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Qualitative Case Studies of Innovative Pedagogical Practices Using ICT

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Abstract The Second Instructional Technology in Education Study: Module 2 (SITES M2) is a series of qualitative studies that identify and describe innovative pedagogical practices in 28 participating countries that use technology. The project resulted in 174 case study reports of innovative practice that are currently being analysed. This article describes the goals, research questions, and methodology for this study and provides a context for the other papers that are published in this issue. Given the large number of case studies, we describe a combined qualitative and quantitative approach to the research.

Keywords: Case study; Computer; ICT Use; Instruction; Methodology; Primary; Secondary

Introduction

Countries from Chile to Finland and from Singapore to the United States have all set national goals and policies that identify a significant role for information and communication technologies (ICT) in improving their education systems and reforming their curricula. Major investments have been made to increase the numbers of computers in schools and the networking of classrooms. Most countries, however, have a relatively small number of schools and teachers who are taking the lead in using technology to make changes in pedagogical practices that prepare students for the future. What are these innovative teachers doing, and how are they succeeding in their use of ICT to change the curriculum and what students learn? What school organisational practices, national policies, and other contextual factors are contributing to their success? What can policy-makers and other teachers learn from these innovations?

These are the basic questions addressed by the Second International Technology in Education Study (SITES) Module 2 (M2). SITES M2 is a qualitative study of innovative pedagogical practices that use technology (referred to as IPPUTs). The goals of SITES M2 are:

- To identify and provide rich descriptions for innovative, technology-based pedagogical practices that are considered valuable by each country and that

might be considered for large-scale implementation or adoption by schools in other countries.

- To provide information to national and local policy-makers that they can use to make decisions related to ICT and the role it might play in advancing their country's educational goals and addressing educational needs and problems.
- To provide teachers and other practitioners with new ideas about how they can use ICT to improve classroom practices.
- To add to the body of research knowledge and theory about the contexts and factors within and across countries that contribute to the successful and sustained use of innovative technology-based pedagogical practices.

The International Coordinating Committee (ICC) worked with the International Steering Committee (ISC) and National Research Coordinators (NRCs) from each country to design the study (See the appendix for membership of these groups). The project's first meeting was in October 1999; data were collected in 2001; and during 2002, the cross-national analysis and reporting are being completed. The list of participating countries is shown in Table 1.

Table 1 Countries Participating in SITES M2

Australia	England	Korea	Russian Federation
Canada	Finland	Latvia	Singapore
Chile	France	Lithuania	Slovak Republic
China Hong Kong	Germany	The Netherlands	South Africa
Chinese Taipei	Italy	Norway	Spain Catalonia
Czech Republic	Israel	Philippines	Thailand
Denmark	Japan	Portugal	United States

In each of 28 participating countries, national panels used common selection criteria, modified by national context, to identify innovative classrooms. National research teams used a common set of methods to analyse the pedagogical practices of teachers and learners, the role that ICT played in these practices, and the contextual factors that supported and influenced them. This process resulted in 174 case studies that used a common reporting format. The following articles in this issue report on these activities in several countries. The ICC is currently concluding the international analysis and drawing implications from these studies for both improved policy and classroom practices. This article describes the goals and design of the study, as well as our approach to the international analysis.

SITES is a study in three modules authorised by the International Association for the Evaluation of Educational Achievement (IEA). SITES M2 is a series of qualitative studies that identify and describe innovative pedagogical practices that use technology. M2 builds on Module 1 (M1) and contributes to the subsequent Module 3 (M3) of SITES. Conducted in 1997–99, M1 was a survey of principals and technology coordinators at a sample of schools in 26 countries (Pelgrum & Anderson, 1999). The focus of M1 was on the extent to which schools have adopted and implemented pedagogical practices that are considered important to education in the information society. Scheduled for 2002–2006, M3 will be a school survey and an assessment of teachers and students, focusing on the impact of ICT on the skills and competencies they will need for the information society.

Innovation defined

As stated above, the focus of SITES M2 is on innovative pedagogical practices using technology. The assumption of the study — one borne out by findings from

SITES M1 (¹Pelgrum & Anderson, 1999) and other research — is that new pedagogical practices are emerging in schools. These emerging practices involve changes in what it is that teachers and students do and learn in the classroom. These practices are providing students with skills and competencies that they need as they extend their learning throughout their lives in the information society of the next century. These changes are often supported and enabled by the use of ICT.

