CRIPT Research Abstracts

Research abstracts from the fifth International Primary Design and Technology Conference – Excellence Through Enjoyment, hosted by CRIPT: Centre for Research in Primary Technology. Further details of the conference, of courses, research opportunities and in-service work provided by CRIPT can be obtained from Professor Clare Benson, clare.benson@uce.ac.uk

What Does an Enrichment Programme Reveal about the Nature of Gifted and Talented Behaviour in Primary School Design and Technology?

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A design and technology enrichment programme is proposed as a way to aid teacher nominations in the early identification of student giftedness. A study, initiated by the Wandsworth LEA and carried out by a Brunel University research team, is used to show the way that enrichment programmes, that take place over a period of time, of the sort designed by the Nuffield Design & Technology Project, may be able to facilitate the identification of giftedness. Accordingly, the performance and behaviour of children (and their teachers) inside three primary classrooms are tracked over the span of two-day tasks, and conclusions are made concerning the possibilities of using appropriate enrichment tasks as indicators of, and a means of, nurturing giftedness.

Never Keep Ideas in Your Head: Elementary Pupils' Views of Portfolios in Technology Education

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The study described here investigated elementary pupils' experiences when using design portfolios and the role the portfolio played in their technology education. The research builds on previous work that investigated the use of design portfolios by professional designers, teacher educators and teachers working in England and Canada.

Focus group interviews were held in England with three groups of Year 6 pupils. Questions asked of participants focused on definitions and the advantages and disadvantages of using a portfolio, as well as pupils' understanding of the purposes of a portfolio. Audiotapes of the interviews were transcribed verbatim. Analysis of the data involved thematic analysis and concept analysis.

Analysis of the data has revealed that Year 6 pupils (a) regard the primary purpose of the portfolio as a way to remember ideas, (b) enjoy using portfolios, but (c) are uncertain about the uses of the portfolio. The paper will end by raising questions about the use of portfolios in elementary design and technology education.

Developing Designerly Thinking in the Foundation Stage - Perceived impact on Teachers' Practice and Children's Learning

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During 2003-4, the Department for Education and Skills (DfES) funded a large scale project relating to the development of practice of Foundation Stage (3-5 years) teachers in design and technology. Twenty tutors and four hundred teachers were involved in the project in Local Education Authorities (LEA) throughout England. Within the Foundation Stage, children undertake design and technology activity, but it is not a separate subject; it is integrated into the six areas of learning-the Early Learning Goals – that form the framework for the Foundation Stage curriculum. Research has shown that few experiences are offered to young children relating to the designed and made world, and in particular the design element is neglected. This action research project was therefore based around this 'gap'; a programme was devised related to the designed and made world; and this paper seeks to discuss some of the findings relating to impact on both teachers and children.

A Case Study Relating to Food Containers with four-year-olds in an Infant School in France

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Activities involving the study and production of objects appear on the curriculum for each cycle of a primary school in France. The curriculum does not specify the type of technological object to be studied, or the technological functions to be dealt with, the materials to be manipulated or the techniques to be used, any more than the concepts to be formed. It is left to the teachers to exercise their discretion and make the choice. They look at the complexity of technological objects to be studied and vary the way in which knowledge is passed on by varying the way in which study is organised from one cycle to another. These choices are of interest to teaching and training professionals.

The purpose of this study is to present a sequence devoted to studying containers and packaging of foodstuffs in France during the first cycle of primary school with 4-year-old pupils.

Arguing for the Development of Technological Literacy

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There is more than ever before a growing need to understand the "character of contemporary life" (Borgman, 1984). We are transforming our world at an alarming rate and in so doing we are alienating ourselves from it. Our technologically mediated existence is threatening the very democratic process itself. We need to develop a new language, a new literacy in order to both understand our brave new world, and learn how to live a meaningful existence in it. Where better to start this new literacy than in technology education.

In this paper I will present an argument as to why we need to develop a technological literacy in technology education at school level. More questions will be raised than answers given; I do not have all the answers. I just hope to awaken the debate.

Supporting Trainee Primary Teachers' Understanding of Teaching for Creativity

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This paper will report on findings from the 'Creative Teachers for Creative Learners' Project (2003-5) funded by a Research and Development Award from the Teacher Training Agency. Trainee's understandings of teaching for creativity in D&T and other areas of the primary curriculum have been elicited through a variety of instruments, including reflections upon classroom observation and 'draw a creative person' exercises. To address some of the perceived needs arising from this preliminary research, the authors have collected digital video clips of classroom practice in a variety of primary schools, which have been collated into 'The Creative Primary School' CD-ROM, a resource to support primary trainees. This resource has been trialled in the participating institutions, partly through use of virtual learning environment discussion boards. The CD-ROM resource, together with findings from the pilot studies, will be presented.

