this deficit in skills through pre-service (Department for Education and Employment (DfEE) 1998) and in-service training initiatives (Teacher Training Agency (TTA) 1998). In the context of science teaching, barriers to ICT use have been described in three broad areas: Shortages in computers and related hardware; lack of teacher expertise and inclination (for some) to use computers coupled with a lack of access to machines to address these issues; and finally the lack of clarity of teaching purpose when faced with a wide range of possible options and generic software (Tebbutt 2000). In addition to these factors, Tebbutt raises the need to consider issues pertaining to teachers' workload and pupil characteristics, which might also influence adoption of ICT approaches in favour of non-ICT alternatives. Thus the development and integration of ICT for teaching purposes has proved to be more problematic than technophiles and politicians may have expected or wished. Uneven distribution of ICT resources, deficits in the necessary ICT skills and a lack of pedagogy for teaching subjects with ICT has each contributed to the complexity of integrating new technology into subject teaching.

3. INTEGRATION OF ICT - A MANAGEMENT PERSPECTIVE

The use of ICT in subject teaching involves the integration into lessons of an innovative teaching tool. It is useful therefore to consider how scholarship on the management of educational innovation can illuminate integration of ICT into classroom practice. An authoritative source of such scholarship can be found in the work of Elliot Rogers (Rogers 1995). Rogers suggests that to better understand the implementation of an innovation, attention needs to be paid to the differences between the characteristics of people adopting innovations in addition to the features of the innovation itself. Moreover, scholars of innovation diffusion have seen an individual's perceptions of the attributes of an innovation as useful predictors of the rate of its adoption (Rogers 1995).

With particular reference to educational settings, Michael Fullan has described 'needs identification', 'goal clarity', 'complexity' and 'practicality' as key factors that affect successful implementation of an innovation (Fullan 1991). To develop the discussion further, needs identification raises questions about the relative importance of the innovation and what priority it should be given amongst other initiatives. In England

DATA USE IN THE CLASSROOM

The Challenges of Implementing Data Based Decision-Making at the School Level

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Abstract: Systemic efforts to implement database decision-making at the school-level and classroom-level face several challenges. First, most data available within district information systems are limited to operational needs of schools and the district. Second, educational organizations have little experience integrating complex data into their decision-making processes. Third, while large-scale assessment and accountability data are more generally available for gauging the performance of educational systems, there are major differences between the evidence used for external accountability systems and the data needed for making instructional decisions on a daily basis in the classroom.

Key words: Decision support, educational management

1. INTRODUCTION

This paper will examine problems school-level staff encounter when attempting to implement data-based decision-making reform efforts, specifically those decisions that influence teaching and learning in the classroom. Many schools and districts are exploring data-driven decision-making as a solution for improving resource allocation and instructional program decisions. One of the most challenging problems policy makers and educators face in attempting to implement curriculum reforms is that intervention decisions are made at least one organizational level above that of the teachers - the persons actually engaged in instruction.

Any systemic effort to implement a focus on database decision-making at the school-level and classroom-level faces several challenges. First, most data available within district information systems are limited to what has been deemed important for the operational and accountability needs of schools and the district. These data include attendance, discipline, and basic demographic data. District systems will also contain detailed information about human resources, budgets, and other business processes. Typically, the only outcome data available are the results from centrally administered tests (which are often annual events) and grades. While this data is useful to help frame annual analysis of school-level, classroom-level, or student-level outcomes, it is inadequate for making mid-course or interim instructional decisions within a single grade/marking period.

Second, while the issues involved in successful database decision-making are just beginning to be discussed in the literature on educational administration and assessment, an important and growing body of relevant work is emerging from business schools around the world. These studies range from considerations of the role of experts in organizational learning (Albert & Bradley 1997) to multi-dimensional representations of the lifecycle of knowledge (Boisot 1998). Educational journals tend to be focused on application. For example, *School Administrator* recently published an entire edition (April 2001) dedicated to data-driven decisions. This work addresses systemic reform concerns that help to provide both the technical and information resources necessary to support school-level databased decision-making.

