Teaching Historical Chronology: An Application for Virtual Environment Technology

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History: Why important?

• Knowledge encourages good citizenship
• Better knowledge of history can avoid repeating historical mistakes (.... Maybe people do “learn from history”!)
• Understanding how past events are related helps to interpret current situations so sequence, “chronology”, is crucial
And yet...

• The British Government (former Secretary of State for Education) complains that UK children’s knowledge of history when they leave school is “lamentable” – they don’t know much at all

• Surveys show that adults also can’t place many important historical events in correct chronological order
Traditional approaches

• Washing line: successive items (pictures) strung across the classroom like a line of washing (Problem: historical sequence has to be imposed by the viewer e.g., left-to-right)

• Photographs, personal accounts, dressing up in costume, using artefacts, visiting sites of historical interest (Problem: no obvious historical sequence)

• Basic confusions of understanding and experience: Romans with “skateboards” and “mediaeval” mobile phones
Technological approaches: 2-D

- Masterman and Rogers (2-D interactive time line on computer screen); may improve on washing line but not tested by the authors
Use of 3-D graphics

Shown on RT television channel
Based on Karamzin’s *History of Russia*
*Significant events in Russian history shown as 3-D animations*

Excellent “presence” so it is as though viewer was “present” at e.g., crowning of Ivan the Terrible, but apart from costumes, no obvious time line. This was provided by cutting to a 2-D “family tree” showing links between successive Tsars.
Previous attempts include...

• The Aphrodisias project, the reconstruction of the Agora market place (US archeology student resources)

• The Norwalk project called the “Origin”, introducing children to the diverse history and culture of the Norwich region in the UK
Virtual Reality: Can this help?

• The promise of virtual environments: VEs will be “...the most effective medium for use in education” (Johnson et al, 1999; see Whitelock, Brna and Holland, 1996; Furness et al, 1997)

• For history: VR (or VET – virtual environment technology) can be used in desk-top format to provide interactive exploratory experience of history (c.f., H G Wells’ time machine)
Why Virtual Reality Technology?

- VR has the benefit of being spatial-temporal so time passes as viewer moves through the VE
- Benefit of Interactivity (active > passive)
- Information stored in spatial memory (of apparently unlimited capacity) not semantic memory (which is prone to confusion e.g., 1066 v 1666)
VE use in raising awareness of personal history

- A small group of disabled young people created images that represented significant events in their lives, and each pasted these into their own personal virtual fly-through (Pedley, Camfield and Foreman, 2003)

- Better memory for the order of personal historical events after participation
Nichola: I got my new wheelchair (in 1997)
Experience of a sequential virtual fly through will engage the use of spatial rather than simply semantic memory and enhance recall of historical chronological sequences compared with other media (such as print or PowerPoint).

Note: Use of challenge and a game-like format, plus training with the input device all beneficial
press w to restart, spacebar to move
The death mask of Tutankhamun
Measurement of Performance:

• (1) Recall items, (2) place given 9 items (as paper pictures) in the correct order

Measures:

• (1) Total items recalled (total: 9)
• (2) Removed scores: How far is each placed item from where it should be in the list? (Maximum 8 per item and totalled across the whole list)
Mean REM (Removed) scores for three groups

Significant difference among groups, the VE group being better $F(2,33)=5.95$, $p<.05$, and a nearly significant gender difference favouring males, $F(1,33)=3.48$, $p=.07$. These are typical data from VE history studies.
Ukraine study

Environment constructed based on Ukrainian history
Tested 8-9 year-olds

- Children in the VE were shown to be superior compared to the PowerPoint group. VE use produced error-free learning
- [The Kruskal-Wallis non-parametric ANOVA was used to compare the three conditions on REM and Correct variables. The result obtained was significant, $X^2(2) = 6.28$, $p = 0.043$ in each case. The Mann-Whitney U-test conducted on the REM and Correct variables showed that the VE group did better than PP, $U (N1 =N2=10) = 25$, $p = .013$ (two-tailed) in each case.]
Removed scores for the three groups
Single time lines: summary

- Use of sequential fly-throughs does enhance memory for chronological sequences
- But 9 items is not “history”

Can the principle be extended to provide a broader picture of history?
Multiple time lines

• Kullberg (1999) at MIT showed that it is possible to construct a layout environment like a large “field” of data (history of photography) that can be explored, freely taking various routes and moving forward and sideways

• Kullberg never examined whether people benefited from this, compared with eg. reading a book about photography
Why is layout important?

• VR can potentially provide a spatial-temporal plan that is memorable like rows of familiar shops are memorable, in sequential order
• Used by Korallo et al (2012) to examine 3 time lines in parallel – art, psychology, and general history
Note:

- The previous slide shows two examples of events, having dates close together. Events are selected to represent epochs which are usually more “spaced” in time!
Participants and Materials

• Twenty-seven participants (21F, 6M) took part (24±4 years), fourteen in the VE group (4M, 10F) and thirteen in the Booklet group (2M, 11F). They did not have specialist knowledge in advance, of any area covered by the timelines beyond a Year 1 knowledge of Psychology.

• Three VE timelines were produced using Virtools software. The same materials (images and information) were used to produce three booklets (in A4 format with coloured images). Events were selected randomly and matched according to the year in which they occurred, so at equivalent distances along the three timelines
Procedure

• Participants were randomly divided into two groups, one (experimental group) that was exposed to the VE and another (control group) who worked with a paper version of the environment designed in a booklet format.

