

Harnessing Authentic Learning and Multimedia to Enhance Teaching and Learning

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Introduction

The role of Information and Communication Technologies (ICT) in education has attracted considerable debate revolving around its theoretical basis, actual implementation and the nature of multimedia resources. Reports into the impact of ICT come to a similar conclusion across Great Britain, that it has not transformed teaching and learning in ways claimed by its early advocates (Dryden, 1994; Landow, 1992) and appear to support Dillon and Gabbard's (1998) contention that many such claims were unfounded. Her Majesty's Inspectorate of Education in Scotland (2007) reported that 'while much progress has been made in recent years in the impact that ICT has had on learning and teaching, excellence exists only in isolated pockets' with this failure having a 'detrimental impact on the learning experience of large numbers of children and young people'. Munro and Condie's review of ICT in schools (2007) discovered uneven progress 'across and within schools and technologies'. This opens an increasingly wide gap between the ways students' learn in and outside of school' with education, it is claimed, failing to engage with 'digital natives'. (Prensky, 2001)

This paper discusses the impact on teaching and learning of a multimedia CD ROM supporting student investigations into Victorian attitudes and policies towards poverty as illustrated in Barnhill Poorhouse, the largest institution of its type in Scotland. The evaluation of this CD ROM contributes to the more general debate over ICT in education and concludes that technology must support sound pedagogy, especially one built around the development of historical knowledge, understanding, and an enquiry methodology within an authentic framework. *Barnhill* is one of seven multimedia resources which we have produced and while the context relates to Scottish History the overall themes and learning tasks find parallels in many other countries giving our work relevance beyond Scotland.

ICT in Teaching and Learning

ICT received an enthusiastic early billing especially as applied to history education with Munro (1990) arguing that there were 'powerful learning advantages to be gained' from datasets of census information. These supported local studies, comparisons over time alongside the formation and testing of

hypotheses. This early optimism was gradually balanced by more sceptical voices with doubts expressed over, in particular, the actual impact made by ICT on teaching and learning. In reviewing research evidence on telecommunications in the classroom, Fabos and Young (1999), characterised claims of enhanced writing and collaboration skills as 'inconclusive, overtly optimistic and even contradictory'. Cuban's (2001) study concluded that computers had failed to revolutionise the ways in which 'teachers organise or teach in the classroom ... teachers have adopted an innovation to existing ways of teaching and learning' However, these conclusions conflict with a growing body of evidence that ICT can enhance the teaching and learning (history) through the provision of varied primary and secondary sources such as census data (Spaeth and Cameron, 2000) developing historical understanding and skills (Calandra and Lee, 2005) while also catering for diverse learning styles (Gardner, 2001; Choi, Lee and Jung, 2008).

Much of the current research into enhancing teaching and learning through ICT focuses on the learning tasks notably authentic learning/critical skills in which learning is achieved by the active construction of knowledge supported by several perspectives in real life contexts. (Oliver and Herrington, 2003. Reeves, 1999. Iiyoshi, Hannafin and Wang, 2005. Zhu and Baylin, 2005). Authentic activities also produce authentic assessments integrated with the challenge. (Schwartz et al 2000). Authentic activities find parallels with problem-based learning in that the starting point for learning should be a problem, query or puzzle that must be solved. (Boud and Feletti, 1997). History is problem-based and as such provides fertile ground for authentic learning.

The increasing use of primary historical sources provided the third context for ICT to enhance teaching and learning. In Scotland and the USA students develop an understanding of the past through original artefacts and documents, which help students 'do History' rather than simply receive it. (Haydn, Arthur and Hunt, 1997). The national History course for the middle years of Scottish Secondary Schools requires students to evaluate sources with reference to their historical significance, the points of view conveyed in them and to the relevant historical context. (Scottish Qualifications Authority, 2007). Hutchinson (2005) discussed how letters from the American Civil War helped students understand and empathise with soldiers. New technology can help make these and other sources more accessible for students and more manageable for teachers. (Lee and Clarke, 2004).