'Creative Friends' in a Collaborative Project: Playing with Sounds

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Typically, children's design projects are planned with outcomes for a single age group in mind. Learning outcomes are identified in advance, and this has become an orthodoxy in the UK, reinforced by the expectations of the inspectoral regime which few teachers feel able to challenge.

Recent initiatives suggest that more powerful learning may be achieved by working with children's ideas in ways that respect the creative imaginations of childhood (DfES 2003). Children in the later years are sometimes set tasks that involve designing for younger children, but rarely work with younger children on collaborative ventures. The project reported here takes the form of a collaborative enterprise between children in the Reception class and pupils from the top of Key Stage 2, to realise the younger children's design ideas, with the older children acting as 'creative friends' (Best & Craft: 2004). The project uses techniques based on an understanding of the Reggio Emilia project-based approach (Edwards, Gandini & Forman: 1993; Forman: 1996; Abbott & Nutbrown: 2001) which, rather than planning outcomes in detail in advance, seeks to 'make learning visible' when projects stem from children's ideas. Reflections by children from both year groups on their personal learning through the project form the data set from which some conclusions about D&T activity can be drawn.

Teacher Change in Response to Student Learning in Technology

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Making judgments about student learning during ongoing technological activity in primary school classrooms has proven to be a difficult task for teachers. Hence, it is essential that teachers understand clearly the nature of learning that occurs as students engage in technology activity so that teachers can devise effective assessment processes thus ensuring high quality learning outcomes for students. Using an interpretive research methodology, the researchers investigated teachers' implementation of technology units of work in three different classroom and school contexts. Data sources included interviews, classroom observations, field notes, and analysis of artefacts such as written teaching plans. The findings indicate that changes were evident in teachers' pedagogical approaches as they became more cognisant of student learning. The implications of these findings for the professional development of teachers are analysed and reported in the paper.

Necessity is the Mother of Invention: The Unforeseen Benefits of Large Class Sizes, Limited Resources and Teachers with Insecure Knowledge Surety

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This paper focuses on Technology Education projects on vehicles by third year pupils (aged 8 years) in England and South Africa where the broad understanding of Technology Education is shared. One might therefore have expected similar experiences and outcomes. However in reality the pupil experiences were quite different as were the ranges of pupils' cognitive developments.

I will show the differences (and similarities) in pupil experiences, attempt to explain the reasons for these and the consequences.

Excellence and Enjoyment, Compliance and Creativity – Can We Really Have It All?

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Many teachers and pupils today are beginning to question current primary educational practice (Ogunleye, 2003, Wragg, 2003). They find themselves compliant to an overcrowded curriculum model based on content rather than pedagogy. Those who recognise that engagement and enjoyment is key to learning complain of frustration with a lack of opportunity to address teaching and learning more creatively (MacGilchrist, 2003, Hofkins, 2003). For those committed to broadening educational opportunities for all children so they can participate in the 21st century, is it not time to reconsider the current curriculum model that appears to be failing so many?

This paper reports on selected results of case study collaborative action research in the primary curriculum. It focuses on the

implementation, in a class of Year Six pupils, of a cross-curricula project-based model where design and technology provided the integrative focus. This model sought to overcome a pedagogical dichotomy between compliance and creativity, raised by the Headteacher and recognised in the literature. The research addressed two important questions:

- Was it feasible, in a climate under immense pressure to focus on standards and measurement in the core subjects, to provide a broad and balanced primary curriculum model that embraced rather than marginalised the arts?
- Would such an alternative model allow teachers to explore more creative learning and teaching methods and encourage greater levels of engagement on behalf of the pupils?

The paper highlights the wider context surrounding the current primary curriculum debate. It presents selected findings which provide evidence to suggest that through the application of a process-led pedagogy it is possible to address compliance with National Strategies and the National Curriculum whilst at the same time enhance the creative potential of learning and teaching.

Research on "Community Art Map" Curriculum and Creative Teaching at Primary School

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The creativity of elementary school students mostly comes from learning. Both curricula and extracurricular courses can inspire their potential and develop the coordination of their sensory abilities. Those courses can also cultivate the students' adaptation to a new environment and further arouse their curiosity and learning desire. Teachers can also encourage students to explore questions and solve them themselves, which is also a kind of creativity. The purpose of the nine-year compulsory curriculum for junior high school and elementary school declared by the Ministry of Education in Taiwan and implemented from the year 2000 has also set a goal to cultivate students with abilities of active exploration and research and of independent thinking and question solving.

