Applying the GeoExploratorium to geography teaching programmes

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Abstract

A product that has been conceptualised to do this been given the name of a 'GeoExploratorium' (Cartwright, 1997). It was envisaged that it would work cooperatively with other discrete and distributed New Media resources and it would provide artifacts for geographical exploration and discovery. It could be used as part of an exhibition, using a discrete version (for speed of delivery) or at a remote site (with Internet capabilities)). It is envisaged that it would be used as a complementary learning method to existing teaching and learning programmes that encourage the flexible delivery.

The GeoExploratorium could enable non-elite users to explore geographical concepts. It would use a suite of metaphors that have been proposed for the provision of 'media-rich' geographical information that would complement the map metaphor. It would provide complementary ways to understand and comprehend geographical information using interactive multimedia. The metaphors were originally conceived and developed with discrete multimedia products as 'targets', but the concept has now been extended to distributed New Media. The metaphor set includes the Storyteller, the Navigator, the Guide, the Sage, the Data Store, The Fact Book, the Gameplayer, the Theatre and the Toolbox. It is argued that the combination of these metaphors, when used with the map metaphor would provide the means to deliver the contents of the GeoExploratorium using discrete/distributed interactive multimedia elements, supported by appropriate tactile multimedia resources, as required from package to package.

This paper describes the GeoExploratorium and its application in an educational context. The results of an evaluation project will be discussed and plans for future research and development elaborated upon.

Technical topics: Multimedia Cartography and Electronic Maps / Cartography and Children

Introduction

Once upon a time when one visited a museum you looked at machines and devices in glass display cases. If you pressed a red button the ‘thing’ would work for you. This was the sum total of interaction. This all changed when Frank Oppenheimer founded the exploratorium, where exhibits consist of real things that the learner could touch directly. Today almost all museums work this way, as curators see how much more compelling real experience is than button pushing.

There has been much interest in making information about geography available to the general public using ‘normal’ (or non-specialist) machines – ideally using domestic devices. This has led to discussions about what information should be delivered. The increased access to sophisticated computers by the general public has led to an awareness that resources like discrete multimedia products and their distributed counterparts on the Internet, and particularly through the use of the World Wide Web, has revolutionised the way in which information is both accessed and used. Cartographers have embraced the use of interactive multimedia, delivered via discrete or distributed means, as a method of providing products that are easily useable with 'everyday' skills, using modest computer platforms and accessible communications resources like the Web.

In a similar fashion, access strategies need to be developed to enable geographical information to be readily accessible (and usable) via the Web for consumers. If geographical information resources were to be 'aimed' at the 'non-elite' user, then an ideal 'place' for installation and testing to take place might be in Museums, especially the new genre of museums that aspire to provide access via non-traditional means and devices.

Work has been carried-out by the author to apply exploratorium ideas to the exploration of geography, and developed the concept of a GeoExploratorium, a virtual exploratory ‘space’ where users could investigate geography using tools with which they felt most comfortable. It is envisaged that access to and use of these tools would move users out of ‘Flatland’ and into a realm or innovative tool usage that would enable them to explore and thus better understand geography. The effectiveness of individual visualizations or ‘sets’ of visualizations (that may ‘move’ to illustrate the dynamic nature of geographical information) and the future of these visualizations for exploring geographical information, by students of geography in particular, is the focus of research.

Flatland

Flatland (Abbott, 1884), written over 100 years ago by Edwin Abbott (Banchoff, 1990), looked at the geometry of higher dimensions. Abbott

outlined a two-dimensional earth that was inhabited by 'flat beings'. But, more particularly pertinent to the author's on-going research programme was Abbott's exploration about how humans would interact with phenomena from a dimension that was on a higher plane than their own. Contemporary computer-generated visualization products now enable different dimensions to be visualized, including geographical information, that has a multi-dimensionality that has been difficult, but not impossible, to portray. This has led to a re-assessment of how to use contemporary mapping artifacts.

Moving from Flatland.

Flatland, according to Tufte (1990), is based on the classic by A. Square (Edwin A. Abbott, 1884), *Flatland: A Romance of Many Dimensions*. Tufte (op cit., p. 12) notes that: "Escaping this flatland is the essential task of envisioning information – for all the interesting worlds (physical, biological, imaginary, human) that we seek to understand are increasingly and happily multivariate in nature. Not flatlands."