Multimedia CD ROMs

Authentic learning, multimedia and the emphasis on primary sources provided the context for a series of CD ROMs produced by the authors for schools on themes within Scottish History. The programs include:
Doon the Watter (1997) examines holiday travelling on holiday by paddle steamer down the River Clyde;

Auld Reekie and the Dear Green Place (2001) allows pupils to investigate contrasting lifestyles in Victorian Edinburgh (Auld Reekie) and Glasgow (Dear Green Place);

Changing Scotland, Scottish Society 1880-1939 (2003) provides case studies into how industrialisation and urbanisation affected people's lives;

Barnhill (2005) analyses the largest poorhouse in Victorian Scotland which raises issues over attitudes and policies towards poverty.

Industrialisation, urbanisation and migration provided the historical context for the CD ROMs but life in rural Scotland also underwent radical transformation in the nineteenth century. This will be analysed in a further program, *Ruled by the Seasons* which uses the Journal kept between 1879 and 1892 by James Wilson, a farmer in Banffshire, north-east Scotland, to illustrate life in rural society.

Changing Scottish Society was produced for students in Secondary Year 5 (student age 17) with other CD ROMs developed for students from Primary 6 to Secondary 2, student ages 11-14. Nonetheless, the CD ROMs feature a similar range of primary sources. Census databases run as a spine through each program, as in *Auld Reekie* to highlight contrasting areas of Glasgow and Edinburgh in 1851 and 1891. *Ruled by the Seasons* contains the 1881 census for Banffshire allowing students to trace the people and places described by James Wilson, analyse socio-economic profiles of farms, villages and towns while also studying their local area. One student recorded how census databases in *Changing Scotland* were useful in investigating the past since 'you can see different people that lived at the time eg how many people were living in the same building'.

Other primary sources supplement the census, chosen for the insights they provide into the past: photographs; drawings; advertisements; autobiographies; diaries; film; music; newspaper articles; poems; dramatic reconstruction; recipes and letters. These sources link to suggested learning tasks designed to develop knowledge, understanding, and skills such as searching a database. The following screenshots from *Barnhill* illustrate the links between information, sources and student tasks.

BARNHILL
Entering Barnhill

Table 1: Applications for Poor Relief, 1877-1881

NAME	AGE	PLACE OF BIRTH	OCCUPATION	DISABILITY	COMMENTS	DECISION
Francis Martin	74	Ireland	Servant	Debility	Applied for outdoor relief due to failing health. No family.	Three months in Barnhill.
Thomas Leitch	59	Edinburgh	Shoemaker	Rheumatism	Wife died in 1879. Partially unfit for work due to Rheumatism.	Three months in Barnhill.
Mary Martin	10	Dundee	-	Child	Mother died 5 years ago. Father in Royal Infirmary	Sent to Barnhill.
James Bannatyne	18m	Glasgow	-	Child	Mother in prison for 40 days. Father left home.	Sent to Barnhill.
John Lambert	11	Glasgow	-	Child	Father died in 1850. Mother died in 1874. Stayed with aunt who applied for outdoor relief.	Aunt given 10 shillings (50p).
Angus Davis	82	Ireland	-	Debility	Very weak and nearly blind.	Three months in Barnhill.

Figure 1. Extract from the list of applicants for poor relief, 1877-1881 including Thomas Leitch and Mary Martin

BARNHILL
Entering Barnhill

Use the census database for Barnhill to find out more information on Thomas Leitch and Mary Martin.

Where were they born and why might they and their families have moved to Glasgow?