There are many historical sites and temples which are both historical and artistic in different communities in Taiwan. Children growing up in these communities should have special connections to the landscapes in which they live. Every landscape and picture serves different purposes, and every child should also have their landscapes and pictures in their minds. The purposes of the research are as follows: 1) To develop creative thinking in art instruction patterns and curricula; and 2) To explore teachers' processes of creative thinking in art instruction and their reflection of this.

A Study of the Acquisition of Technical Competence using Girl-Friendly Science Instruction in Primary School

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In a school project carried out in Lower Saxony, Germany, called "social integration in a primary school appropriate for boys and girls", a practical experiment of girl-friendly social studies and science instruction was tested for three years alongside other interventions. This social studies and science instruction is based on the didactic principles developed in a local and ecological elementary social studies and science workshop called RÖSA (www.roesa.de) and the concept presentation (www.lesa21.de). This concept has already been tested for several years at the University of Oldenburg, Germany, and in the elementary social studies and science workshop RÖSA. The main focus of this concept of social studies and science instruction is concerned with specific, self-developed working materials to achieve exploration and , problem focussed learning for children. The paper will outline the methodology used, the key findings and some implications for practice.

Achieving Excellence in Teaching Through Practitioner Research, using Design and Technology Education Processes

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What is practitioner research, how does it work, why is it important and how can design and technology processes inform practitioner research? These questions centre on gaining understanding of one's own teaching practice in order to improve upon it. This paper aims to examine the role of practitioner research in teacher professional development and suggests a methodology to facilitate this process. In order to maximize effective teaching and learning, critical and reflective investigation in one's own teaching may result in improved practice, because by using systematic and well-organised ways, appropriate methodologies that facilitate investigation of own practice can be developed and shared as a means of transforming teacher learning. The concepts discussed in this paper focus on introducing practitioner research to those teachers who are not familiar with the concepts of practitioner research and it introduces research to those who are perhaps new to the profession. There are many reasons for participating in practitioner research and there are numerous factors that shape and define practitioner research. I hope to this paper, and the simple structure that I propose, will initiate ongoing enquiry into own teaching practices so that a critical, reflective mindset develops that can be used as a basis for further professional development.

Pupils' Views of Writing Tasks in Design and Technology: Purposeful Activity or Just More Paperwork?

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Tasks which involve children in writing, often combined with drawing, have become an established part of design and technology practice in England at Key Stage 2 (pupils aged 7-11). These serve a variety of purposes from the teacher's perspective. However, what meaning do pupils make of them? Do they view them as purposeful and integral elements of their design and technology experience or do they regard them as unwelcome intrusions into the enjoyable business of designing and making?

There has been a significant increase in the level of interest in pupil perspectives in both school improvement and education research over the last decade. This paper draws upon this recent work in order to make public the very particular insights that children can offer to help us increase our understanding of the complexities of teaching and learning in design and technology.

This paper is based on an analysis of interviews with 35 pairs of children aged 9-11, from mixed age classes in three rural schools. This data was gathered as part of a larger collaborative action-research project.

A Rationale for the Inclusion of Design and Technology in Technical Teacher Education Programmes in Zimbabwe

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Zimbabwe as a country is very much aware of the importance of a practical and technological biased education: an education that is relevant to industry and commerce and to the development of technology as a whole. It has a coherent system of producing architects, graphic artists, illustrators, environmentalists, engineers, including the industry and product related disciplines that produce textiles and furniture as evidenced by the number of universities, polytechnics, and technical colleges, which offer science and technology subjects. Zimbabwe also encourages creativity and innovativeness by providing favourable environments for scientists and engineers. This is evidenced by the establishment of the Harare Institute of Science and Technology, and the Scientific and Industrial Research and Development Centre, both of which are aimed at providing a favourable environment for scientists and engineers to develop new technological ideas.

What Zimbabwe does not have is the contemporary system of technical teacher education that would provide teachers with the means to deepen and widen their knowledge and understanding in issues of design and technology. Drawing on research, this paper seeks to provide a rationale for the inclusion of the subject for teachers, in order that students can study a subject that will prepare them for the world of work, tomorrow.

Teachers' Perceptions of the Purpose and Practice of Design and Technology Education

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The teaching of design and evaluation remains weaker overall than the teaching of making. (Ofsted, 2004)

This research project focused on teachers' perceptions of the purpose and practice of design and technology education. In doing so it addresses the question: what is it that teachers value in design and technological activity? Is it just the making activities or are other aspects considered?