In this study, each country identified and investigated classrooms* in which such innovative practices were taking place. The selections of the classrooms were based on the following set of common international criteria, which were modified to accommodate the circumstances and educational differences in each country. To qualify as an IPPUT, a practice must have be one:

- in which technology plays a substantial role,
- that shows evidence of significant changes in roles of teachers and students, the goals of the curriculum, and/or the educational materials or infrastructure,
- that shows evidence of measurable positive student outcomes,
- that is sustainable and transferable.

And finally, IPPUTs are those practices:

- that are innovative, as locally defined.

‘Innovative’ is a difficult concept to specify and operationalise. The notion of ‘newness’ associated with the term demands that a study of innovation be open to the unanticipated. Consequently, we did not want to over-specify the definition. Furthermore, innovation is often dependent on the cultural and historical context within which it is observed; what is innovative in one country may not be in another. Nonetheless, because this was an international comparative study, it was important to provide a common frame of reference for this term. For this study, the frame of reference that we used to define ‘innovation’ was practices that prepared students for lifelong learning in the information society. Practices from the theoretical literature were suggested as examples of such practices; those that:

- promote active and independent learning in which students take responsibility for their own learning, set their own learning goals, create their own learning activities, and/or assess their own progress and/or the progress of other students.
- provide students with competencies and technological skills that allow them to search for, organise, and analyse information, and communicate and express their ideas in a variety of media forms.
- engage students in collaborative, project-based learning in which students work with others on complex, extended, real-world-like problems or projects.
- provide students with individualised instruction, customised to meet the needs of students with different entry levels, interests, or conceptual difficulties.
- address issues of equity for students of different genders or ethnic or social groups and/or provide access to instruction or information for students who would not have access otherwise because of geographic or socio-economic reasons.
- ‘break down the walls’ of the classroom—for example, by extending the school day, changing the organisation of the class, or involving other people (such as parents, scientists, or business professionals) in the education process.

* The focus was on educational settings within a school context in which learners interacted with teachers. These were typically classrooms but the definition did not preclude other instructional arrangements. Thus, the term ‘classroom’ is used in the broader sense of such settings.

- Improve social cohesiveness and understanding by having students interact with groups and cultures that they would not interact with otherwise.

This definition and these examples are considered to be a common starting point for all countries. A process was specified by which each country reviewed and modified this definition — in collaboration with the ICC — to accommodate country-specific educational goals, concerns and cultural differences.

Methodological approach of SITES M2

A mixed qualitative-quantitative model was used for SITES M2. Mixed methods can be used together to capture the richness, complexity, and interdependence of events, actions, and conditions in the real classroom (Tashakkori & Teddlie, 1998). National research teams collected both qualitative and quantitative data and the ICC used both quantitative and qualitative analytic methods. Given the large number of cases generated by SITES M2, quantitative analyses was used to identify major trends from the 174 case reports that were collected; these trends were then pursued in the detailed, cross-case analysis.

But at its core, SITES M2 remained a qualitative study. The primary focus of the SITES M2 in the 28 participating countries was on the case studies of innovative pedagogical practices using technology. The unique challenge of SITES M2 was to take a methodology (i.e. case study) normally associated with a single researcher in an intimate field setting and appropriately scale it to the requirements of international comparative research, where a large amount of data is collected, and research must accommodate the constraints of many teams and countries, a diversity of social and cultural contexts, and a range of policy needs.

The approach to case study is what Stake (1995) calls an *instrumental* approach. In instrumental case studies, the focus of the analysis is on underlying issues, relationships, and causes that may generalise beyond the case. With this type of case study, the focus is not on the uniqueness of a special case but on what can be taken away from it and cases are selected for this purpose. Analysis of instrumental case studies goes beyond the specific case to examine an underlying issue or research question. Consequently, the methodology emphasises the categorisation and aggregation of data, rather than the complexities of the specific case. In SITES M2, while cases were selected for their ‘innovativeness’, the focus is not on the uniqueness of these cases but on what can be learned from them about how technology is being used to support educational change.

Case selection

In SITES M2, the cases were not meant to represent ‘typical’ classroom practices but those that were innovative. In this regard, the selected cases were to represent the aspirations of each country, rather than represent what was going on in a typical classroom. That is, the goal was to identify the kinds of ICT-enabled practices that each country valued and wanted to hold up to others in their country and to the world. Consequently, it was important that the selection process was credible and the selected cases were highly compelling.

To meet this need, the ICC worked with the NRCs to specify a set of criteria and a standard procedure by which each country identified a set of cases most worthy of examination. Countries could submit up to 4 cases for each grade level: primary,

lower secondary, and upper secondary. Although more cases could be selected in each country, a limit of 12 cases could be submitted for inclusion in the international study.