Search 1 Surname = Leitch and Forename = Thomas

Search 2 Surname = Martin and Forename = Mary and Age = 10

Figure 2. Task of searching the census database for Thomas Leitch and Mary Martin

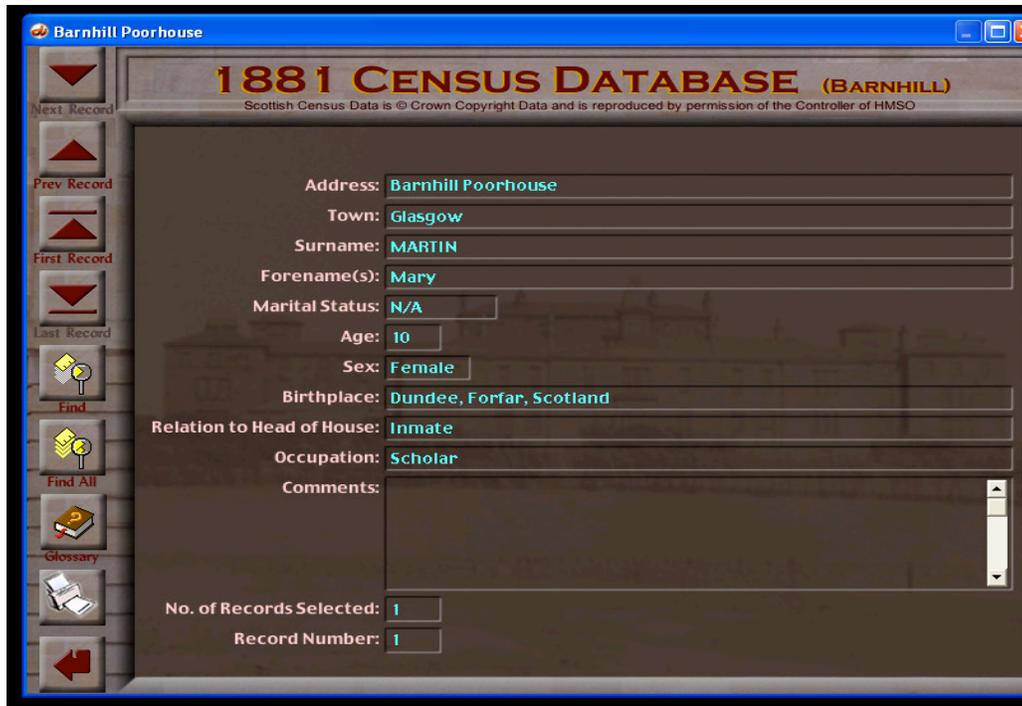


Figure 3. Entry for Mary Martin resulting from the search in Figure 2.

These screenshots provide a very small sample of student tasks which in *Barnhill* and *Ruled by the Seasons* build to a critical skills challenge. The farming challenge presents students with a scenario whereby tourists coming to Scotland wish to learn about farming in the past. Before visiting a farming museum they have asked for a leaflet showing some of the work done by farmers in the past. The task is to produce a leaflet in English and in one other language. The challenge outlines product criteria, for example, the leaflet should contain information on at least six types of work done in the past. The challenge subsumes assessment into the task since students must compile an evaluation sheet for an expert from the museum to assess each leaflet. This part of the challenge encourages students to think critically about the criteria for a well designed and informative leaflet.

In the Barnhill Challenge, groups of students are presented with a scenario whereby houses built on the site of the Barnhill are being cleared so revealing artefacts from the Poorhouse. Students, working in teams of archaeologists, must select any three artefacts and give a presentation to a panel of experts from recently opened Museum of Social work to explain why their chosen artefacts should be displayed to illustrate life in a poorhouse. Presentations must set the artefacts in context by, for example, providing background information on life in nineteenth century Glasgow.

Classroom Application

The availability of computers and the topic being studied have influenced the ways in which teachers and students worked with the programs. Early programs

were produced at a time when classrooms often had just one or two computers, a situation managed by groups of pupils working on computer and non-computer tasks. However, the schools which evaluated *Barnhill* used class sets of laptops allowing, as noted by one teacher, 'children (to work) on laptops usually in pairs but they could also move on individually for personal research'.