The Technology Fair as Mean for Promoting Primary Education Students' Problem Solving Skills and Interest in Science and Technology

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There are many ways in which university education can help undergraduates primary education students become better problem-solver. This paper presents the idea of using the Technology Fair as a means for promoting students' problem solving skills. Specifically, we reflect upon the results of study carried out in Autumn 2004. The sample of the research consisted of 85 undergraduate students of the Department of Educational Sciences enrolled in a compulsory course on Design and Technology at the University of Cyprus. The purpose of the study was to investigate the influence of a procedure of working with primary school children to complete and present a Technology Fair project, on the problem solving skills of undergraduate students. Pre-tests and post-tests were administered to undergraduate students before and after the preparation of the Technology Fair, respectively. A number of students was selected and interviewed after the completion of the technology fair. Data also collected from reflective diaries kept by the students during the preparation of the technology fair. The analysis of the results indicates that the Technology Fair contributes to the development of positive values and attitudes in science and technology education and has a significant influence on improving students' understanding and application of problem solving and decision making strategies within the domain of technology.

SUNSTEP Moving into a New Dimension of Knowledge Through Enjoyment

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The South African Education Department presently experiences a phase of major change, which affects all role players. SUNSTEP (Stellenbosch University Schools Technology and Electronics Programme) seeks to assist teachers in blending the Revised National Curriculum Statement (RNCS) with good Technology classroom practice. Until the RNCS was in place, SUNSTEP was an awareness programme, introducing electronics into schools and exposing children to basic electronic ideas. Since the roll out of the RNCS, many teachers struggle to unpack the RNCS policy and come up with good classroom practice. Providing teachers with electronic kits and a worksheet for Technology: Systems and Control, is no longer sufficient, as they do not know how to do the assessment or apply the content and information innovatively. SUNSTEP compiled a learning programme for Grade 7 teachers to demonstrate how they can fully adhere to the curriculum and teach their (12/13 year old) learners about basic electrical circuits, in series and parallel, and to become problem solvers who demonstrate knowledge and understanding of the concepts.

Junior Aged Children as Reflective Practitioners

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This paper focuses on the extent to which children are provided with sufficient opportunities to take responsibility for achieving 'optimised design solutions', through

reasoned decision making, when working as a group, and how this position can be supported or hindered by related elements of teachers' classroom practice and or group dynamics.

The discussion is based on my Ed.D work, completed in early 2004, which concluded that the development of young children as reflective practitioners, related to an effective interplay between teachers use of metacognitive questioning, clear task structuring and the management of well organised collaborative endeavour, was generally not well supported in the junior classrooms observed. Moreover, even when these key elements of effective classroom practice were appropriately employed other factors (see Cognitive Dissonance below) impact upon the ability of pupils to reach a shared and suitably justified/agreed understanding of how to make proficient progress, together.

Creative Problem Solving in Technology Education a Juggling Act

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From 2003 a set of technology education exemplars and a matrix were made available to New Zealand schools. These exemplars are part of an assessment strategy announced by the Minister of Education in August 2000. One component of the matrix describes a characteristic of technological literacy as 'Being Innovative, Creative, and a Risk Taker.'

This paper will highlight the results of a pilot study looking at a framework which was design to support creative problem solving in primary classrooms. A year two class are introduced to the framework using the Krusty the clown character from the popular culture programme – The Simpsons. This framework called JUGGLE was designed to develop the characteristic highlighted above.

The paper highlights these key factors;

- Using popular culture to engage children in technology education.
- Teaching children to problem solve creatively.
- Developing frameworks to support creativity in technology education.

The Laptop Advantage: Trialling the use of Laptops in Primary Technology Teacher Education

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In Semester 2 (August – November), 2004, a class of 50 primary teacher trainees who were studying their compulsory technology education unit, were selected to be part of a laptop trial project. The students were presented with a laptop computer for them to use throughout the semester, and data was collected at different times in a variety of ways to enable judgements to be made about the efficacy of their use. The primary research question was: How has the use of a laptop computer enhanced learning? Qualitative and quantitative data were collected through the following means:

- Skills Audit: a pre and post test skills audit was conducted with the laptop (research) group and with the control group (other students doing the same unit without laptops).
- Grades: research and control groups final grades and assignment grades were compared.
- E-portfolio: all students develop an electronic portfolio as part of their unit requirements, in which they were encouraged to reflect about their computer use.
- Discussion Board: the unit was supported by an on-line discussion board.
- Survey instrument: all students completed a research survey instrument.

This presentation will discuss the findings from this project.