It is argued that it is only with the recent development and consolidation of contemporary publishing tools, multimedia and global communications systems (leading to global publishing (and true multi media publishing) that cartography has moved from being located in 'Flatland' (in the early days of printing), from an era of compromise (when computers and computer graphics were used to (quickly) generate map-graphics that could sometimes be almost undecipherable (but available almost instantaneously) to today's age of innovation.

Testing 'Space'

In the teaching of geography, the general method for the depiction of the attributes that combine to present a picture of the real world is to use of the map metaphor. Whilst still an effective means for the portrayal of geographical information, the map metaphor can be enhanced using other metaphors, which can be readily delivered using contemporary technology and communications, including discrete multimedia and Web resources. Maps alone shouldn't be seen as the only type of metaphor available to develop an appreciation of contemporary geographical theory. The uses of just the map metaphor to access geographical information limits the flexibility particular users have in retrieving relevant and current data. The construction of a metaphor set that could be used as the basis of access to geographical and other spatially related resources, both discrete and on-line, could provide the means for users to explore this information. This could be done in ways that (active) users and (passive) viewers feel most comfortable with and which can be exploited to impart the 'best' image of a particular (geographical) area of interest.

This research programme is being conducted, with an aim of constructing and evaluating a ‘different way’ of providing geographical teaching/learning elements with multimedia cartography – the use of a GeoExploratorium. Providing a new way of 'seeing' geographical information by providing different viewpoints and therefore, hopefully, ensuring that the 'voids of geographical understanding' are filled with information gathered from other perspectives and used to assemble a more complete picture of reality.

Touchstone - Dorling Kingsley *World Reference Atlas*

The Dorling Kindersley *World Reference Atlas*, produced on CD-ROM and as a paper version, was used as a ‘touchstone’ for evaluating the success, or otherwise, of applying the *GeoExploratorium* Concept to geographical information provision. Initial testing was done to ascertain whether students thought that the electronic version of the product provided superior results to the paper product. As Dorling Kindersley published two versions of the Atlas from the same database, producing two fine complimentary products, it was thought that this was an ideal vehicle for preliminary testing to establish student preferences.

The basic ‘building blocks’ of the Dorling Kindersley Atlas was used as the fundamental data elements that comprise the GeoExploratorium prototype. These datasets are:

- Climate;
- Transport;
- Tourism;
- People;
- Politics;
- Aid;
- Defence;
- Economics;
- Resources;
- Environment;
- Media;
- Crime;
- Education;
- Health; and
- Wealth.

It was important that these elements be incorporated into the prototype so as to enable comparisons between usage of the GeoExploratorium and the CD-ROM / paper information presentation methods.

Four user ‘profiles’ were used to guide access to the prototype. These have been defined previously as the 'Nintendo Generation', the Computer Generation, the 'Video Generation' and the 'Print/Audio Generation' (Cartwright, 1999). Interfaces allow the 'Nintendo Generation' to access information using a games metaphor, the Computer Generation via a pseudo computer interface, the 'Video Generation' through a video-controller and the 'Print/Audio Generation' through an interactive newspaper.

Testing 'Vehicle' - The GeoExploratorium

Cartwright (1997) developed the conceptual ideas of supplying information as part of a GeoExploratorium: a multimedia enhanced package that combines tactile, discrete and distributed multimedia components. The GeoExploratorium combines a number of metaphors (Cartwright and Hunter, 1999) to allow users to choose the resources and the relevant delivery method that they are most comfortable with for their specific 'discovery' and 'exploration' methodologies. The multi-metaphor resource provided by the GeoExploratorium enables users to choose the package or parts of a package that is most appropriate for individual tasks of geographical information exploration.

While there has already been considerable experimental work conducted using some of these new technologies to convey geographic information to users (in particular, multimedia), package designers are still unable to say with any firm measure of confidence just how effective these new methods are—which places them at a disadvantage when using them given that they remain highly resource-intensive to implement. Too often, the 'gee whiz' attitude dominates with regard to these new methods without a proper understanding of whether they are more effective than traditional communication approaches. Accordingly, rigorous evaluation procedures must be designed and implemented to understand the strengths and limitations associated with these new interactive multimedia techniques and then to develop rules to be applied more effectively and efficiently. This issue is of critical importance given recent initiatives in multimedia and information technology in general and the need to use it effectively in geographical teaching packages in particular.