Flexibility has been the key in regard to selection of content with most teachers matching their topic to relevant chapters. Consequently, one teacher selected chapters in *Auld Reekie* on Housing, Education, Fashion, Food and Mealtimes, A Servant's Life and Leisure and Entertainment as the basis for a study into the Victorians. Some teachers used a program to support a tangential topic such as a river study while others selected one section, for example, the guide to essay writing in *Changing Scotland*.

Each school which evaluated *Barnhill* was equipped with an interactive whiteboard which in turn influenced teaching and learning. One teacher recorded that, 'I used the Smartboard and laptops with pupils to focus on certain areas, particularly in the early stages when introducing database searches etc. As a class we were able to discuss pictures/film available on the disc, children were then able to work independently through the program'.

A teacher who used *Changing Scotland* reported a very similar interchange between the interactive whiteboard and whole class discussion/explanation. 'At first whole class explanation and use of CD-ROM (*Changing Scotland*) using Smartboard. Subsequently one or two to each PC working through tasks for each aspect of topic. They printed out answers/notes from note-taking facility for me to look through before returning them for future revision. At end used Smartboard again to explain/discuss essay writing'.

Student and Teacher Evaluation

The evaluation of the CD ROMs is largely qualitative and over all the programs has included 243 school pupils and 9 teachers across all the programs. This paper focuses on the evaluation of *Barnhill* carried out by 63 pupils aged 11-12 years and 3 teachers in two schools.

The evaluation used pupil and teacher questionnaires and interviews alongside some co-operative teaching with the Principal Investigator. A DVD showing pupils and teachers working with the program was also produced. Before and after working with the CD ROM, pupils evaluated their own ICT skills in such areas as searching a database and making up a multimedia presentation. Schools were chosen as having the necessary ICT resources, a range of pupil abilities, and an environmental studies program which included the Victorian topic.

The research was carried out by the Principal Investigator who it could be claimed had a vested interest in a positive outcome. However, criticisms were not ignored and criticisms of earlier programs influenced the design and

development of subsequent CD ROMs. One pupil evaluation of *Doon the Watter* noted that the program was not interesting but 'I would like it if it was fun. With a person or something to take us through and it should be more colourful'. Consequently, John Campbell, the fictitious name given to street boy, takes pupils through Barnhill. Moreover, the CD ROMs are not commercial products, rather educational resources.



Figure 4. 'John Campbell' with his friends and as a guide through the *Barnhill* CD ROM

The pupil questionnaire asked a range of question beginning with overall pupil evaluation of the program followed by evaluation of the primary sources, Figure 5 below. Questions then moved onto the learning tasks and activities such as acting out meal time in Barnhill and writing an essay. Pupils then recorded the 5 most important pieces of information which they had learned about poorhouses and evaluated the impact on a range of ICT skills. A separate section contained questions on the Barnhill Challenge and its associated assessment exercise. The teacher questionnaire focused more on the impact on teaching and learning from independent learning and skills through to classroom organization. Teachers also evaluated the Barnhill Challenge.

BARNHILL

PUPIL COMMENTS

1. What is your year group in School? P7

2. Please put a tick beside the Section of the program which you studied:

Introduction	<input checked="" type="checkbox"/>	Barnhill	<input checked="" type="checkbox"/>
Causes of Poverty	<input checked="" type="checkbox"/>	The Barnhill Challenge	<input checked="" type="checkbox"/>
Helping the Poor	<input checked="" type="checkbox"/>		

3a. The program contains different resources. Put a tick beside the resources which you looked at.

Film and Video	<input checked="" type="checkbox"/>	Databases	<input checked="" type="checkbox"/>
Photographs	<input checked="" type="checkbox"/>	Drawings	<input checked="" type="checkbox"/>
Descriptions of the past given by people who lived at the time			<input checked="" type="checkbox"/>

3b. Which of these resources did you find most helpful?