Following the standard procedure, the NRC in each country established an expert panel to review and select the cases for study. The panel consisted of a range of stakeholders that included policy-makers, teachers, administrators, technology experts, and researchers. The expert panel started with the international criteria specified above and, in coordination with the ICC, provided a local definition for innovation and made other modifications that accommodated the needs and situations of that country, if such modifications were deemed necessary.

The NRCs and their national panels engaged in a three-step process to select the cases for study in their countries. First, they used a variety of sources to build an inventory of potential IPPUTs. These sources included SITES M1 data, national awards programs, practitioner journals, web sites, and personal knowledge of panel members. Second, the NRCs collected additional information on potential cases that could be used to make the final determination. Finally on the basis of this information, the panel selected the cases for study and inclusion in the international study.

Data collection and case write up

Case studies of selected classrooms were conducted by national research teams, using a common set of data collection instruments and analysis protocols. Research teams spent one week or more at each site. Sources of data included:

- surveys (including M1 indicators) and interviews of administrators, teachers, and students, and, where relevant, parents and other community members.
- archival or historical data, such as project proposals, progress reports, or annual reports.
- programme materials, such as teacher lesson plans, instructional materials, curriculum guides, software, reports, assessment instruments, etc.
- students' products, such as reports, projects, tests, and student-generated websites, as well as teachers' analyses of these.
- classroom observations that described teacher and student activities, teacher-student and student-student interactions, seating arrangements, computer placement and resource allocation, etc.

Classroom observations were made of at least four class sessions over two visits to each school. It was intended that data collection would extend over a set of sessions that constitute at least one extended curricular unit or project.

The project case report guidelines described a two-step process for writing up the reports. With the first step, researchers used a data matrix format, mapped onto the conceptual framework, to reduce and organise the data collected with the various instruments. The data matrix was organised around the research questions and the project's conceptual framework. The second step involved converting the matrix to a case narrative. The narrative report template followed a standard, highly structured format, again based on the conceptual framework. This template included sections on various contextual factors and focused on classroom-level factors, related to curriculum content and goals, teacher and student practices and outcomes, the ways ICT was used and problems encountered, and sustainability and transferability of the innovation. The result was a 10-page narrative for each case, a

glossary that defined special terms, and the portion of the data matrix pertaining to classroom practice. Again, all of these documents were presented in English. In total, more than 200 documents related to 174 cases were submitted to the ICC for the international analysis.

Quality monitoring plan

The ICC monitored the quality of the research as it was conducted in participating countries. Five activities were planned to assure quality throughout the project. The NRCs:

- coordinated with the ICC on the composition of the expert panel and on the review and modification of the international criteria for case selection;
- coordinated with the ICC on the selection of cases for study;
- promoted the ICC held workshops on both data collection and data analysis;
- conducted pilot tests in which they tried out data collection and analysis techniques and reported on these to the ICC;
- exchanged their first case write up with both an ICC member and a critical NRC friend as a way of getting feedback on the format and contents of the case report.

OECD cooperation

The Organisation for Economic Cooperation and Development (OECD) also conducted a set of case studies in ICT. The OECD study focused on the effects of ICT on school culture and organisation, whereas the IEA study focuses on its effects on classroom practices. The two focuses on school culture and classroom practice are both important individually and, together, they provide a complementary set. Their complementary relationship presents the possibility of a more powerful impact of the studies when countries participate in both and when the studies are coordinated. The SITES M2 ICC cooperated with the OECD research group to coordinate the two studies, minimise conflicts, and maximise the potential payoffs of these two studies when they were conducted in the same country. Thirteen countries participated in both studies.

Analysis methodology

The goal of the analysis of the cases was to understand innovative pedagogical practices using technology, how these innovations changed what it is that teachers and students do, the roles ICT plays in supporting them, how these innovations are associated with various outcomes and contextual conditions. The mixed model is both necessitated by and takes advantage of the fact that there were 174 case studies to analyse.

In the first step of the analysis, the ICC devised a coding sheet to characterise the cases. The coding sheet consisted of a 27-item scheme derived from the research questions and conceptual framework. We also created a set of guidelines that elaborated on the meaning of the codes. The coding sheet characterized cases along variables such as grade level, subject area, type of curricular change involved, teacher classroom activities reported, student classroom activities reported, type of technology used, reported impact, etc. Each of the 174 cases was read by a member of the ICC and coded using the coding scheme. A particular coding was based on the statements made in the case reports that were backed by data. These data were

often comments made by administrators, teachers, or students or observations made by the researchers and these were cited in the case reports. The ICC coding of the cases was conservative. If statements were not sufficiently backed, ICC members asked the NRCs clarification questions or requested additional data from them to support the statements. The coding guidelines were shared with the NRCs, along with the codes and questions for each case. The NRCs reviewed the codes for each case and responded to the questions. On occasion, the ICC made changes in the codes based on the comments of the NRCs. On occasion, this interaction resulted in the NRCs appending or augmenting the case reports to include additional detail or warrants for claims that they made.