Research has been, and continues to be, conducted to ascertain the best use of the GeoExploratorium for the dissemination of geographical information. Input from this research is required to fully develop the potential of the metaphors and how they might best be applied to the depiction of elements of the world and thus contribute to allowing a greater understanding about how things that can be spatially defined and simulated actually work and the influences that sculpture their geographical profile. The 'best practice' of using multimedia with geographical information should be defined and refined, so as to ensure that the potential of this innovative resource is not squandered.

Discussion

There has been much interest in making information about geography more available using 'normal' (or non-specialist) machines. The increased access to sophisticated computers by the general public has led to an awareness that resources like discrete multimedia products and their distributed

counterparts on the Internet, and particularly through the use of the World Wide Web, has revolutionised the way in which information is both accessed and used. Cartographers have embraced the use of interactive multimedia, delivered via discrete or distributed means, as a method of providing products that are easily useable with 'everyday' skills, using modest computer platforms and accessible communications resources like the Web.

Humans develop mental maps of environments, real or imaginary. The use of mental maps for wayfaring and appreciating geography is described by psychology as 'cognitive mapping. De Certeau (1984) indicated that two types of description can be made that describes how humans use cognitive mapping for visualising how they move in space: observational and operational. Operational is represented by 'the map' ("a plane projection totalizing (sic.) operations"), 'the tour' or 'the itinerary' ("a discursive series of operations") (*ibid.*, p.119). The map provides a graphic description of a selection of reality that shows a selection (usually made by the cartographer) from reality has been classified, generalised and scaled to show the relative positions of objects to one-another placed in an absolute pictorial 'world' defined by latitudes and longitudes that relate to a map projection (based on a certain mathematical description of the earth) that depict a compromised view of reality. The tour or itinerary provides a sequence of navigational cues that are aimed at taking the user of the artifact to certain locations – everything outside the defined 'corridor', down which the user is allowed to travel (physically or virtually) is ignored, the 'journey' is paramount. It has been argued by geographer/cartographers like Castner (1981) that the map model works best, that users have to appreciate the 'grammar' of cartography in order to fully understand the 'language' of maps and how it depicts geography (including the associated 'lies' that maps have to tell to illustrate the 'truth' about what the map reader needs to see on the map in order to have the best 'view' of reality. Using the defined geographical 'picture' that is used in the corridor provided by the tour or itinerary only a small view of what reality really is provided and therefore a true appreciation of what constitutes the 'real world', and where the user 'fits' into that world, cannot be had.

Using Multimedia

Multimedia offers a different way to extract pertinent facts that are current and complete. Indeed, there is a danger that in all of the hype about multimedia and what it offers, that this particular 'combination' of media types, all stored on some almost indestructible medium like CD-ROM or delivered via the Internet, may also eventually prove to be another 'sidetrack' - one which is eventually ignored by users as a means of accessing geographical information. However, a package consisting of tactile, discrete and distributed multimedia, the World Wide Web and the Internet for communication and access, and combining it with other

complementary resources may well be the application of multimedia that ensures that users can fully exploit the information on offer.

A multimedia map provides not only a picture of geographical reality, but also access to geographical data. It allows users to access further data and information plus background information about how components (data systems, data suppliers and facilitators, and mapping systems) actually work. The geographically linked features and attributes that can be displayed using a multimedia map are a conglomerate of items, systems, processes and conventions (Cartwright and Hunter, 1996).

Multimedia Cartography has changed artifacts for geographical exploration - from ‘frozenscapes’ (visualizations of geography that cannot be altered by the user) to ‘Malleable Visualizations’ (a computer-generated multimedia visualization with which users can interact and ‘mold’ into one that best suits their particular needs).

Conclusion

Future research needs to be conducted to ascertain the best use of the GeoExploratorium for the dissemination of geographical information. Input from this research is required to fully develop the potential of the metaphors and how they might best be applied to the depiction of elements of the world and thus contribute to allowing a greater understanding about how things that can be spatially defined and simulated actually work and the influences that sculpture their geographical profile. The ‘best practice’ of using multimedia with geographical information should be defined and refined, so as to ensure that the potential of this innovative resource is not squandered.

The realities of 'hordes' (with apologies to the general public at large) of niavé users having access to sophisticated interactive multimedia devices is one aspect that researchers in cartography need to address. This reality is what this research project is addressing.

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