I found the databases and photographs-drawing helpful.

Please explain your answer.

The database is helpful because you find information quickly and in photos-drawings you can see what it was like more clearly.

Figure 5. One page from student evaluation of *Barnhill*

Barnhill, Student Evaluation

Current changes to the Scottish curriculum are taking place as part of A Curriculum for Excellence (Learning and Teaching Scotland, 2007). This rates challenge and enjoyment first among seven principles of curriculum design since 'children should find their learning challenging, engaging and motivating'. Student comments were generally positive with eighty nine per cent recording that they had enjoyed working with the program:

'It showed you an example of how they lived their life in Victorian times';

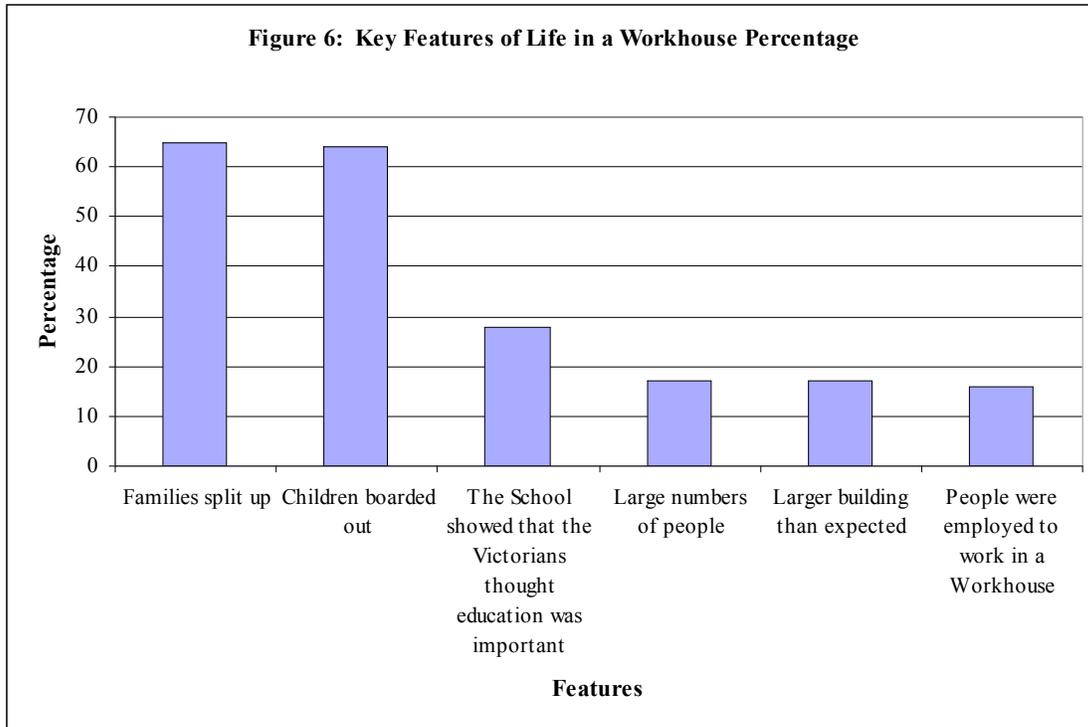
'It made you think about people in their times and how they lived';
'Barnhill made you actually realise how poor people were and what they suffered';

'I enjoyed making up the presentation';
'It was fun learning about the olden days compared to now'.

Reasons for negative evaluations included: 'it needed more visual representation'; 'was not interesting' and 'I got confused'. Three pupils would have liked it in the format of a game. This last point concurs with Prensky's (2001) who called for educational software be games-based matching student experience outwith formal schooling. A game format for Barnhill would have been more expensive to program while the design was influenced by Mayer's (2001) seven principles of multimedia design which advocate excluding 'extraneous words, pictures and sounds'.