Third, while large-scale efforts to make assessment and accountability data more generally available do provide some insight into the performance of an educational system, there are major differences between the evidence used for external accountability systems and the data needed for making instructional decisions on a quarterly, weekly, or daily basis in the classroom. The large gap between the time horizons of state-level testing and the more immediate needs of program administrators and individual teachers in the classroom means that data needs and rules of evidence will be commensurately divergent.

2. APPROACHES TO UNDERSTANDING DECISION-MAKING AND KNOWLEDGE WORK

There is a growing literature on information seeking, information processing, and information use that provides insights into how individuals and groups identify information needs and then respond (or choose not to respond) to those needs. This work draws on and can be used to frame other

work in the areas of group decision-making, knowledge management, and the human factors of decision support systems.

One recent study of information seeking on the web provides an excellent synopsis of what the authors call an integrated model of human information seeking (Choo et al. 2000) summarizes this model. The important aspects of the model for this paper are intersections between the different behavioural areas – the identification of informational needs, seeking to fulfil those needs, and use of information to address the identified needs. The three points outlined in the introduction can be addressed through this model. I will use a school improvement team attempting to create an improvement plan for math instruction as an example case to illuminate several aspects of this information-seeking model. The anecdotes described in this case are taken from lessons learned from working with school improvement teams and from school improvement planning documents.

2.1 Information needs

First, the identification of information needs is a primary problem in any type of school reform or curriculum improvement. As indicated above, much of the data available from district information systems is limited to data useful to make district level decisions. The granularity¹ and temporal resolution² of the data available severely restrict its usefulness for different user groups. In the case of an effort to understand current performance and how that performance relates to school and district goals, the School Improvement Planning [SIP] team can examine district accountability reports for aggregate data and school-level and individual-level score sheets from math component of the annual standardized math achievement test and compare the results on these metrics to goals set by the school, district, and/or state for their desired or expected performance.

In this situation, the SIP team attempts to frame a problem in terms of a gap between the observed math performance of the students and outcomes targeted by the accountability goals. At this point, the problem has been

¹ Granularity is a term used to describe the level of aggregation of data. For example, attendance data could be listed as follows in increasing finer granularity – days absent this year, days absent this semester, days absent this week, or periods absent this day. The finer the grain size, the more detailed the analysis can be. The tradeoff however, is that the finer the granularity, the more data one must manage.

² Temporal resolution refers to the span of time to which a particular datum or data set refer. Annual test scores have the temporal resolution of one year. Weekly spelling test scores have a temporal resolution of one week. The temporal resolution of a particular type of data makes it more or less useful for measuring the state of or the change within a system over a given span of time.

THE RESULTS OF IMPLEMENTING SIMS IN ENGLISH SECONDARY SCHOOLS

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Abstract: This paper describes an evaluative study of the implementation of the School Information Management System (SIMS) which is used to support management and administration in the majority of English secondary schools. There has been very little large-scale research on the use of computerised school information systems despite the massive growth since the early 1980s. The large-scale survey carried out for this study shows that SIMS use is particularly clerical and the use of SIMS to support school managers is still very limited. Problems identified include the reliability of SIMS, the degree of user training (especially managers), user support if problems occur, and the clarity of the innovation process. Relevant factors relating to the promotion of SIMS use are identified. Users are in general positive on the effects of SIMS use. It is concluded that wider and better SIMS use would be promoted by more carefully designed user training based on a thorough analysis of the needs of user groups.

Key words: School information system, usability, effectiveness, implementation

1. INTRODUCTION

At two previous conferences of Working Group 3.7, the evaluation of the implementation of computerised school information systems (SISs) in Hong Kong and The Netherlands were presented. Here, we will present the results of similar research in England. The rationale for these studies was to fill the gap in our knowledge on this important type of computer use in schools, and, by that, to gain insight into the factors that prove to promote successful SIS-implementation. In England SIMS (School Information Management System) has the largest market share of computerised school administration systems. SIMS is a modular but integrated system in that once entered, data is available between modules. Briefly, SIMS consists of about twenty modules that support the work of clerical staff and school managers and teachers (for details see Wild & Walker 2001).