• The researcher pointed out that all information presented in the environment should be considered, as if the participant was being asked to revise for an examination.

• The control (booklet) group was effectively given the same task, but asked to learn the materials in the three timelines by using three separate booklets.
Testing

• **Test 1**: participants had to recall the items learnt in their condition, but not in any particular order.

• **Test 2**: they placed events presented in a selected timeline in the correct chronological order (for each time line).

• **Test 3**: they placed together the events that took place in the three domains, i.e., History of Art, History of Psychology and General History, simultaneously.

• Finally, a questionnaire was designed to investigate whether participants could relate one timeline to another, and whether simultaneity could be identified between the events in the timelines. For instance, one of the questions asked: “What happened in the History of Psychology when an event X occurred in the History of Art?”
Mean number of correctly placed items for each domain/time line when tested independently (a=art, p=psychology, g=general history).
REMcombined: Mean REM scores for each domain/time line when the three were tested together (a=art, p=psychology, g=general history).
Perhaps most importantly...

- Participants said that they benefited from being able to “scan across” between time lines, explaining why they were significantly better able than the booklet group to say “what happened” in one time line when another event occurred in another time line: they began to get the “bigger picture”
Future developments?

• Children and their class teacher could progressively construct their own class history timeline
• Environment is expandable to multiple time lines (like Wells’ time machine)
• Middle school children might benefit as extended exposure is required
• Create a software shell usable for any subject having a chronological component (art, architecture, medicine, health and so on)
• The intention is not to “replace” standard history teaching, rather to provide adjunctive protocols that overcome particular problems, particularly the extraordinary difficulty that many children have with the chronological ordering of events.
Press interest

• The study has attracted interest from the UK press, for example it featured in the *Times Educational Supplement* in 2013
Robbed of their past

A new survey reveals a ‘two-tier system’ in history teaching, with poorer pupils placed at a disadvantage.

Adi Bloom reports

HISTORY EDUCATION in schools is becoming a two-tier system, with some pupils guaranteed extensive, well-taught lessons and others taught poorly and inadequately.

Often, this division reflects pupils’ economic background, with disadvantaged pupils less likely to study history beyond the age of 14 than their more affluent peers.

Researchers from the Historical Association surveyed 107 schools to find out how and when history is taught to Key Stage 3 pupils. Almost 200 of these schools were comprehensive, the others included fee-paying and grammar schools, as well as academies.

This report was written by academics from the Institute of Education, University of London, and the University of Reading.

Three-quarters of all schools offered history as a discrete subject. The others either included it as part of a humanities curriculum or offered integrated humanities courses.

Grammar and independent schools were the most likely to teach history as a separate subject. Meanwhile, one in 10 comprehensives, and more academies, said that history lessons were optional from Year 9 onwards.

The quality of teaching emphasised this division. In almost two-thirds of state schools, Year 7 pupils were taught history by non-specialists. But this was the case in only a third of grammar and independent schools.

By Year 9, two-thirds of state schools were able to offer specialist history teaching for pupils. This was an area of concern for many teachers. Even more so it was a concern for the future, they found that departing history specialists were not being replaced.

“The specialists are fully occupied with exam groups, meaning key stage 3 is taught by non-specialists,” one academy teacher said. “Any increase in GCSE uptake would make this situation worse.”

History teaching in state schools also suffered from time constraints. A quarter of comprehensives offered a maximum of an hour’s history teaching to Year 7 pupils every week. In contrast, many grammar and independent schools offered more than 90 minutes of history teaching each week. (This, however, had changed by Year 9, when comprehensives tended to offer more than 60 minutes of history teaching a week – more than grammar and independent schools.)

The senior management team does not seem to appreciate the importance of good quality, quantity teaching at key stage 3,” said one comprehensive teacher.

The problem, the researchers suggest, is that history is widely perceived as a subject in which it is particularly hard to achieve A grades at GCSE. As a result, lower-achieving pupils are steered away from the subject, towards courses that would help boost their school league table position.

The result has been a two-tier system of education,” the researchers said. “The fact that this division appears to be most pronounced in state schools is in line with recent research that more pupils from more socio-economic classes are typical of schools that are more likely to offer history as a separate subject.”

An alternative method, the academics suggest, would be to create a virtual road along which different historical periods can be seen in relation to one another. As pupils progress down the virtual road, they pass pictures, which they can click on for additional information.

Several timelines can be viewed simultaneously on a single road. For example, images from politics show that the events of 1943 appear in the centre of the road, with history of art to the left and history of psychology to the right.

They created such a virtual road and presented it to a group of students at Middlesex University. Fourteen students were given the virtual timeline to explore, while 13 were given more traditional timelines. After two weeks, participants returned for a series of tests. These examined how well they could understand history and chronology by using the virtual timeline, and when they had learnt the timeline, but also how well they were able to relate different subject-area timelines to one another.

Those students who had been learning from the virtual road significantly outperformed those using the traditional timelines. They performed particularly well on tasks that tested their ability to relate events occurring across different timelines.

“The most important factor that helped them achieve high scores was their ability to connect events with each other – to see a structure and a point of reference,” the academics said.

The control group, meanwhile, struggled to visualise different timelines simultaneously.

The method would require enthusiasm from teachers, the researchers emphasised. But it would also allow pupils to think about the relationships between events, and to examine cause and effect. “In terms of history teaching, the benefits is that it can potentially provide a broader view of history and chronology beyond conventional teaching,” they said.

References


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1903

History of the World

History of Art
References


* available from NF