Students rated the census databases, film, photographs and first hand accounts as the most useful resources recognising the support to enquiry skills provided by the databases: 'you could type in a name and up would come the age and things like that'; '... you can find exact information you want'; 'you can find it quickly as well' and 'on the database you can take a quick glance at it and know quite a lot'. Film and photographs allowed 'you to actually see what is happening', an observation which finds parallel with Swan's (1996) endorsement of archive film within multimedia since it provides 'vivid visual images'. Students also showed a perceptive appreciation of first hand accounts 'because the people had a lot to say and that's good because if you had to ask anyone about the past it would be them'; '... you saw it from different points of you (view)'; and 'it was like talking to someone in the past'.

The most commonly attempted activities therefore related to searching and making up a database, reading sources, studying film and learning tasks such as writing letters and discussing key points. Every student played a role in giving a presentation to the class, but this is discussed later in the context of the challenge. Teachers organised a wide range of supporting activities: drawing; wall displays; art work; designing and sewing a banner; personal research using the internet; acting out meal times at Barnhill; recreating the classroom in the Poorhouse School and personal reading were some examples. Pupils recognised that these activities played an important part of learning. The 'wall display', for example, 'was full of information', while books and the internet 'helped me learn because I had to find out'. This cautions against attributing enhanced knowledge and understanding solely to the CD-ROM as it was only one of several resources albeit central to the topic. Nevertheless, at the end of the topic students could identify key features of the poorhouse regime with Figure 6 from one class (N=25) typifying the six most common features noted by students.



One student empathised with children in the past, 'I learned that children, woman and men were separated from each other. Children were boarded out and they moved away so they couldn't see any family'.

Students rated from 1 (most improved) to 8 (did not improve very much) a range of skills required for working with the program. Students gave the highest ratings to devising and giving a presentation, using a computer and interrogating a database mirroring the Barnhill Challenge and the resources which students found most useful.

Before beginning work on Barnhill pupils evaluated their ICT skills, rating as either 'very well', 'quite well' or 'I need to practice this', eight categories including create and search a database, search for information on the internet, and create a simple multimedia presentation, Figure 7 below. Every student in one class initially said that they needed to practice creating a multimedia presentation, but on completing the same evaluation form at the end of the topic the rating for multimedia presentation had moved to either very or quite well.

Working With Computers



Put a tick in the box which you think describes how well you can do the following tasks.

Name of Pupil

Robert Withnell

21.2.06

Task	I can do this		
	Very Well	Quite Well	I Need to Practice This
Use a computer responsibly	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Create and edit a document or report with text and graphics	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Create a simple multimedia presentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Create and search database	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Study a CD ROM by yourself and in a group	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Send and receive e mail	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Search for information on the internet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Save images from the internet and copy them into a document/report	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pupil Comments:

I need to practice creating a multimedia presentation

Teacher Comments

Figure 7. One student's evaluation of his ICT skills before working with *Barnhill*

The evaluation of the Barnhill Challenge supports other research into authentic learning. (Reeves, Herrington and Oliver, 2002). The suitcase, nurse's uniform and the wicker basket were the most commonly selected artefacts for reasons which included:

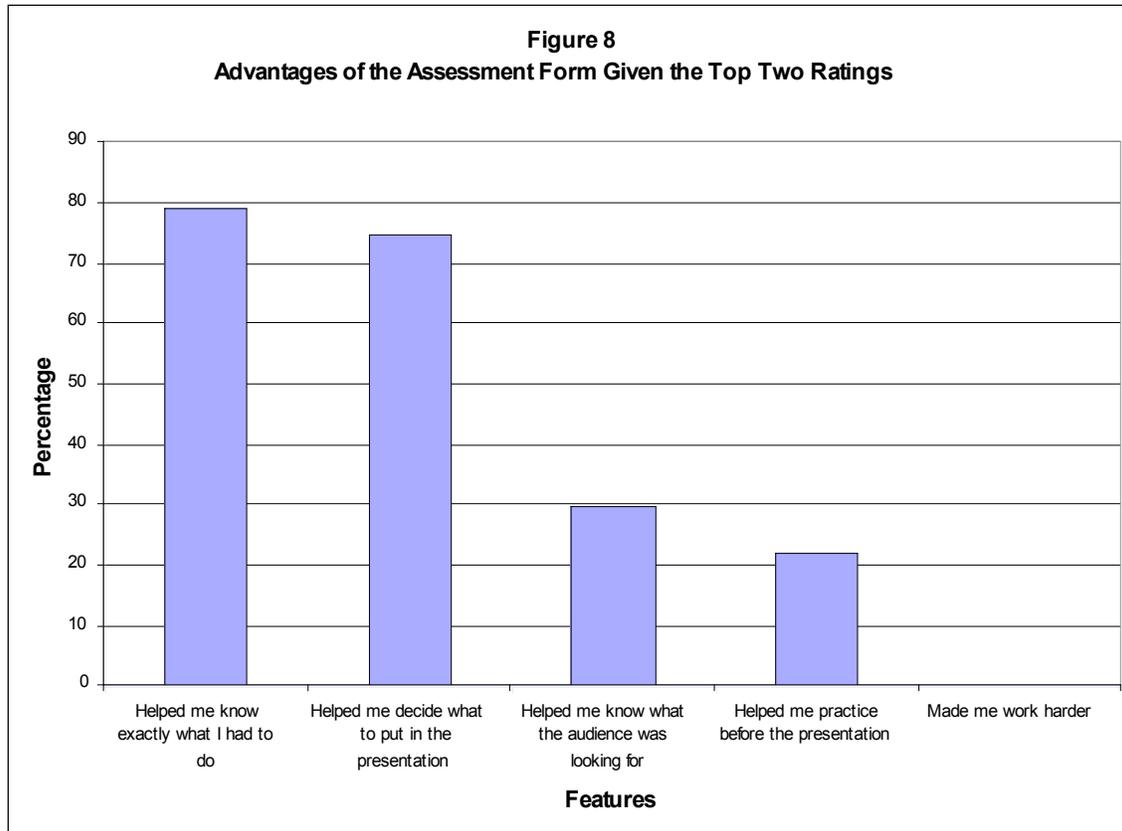
'Because we thought they had a lot of History and give a good example of Barnhill';

'We chose these artefacts because they told so much about Barnhill';

'... the suitcase showed what happened to children'.

Students presented their arguments via PowerPoint with individual roles for students ranging from choosing artefacts to giving the presentation. One student wrote, 'my role was background colour and pictures and help pick the pictures'. Her classmate '...had written the script and gave the presentation and helped make the presentation'. The evaluations also highlight how problem-based learning 'fosters self-directed learning', with students learning how to learn. (The University of Western Australia, 1996). Students recognised that the challenge developed knowledge alongside core skills of looking for information and justifying conclusions since: 'it helped me improve my knowledge because it helped me challenge and gave me answers to different information; 'It made me really think about being boarded out and the school etc'; 'I didn't know how to make a presentation now I do' and 'It helped me improve my skills of looking for information because you only got a little bit of help'.

The involvement of students in devising the presentation assessment sheet aimed to focus attention on the key features of an effective presentation. Figure 8 below demonstrates that the highest ratings were given to three out of five aspects of this task, namely, that it helped me decide what to put in the presentation, know what the audience was looking for and know exactly what I had to do. Finally, all students thought that the challenge was either very or quite helpful in learning about life in the past.



Teacher Evaluation

Teachers noted that the program was easy to use partly because of the 'clear use of icons to access different areas...and tasks involved'. However, it was also noted that 'it was difficult to get round so many computers on my own if there were any glitches', a situation helped in this case by cooperative teaching, but this support was not always available. Teachers appreciated the differentiated activities and that pupils were able to listen to sound recordings of the sources and selected text, but 'answers to tasks would be useful to quickly and easily monitor the progress of the children'. Paper copies of the program with answers now accompany *Barnhill* which in some respects negates the advantages of producing resources in a CD ROM.