EdaDe – Education Through Design – Theory Closer to Practice

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This paper presents the first EdaDe workshop experienced in Florianopolis City (Brazil), in November 2003. Among the objectives of this workshop was to experiment, and later to evaluate with teachers of the earlier series of school, the EdaDe (Education through Design) proposition applied to the Brazilian case. The workshop was offered in the Visual Expression Department, campus of the Federal University of Santa Catarina. The procedures adopted and some results obtained in this workshop are shown.

The Impact of Home Languages on the Teaching of Design and Technology in Schools in England

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Over the last twenty years there has been a marked increase in immigration from outside the European Union, as well as some internal movement between borders. Children from countries as diverse as India, Albania and Saudi Arabia have arrived with their parents to be educated in British schools. The progress of these children has been affected by their ability to understand the English language. Often the child has to decode the teacher's language before they can begin to complete the required task. These children are perceived to be of low ability, and yet they are often bilingual or trilingual, but need to come to terms with a new culture and language. The language spoken at home is known as the home (or heritage) language as a means of separating it from the language taught at school.

There is anecdotal evidence to suggest that children who are not fluent in English, do have lower attainment in schools. The aim of this project was to assess the validity of this belief in the subject of design & technology, in one school with one year group.

A Laptop for Each Pupil: An Analysis of Technology Education Teacher Activity

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This communication proposes an analysis in education technology teaching in France for 13 years old. Laptops are entrusted to each pupil and to each teacher personally. This equipment policy from the local administration (lending computers to pupils) is imposing on the principal actors of the education system without teaching accompaniment or teacher training. This situation gives to the teachers' freedom and offers to them the possibility to use or not to use laptops. It shows, for those which make the decision to integrate into this use their work the problem that arise. The analysis of the first use in the classroom by a technology teacher is used as field of practice observation. The modifications of the teacher's work and what on the contrary is not modified consolidates what the preceding studies as regards education sciences show concerning the role of the teacher.

Using Artefacts and their Stories to Develop Design and Technology Capability

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This paper describes a collaborative project, funded by the World Wide Fund 'Partners in Change', through which student teachers explore the use of artefacts and their stories to stimulate design and technology activities. The aim of this project was to increase the skills of student teachers in the use of artefacts with a global dimension. In addition, an aim was to take the college based work into the classroom to increase the quality and effectiveness of the use of artefacts in design and technology education and to incorporate a global dimension into the student's planning and delivery. Projects with children, carried out during the students' school experience placements were monitored to attempt to

assess the impact the use of the artefacts might have on the students' planning and teaching as well as reflections in the assessed portfolio.

Investigating the Value of Technology as a Catalyst in Developing Creative Thinking Skills in Young Learners

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The paper outlines the background to the research into creativity in the primary phase within design and technology, currently being undertaken. It focuses on the model of creativity that is being used, the methodology for data collection, the way in which the pilot has been undertaken, and some analysis of the findings to date.

Technological Development and Development of Technology Education

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On a national and international level, technology education is considered to be part of general education. This paper highlights causes and effects, and presents the concepts that are available today for teaching technical subjects. Also discussed is a comprehensive, open approach that covers the essential invariant characteristics of technology education.

Technological change has become an increasingly dynamic and complex process. As a result, a fresh look has to be taken at technology education, which is one of the major aspects of this paper. Only if technology education adequately considers the invariants of technology as well as up-to-date standards of science and technology, can students be enabled to solve technical problems that are of immediate relevance for life.

On Strategy to Activate Children's Creativity with the Examination of Inventor Process of Invention

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Citizens' creativity is deemed to be the crux of elevating a nation's competitiveness. The development of a nation would be stagnated and will eventually be eliminated without creativity. Take the recent education reform policy of Australia for instance. Among the seven "key competencies", the capability of problem solving and employing creativity has been included. Likewise, the developmental programme for the Knowledge Economy has also clearly proposed elevating competitiveness through the cultivation of people's creativity (Council for Economic Planning and Development, 2000). Indeed, the nurturing of creativity should begin with children from a young age. The Grade 1-9 Curriculum Guidelines issued by the Ministry of Education in 2000 has distinctly stated the aspiration of cultivating students' ability to explore and research actively, which echoes the Australian education policy. Facing the era of multiple development of knowledge economies, the elevation of children's creativity in the future has currently become the new focus of educational policy internationally. This paper will seek to suggest possible strategies that are appropriate for Taiwan, linked to educational research in this field.

Technology Education: Pain or Pleasure?

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S. Africa introduced the subject Technology education into its curriculum in 1998. As with any change to the curriculum, there were many issues that arose about the philosophy for its inclusion, how it would be implement, how teachers would come to an understanding of the subject and how schools would be appropriately resources. Looking back, in retrospect we can ask ourselves just how 'painfully or painlessly' the introduction of a new curriculum was implemented.