2. RESEARCH QUESTIONS AND RESEARCH FRAMEWORK

The following questions were addressed:

- The extent of, and ways in which SIMS was used in schools;
- The user opinion on the quality of SIMS;
- The nature and effects of the implementation process, and the characteristics of the schools into which SIMS was introduced;
- Factors affecting the degree of SIMS use.

The variables relating to the above issues that were investigated in this study fell into five distinct categories according to Visscher's model (see Figure 1), i.e., features of SIMS use, the implementation process, school organisation, and the intended/unintended effects. The study assumed possible interrelationships between all these variable groups. System use was expected to be more intense if users' evaluations of the qualities of the SIMS implementation process and the school organisation are more positive. More intense SIMS use was expected to lead to more intended and/or unintended effects. For an overview of the variables included in each block, the reader can refer to page 86 in Visscher et al., 2001.

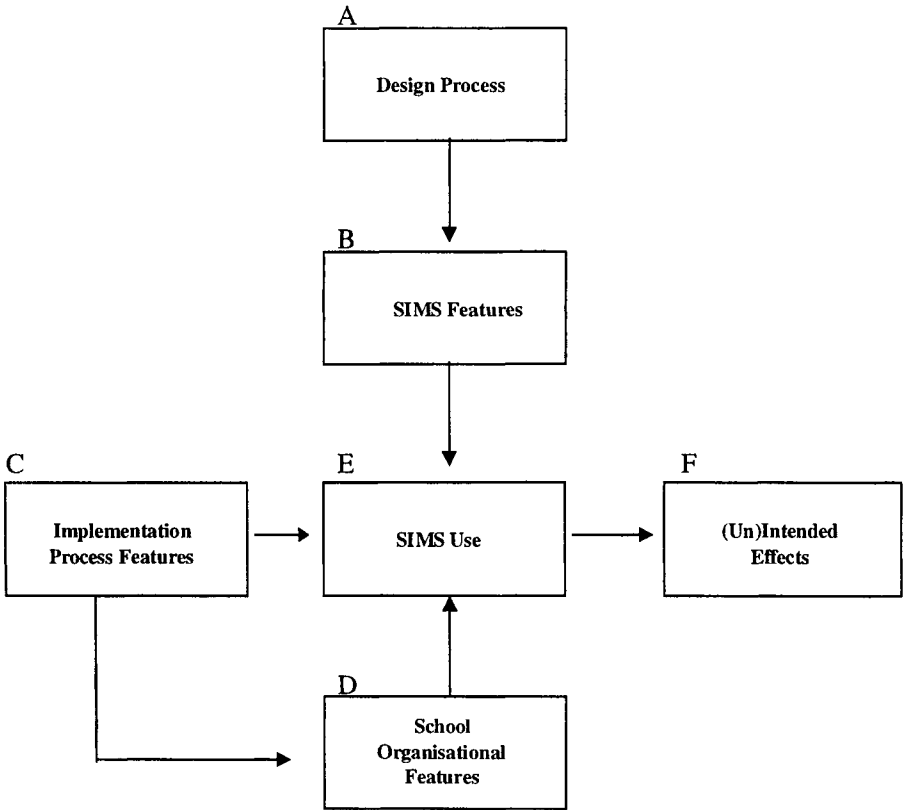


Figure 3-1. The variable groups influencing SIMS use and its effects (Visscher et al. 2001)

3. METHOD AND DATA ANALYSIS

A thousand sets of questionnaires were sent out to a selection of secondary schools in Local Education Authorities (LEAs), in the Midland Counties of England. The LEAs were chosen as they were known to support and promoted the use of SIMS. The schools represented about 25% of secondary schools in England. Each school was sent three questionnaires, which were to be completed separately by the principal, the SIMS system manager and a member of the clerical/administrative staff. The return rate after follow-up activities was 45%.

Data analysis started with descriptive statistics with respect to all variables studied. Furthermore, to investigate to what extent variance in