The teachers worked through the whole program 'but not with all children. This was due to the age and ability of pupils but mostly time constraints and so (I) gave a topic area to each group who had to work through and report to the class'. In future use the topic area would be narrowed 'perhaps focus on life in Barnhill and link to Boarding Out as this was particularly relevant to the age group using it and the area of the school to Luss. This would hopefully lead to a greater knowledge of the period and lifestyle'. (Luss is a small village on the banks of Loch Lomond where some children were boarded out from Barnhill)

The Barnhill Challenge was successful in developing skills especially 'creating slides including text, pictures and footage. Team skills, discussing and justifying choices and making decisions as a group. Delivering presentations to the class-use of voice, clarity of explanation, dealing with and responding to questions'. It developed other ICT skills, ' (students) generally improved their keyboard skills. How to make a database. There was a purpose and reward to learning certain skills on the computer'. Nonetheless, students did not enjoy recording information in a topic booklet and in future 'I would consider not preparing a booklet...and print off pages as they are completed on screen'.

Every teacher noted that the program supported independent learning with students able to navigate through the relevant section/s with minimal guidance. Nonetheless, evaluation of *Barnhill* emphasises the continuing pivotal role of the teacher since 'the accuracy of the content in some cases highlighted the need for research to be more thorough – and more closely monitored by the teacher – to achieve a greater understanding of the period'. Authentic learning alters rather than downplays the links between teacher, student and learning. Teachers remain central to effective learning at each stage from planning through to reporting.

Implications

At first sight the following may not appear share many common features: Blackwell's Island Workhouse; Eagle Pass Irrigation Canal; Mississippi steamboats; Manitoba in Canada and the widening gap between rich and poor in Washington D.C. The answer lies in links or parallels between Scotland and North America. Blackwell's Island Workhouse (Correction News, 1995) was part of the broader development of Poorhouses throughout Scotland finding direct parallels with Barnhill. Scottish-born rancher Patrick W. Thomson, formed the Eagle Pass Irrigation Company to build an irrigation network drawing water from the Rio Grande (Texas Online, 2007) while Doon the Watter was Glasgow's version of the steamboats travelling up and down the Mississippi. Industrialisation and urbanisation brought in their wake increasing divergence between rich and poor epitomised by the West and East Ends of Glasgow and Edinburgh's Old and New Town. (Gordon, 1983. Dicks, 1985) The plethora of Scottish place names in Canada indicate large scale emigration in the nineteenth and twentieth centuries. Manitoba croft on the Island of Tiree bears little resemblance to Manitoba in Canada, but it symbolises the many islanders who began a new life in North America (Devine, 1988).

The underlying historical themes and the primary sources included in the CD ROMs transcend national borders. For example, Hutchinson (2005) demonstrated how soldier's letters can develop understanding, skills and empathy when teaching the American Civil War. However, it is the accompanying learning tasks which remain crucial to enhancement of student learning about, in this case the past. These tasks while developing knowledge and understanding should also embrace a problem-based enquiry methodology and one which embraces authentic challenges. We must move the user 'beyond the immediate topic', wrote Schick (1995), 'to provide information the user can apply to other

problems, to strengthen cognitive skills for processing new data, or to ask questions which challenge the user...’.

The investigative pedagogy underpinning the CD-ROMs demonstrates that when students use ICT ‘to conduct research projects, analyse data, solve problems ... and assess their own work, students are more likely to develop new ICT, problem-solving, information management, collaboration and communication skills’. (Kozma, 2003). This in turn helps answer some of the more sceptical assessments concerning the role of ICT in education. Positive impact does not come automatically since it depends on teachers moving to a constructivist approach, but not at the expense of preparation, planning, advice, monitoring and assessment. Pedagogy, not technology, must be the driving force.

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