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Investigating the role and impact of geovisualisation and geocollaborative portals on collaborative e-learning in tourism education

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ABSTRACT

As geodata are the lifeblood of tourism, the representation of tourism resources on maps (geovisualisation) and the wide use of web 2.0 for creating and discussing geovisualised data (geocollaboration) are heavily adopted in tourism. Consequently, managing geodata needs to be incorporated into tourism curricula and pedagogies to assist graduates with career options. Although research in geovisualisation has examined the impact of geoportals on team-working and cognitive processes, research in education has not examined the implications of geocollaboration on collaborative e-learning. After reviewing the literature, the paper develops and applies a model that exploits geoportals for designing collaborative e-learning in a tourism course. Implications and trends for tourism educators and policy makers are discussed.

1. Introduction

The use of digital maps is increasing not only by governments, research institutions and businesses but also in education (Jones, Blake, Davies, & Scanlon, 2004). This is not surprising when considering the cognitive benefits of digital maps (Davies, 1998) and of data representation on maps (i.e. geovisualisation, MacEachrean, 2005) as well as that 80% of all digital data generated today includes geospatial referencing (MacEachrean & Kraak, 2001). Data with geographical connotations (geodata) and digital maps are the lifeblood of tourism, as tourism by nature involves the transfer of people to places away from home, while all tourism experiences take place in certain geographical areas of the physical or the virtual world (e.g. in secondlife.com or through virtual reality applications). Moreover, as geographical locations and their resources (e.g. cultural, natural) constitute major tourists' attractions motivating and inspiring tourists to travel to a place, information about geographical resources plays a critical role in generating, directing, organising and managing tourism activities in destinations. Consequently, Geographical Information Systems (GIS) applications and currently, webGIS and geoportals are widely adopted in tourism for several purposes, such as (e.g. Sigala & Marinidis, in press; Zanker, Fuchs, Seebacher, Jessenitschnig, & Stromberger, 2009) trip planning, visitors' management and tracking behaviour, online bookings, destination management and measurement of carrying capacity. Geoportals are internet gateways providing access to geographical information and services (e.g. calculating distances, designing itineraries). With appropriate functionality, geoportals can also support collaboration amongst (distributed) users, in which case they are referred to as geocollaborative portals (Sigala, 2010).

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The wide application of digital maps requires tourism educators to incorporate the teaching of spatial skills and geodata manipulation into their curricula and pedagogies in order to assist graduates with career options. Specifically, students would need to develop two major geospatial competencies, namely: how to use maps for information discovery, exploration and presentation; and how to design maps for enhancing their communication and collaboration with peers.

However, although research in geovisualisation has advanced by investigating how geovisualisation and geoportals can support and enhance group work and collaborative decision-making (Brewer MacEachren, Abdo, Gundrum, & Otto, 2000; MacEachren & Cai, 2006; Sigala, in press), research in education is limited, because: (a) it examines the use of digital maps for supporting individual and not collaborative learning processes (e.g. Jones et al., 2004); and (b) it overlooks the opportunities to exploit geocollaboration for developing collaborative e-learning practices. The lack of educational research examining the exploitation and impact of geovisualisation on collaborative e-learning creates a significant drawback in tourism education, since it is widely shown that the Internet can significantly enhance the quality of tourism education by: (a) digitising part or the whole learning/teaching process (i.e. e-learning) (e.g. Cantoni, Kalbaska, & Inversini, 2010; Sigala, 2002); and (b) enabling collaborative learning processes by facilitating constructivism learning amongst and within students' communities and facilitators (e.g. Sigala, 2004, 2005). Moreover, as free web map services and web 2.0 tools – that democratise the creation and dissemination of geographical content and services (Goodchild, 2007) – provide numerous tools for spatial decision-making and group collaboration, research in the area of geovisualisation for supporting collaborative e-learning becomes a must.

In this vein, this paper aims to investigate the role and impact of geovisualisation and geocollaborative portals on enabling collaborative e-learning in tourism education. To achieve that, the paper reviews the related literature as well as analyses examples of different learning applications which demonstrate: the features and benefits of geovisualisation for teaching and learning; and the impacts and the role of geoportals and geocollaborative portals on collaborative e-learning practices. The literature review concludes by developing a model showing how to exploit geocollaborative portals for designing collaborative e-learning. The design-based research approach (DBR) was used as an appropriate methodology for developing the geo-collaborative e-learning model, because of two reasons: (1) the lack of previous literature and of a model analysing how to exploit geocollaborative portals for educational purposes; and (b) DBR entails an iterative process through which researchers and educators collaborate in order to apply, modify and adapt previous theories to new aims/contexts (Reeves, Herrington, & Oliver, 2005). The applicability of the geocollaborative e-learning model is shown by analysing the use of a geocollaborative portal for integrating collaborative e-learning in the teaching process of a tourism course. Finally, the paper identifies the trends regarding the use of geocollaboration portals in tourism education and it concludes by discussing the former's implications on tourism educators and policy makers.

2. Geovisualisation: features and benefits in education

Geovisualisation refers to the external representations of data with geographical connotations on maps. Maps are the interface for presenting and visualising geospatial data, in which location represents the geography of the studied phenomenon. Digital maps and tools further advance the functionality and benefits of geovisualisation (Table 1). For example, by introducing search engines, metadata, 3D visualisation and data layers, digital maps become very interactive and provide flexible geographical interfaces that in turn assist users to explore, analyse, synthesise and present complex spatial information. Hence, geovisualisation provides visual representations of georeferenced data, which in turn increase cognitive resources, reduce the search complexities, ease the pattern determination, and fasten the perceptual inferences (Zhang & Norman, 1994). For example, diagrammatic representations (e.g. a map showing wine itineraries) require less search, comprehension and inference than sentential representations (e.g. a paragraph describing wine routes) (Thomas & Cook, 2005). Hence, in geovisualisation environments, maps can stimulate visual thinking about geographical patterns, connections or disruptions and trends (Kraak, 2003). In this way, users can generate hypotheses, develop problem solutions and construct knowledge (Kwan, 2000).

In sum, geovisualisation aims to turn large heterogeneous data into information (interpreted data) and then, into knowledge (understanding derived from information) by integrating people, maps, processes, information systems (GIS) and the acquisition of information and knowledge. Indeed, as MacEachren and Kraak (2001, p. 3) argued *geovisualisation integrates approaches from visualization in scientific computing, cartography, image analysis, information visualization, exploratory data analysis and geographic information systems to provide theory, methods and tools for visual exploration, analysis, synthesis and presentation of geospatial data.*

Table 1
Views, interactions and tasks of geovisualisation tools (Koua, MacEachren, & Kraak, 2006; Lloyd & Dykes, 2007).

Exploratory data analysis	(conditional) histogram and box plot, parallel coordinate plot, table browser, (conditional) scatterplot, small multiples, scatterplot matrix, time series plot, time plot path, mosaic plot, treemap (and other hierarchical plots), sylph/star glyphs, self-organising map, bar and pie chart
Mapping (data presentation)	Symbology, thematic, density maps, dot maps, cartograms, insets, 3D maps
Interactions	Conditioning, brushing, linking, zooming, semantic zooming, animation, sorting, reordering, filtering, multiple views, categorising, extracting, manipulation (rotation, separation), dynamic querying, distortion
Tasks (complexity of tasks increasing from locate to correlate)	Locate, identify, distinguish, categorise, cluster, distribution, rank, compare, associate, correlate