The second step of the analysis was more quantitative. The ICC used appropriate statistical techniques to analyse the data from the coding sheets. Here specific trends and patterns across cases were identified. The specifics of these analyses varied, depending on the research questions addressed and they are described in detail in the subsequent chapters.

This analysis resulted in a third step, again drawing on qualitative methods. Subsets of cases were selected that corresponded to the trends and patterns identified in the quantitative analysis. Specific portions of these cases were coded using *ATLAS ti*, a qualitative analysis software package. The scheme used to code the passages of the cases was again based on the research questions and conceptual framework. The codes were parallel to but much more detailed than those used to code the cases during the first step of our analytic approach. ICC members practised using *ATLAS ti* and the coding scheme on a common set of cases. We met to review our codes and coordinate our coding practices. We divided the different research questions among members of our group and divided up the detailed coding effort accordingly. While we all started with a common set of codes, each ICC member created additional detailed codes, as necessary, corresponding to the research question being addressed. These more-detailed codings were subsequently analysed by each ICC member using qualitative methods, such as the constant comparative method, Boolean analysis, and network analysis (⁴Ragin, 1987; ⁶Strauss & Corbin, 1990; ⁵Miles & Huberman, 1994; ⁷Creswell, 1998) that are supported by the software tools in *ATLAS ti*. The analytic approach varied for each research question and each is described in subsequent chapters.

When the results of the analysis are complete, it should be possible to identify and describe patterns innovative teacher and student practices and roles in the classrooms that were studied. Also, new curricular goals and outcomes associated with these practices should be identifiable and how these practices may have changed the structure and organisation of the physical classroom and the school day. A central focus of the analysis will be to describe the kinds of technologies used by teachers and students and the extent to which these technologies contributed to changes in practices, roles, curriculum, outcomes, and classroom organisation. Contextual factors associated with these changes, factors relating to the classroom, school, and society more generally, will be identified and, finally, implications of the findings for classroom practice and national policy will be suggested.

Reporting and dissemination

The following reports will be issued by the SITES M2 ICC:

- a final report on the findings from the analyses.

8 R.B. Kozma & R.E. Anderson

- a website or CD-ROM containing case summaries and selected case reports.
- customised versions of the final report oriented to practitioners and policy makers.

The project website <www.sitesm2.org> provides current information on the status of the project.

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Appendix

SITES M2 International Coordinating Committee (ICC)

USA: Robert Kozma (Study Director) & Ray McGhee

Canada: Ron Owston & Rick Jones

The Netherlands: Hans Pelgrum & Joke Voogt

SITES M2 International Steering Committee (ISC)

USA: Ronald Anderson (Co-Chair) & Chris Dede

The Netherlands: Tjeerd Plomp (Co-Chair)

China Hong Kong: Nancy Law

Norway: Jan Peter Stromsheim

Japan: Ryo Watanabe

SITES M2 National Research Coordinators (NRCs)

Australia: John Ainley

Canada: Douglas Hodgkinson

Chile: Enrique Hinostroza & Andrea Guzman

China, Hong Kong: Nancy Law

Chinese Taipei: Cheng-Chih Wu & Guey-Fa Chiou

Czech Republic: Borivoj Brdicka

Denmark: Inge Bryderup

England: Sue Harris

Finland: Marja Kankaanranta & Päivi Häkkinen

France: Catherine Regnier

Germany: Renate Schulz-Zander

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Italy: Renata Picco & Roberto Melchiori

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Korea: Myoungsook Kim & Hyunsoo Seol

Latvia: Andris Grinfelds

Lithuania: Lina Markauskaite

Netherlands: Gerard Doornekamp

Norway: Ola Erstad

Philippines: Ester B. Ogena & Filma G. Brawner

Portugal: Gertrudes Amaro & Helena Henriques

Russia: Alexander Lesnevsky

Singapore: Teo Khee Shoon, Wee Haur Pek, Yoke Chun Tham

Slovakia: Viera Blahová

South Africa: Sarah Howie & Andrew Paterson

Spain, Catalonia: Carme Amoros Baste

Thailand: Pornpun Waitayangkoon &

USA: Ronald Anderson & Sara Dexter

