

# Preface

## ABSTRACT

This chapter introduces the book, setting it in the context of developments in online or electronic learning. We define electronic learning as that which occurs when a computer is used as the means of transmitting the learning materials and organizing the activities. Electronic learning has proved invaluable in distance learning: the numbers of online degree programs is growing steadily. But electronic learning is also a developing feature of the undergraduate curriculum. Most universities now provide their students with a wealth of electronic information via their libraries and via their administrative Web sites. Most universities provide a vehicle for the delivery of course materials. Known as virtual learning environments in the UK, and as course management systems in the U.S., these software platforms are now big business. Students expect course syllabi, reading lists, course exercises, data, old exam papers, and timetables to be online. The next step in this e-learning evolution is to put the lectures and tutorials and student activities online. For most geography teachers (of a certain age) this is a daunting challenge involving radical re-skilling and much effort. What are the best ways to do this? What tools are available to help in the process? What is the best mix of online learning and face-to-face learning? This book relates the experience of and describes the resources developed by a team of academics funded by the UK Joint Information Systems Committee, a body charged by the Higher Education Funding Councils to encourage new electronic learning and knowledge and skills in using digital materials. We hope that this account (including both successes and challenges) will inspire the already electronically literate geography teacher to experiment and develop their own materials or persuade the less electronically confident to take the first steps on this road to, we believe, enhanced learning for our students. The chapter includes a summary of what the parts and chapters cover and a guide on how to use the book and associated materials in an intelligent and time efficient way.

## INTRODUCTION

Electronic learning (e-learning), which occurs when a computer is used as the means of accessing learning resources and activities, provides today's university student with an unprecedented array of learning materials. Most universities in the developed world now provide their students with a wealth of electronic information via libraries, administrative Web sites, and virtual learning environments. Students expect course syllabi, reading lists, exercises, data, old exam papers, and timetables to be online. A logical next step in this learning evolution is to put the lectures, tutorials, and student activities online. As working online can be viewed as a new context for learning and not just a learning tool, for most geography teachers, especially those accustomed to traditional delivery methods, this is a daunting challenge involving radical re-skilling and much effort. What are the best ways to do this? What is the best mix of online and face-to-face learning? What tools are available to help in the process? Through

the experiences of an international team of geographers, educationalists, and computer scientists we aim to answer these questions.

This book makes a unique contribution to methods of collaboration between partners in developing common materials, linking courses, and sharing students, pointing to a joined up and networked future of learning. We describe the learning resources developed in the geography topic areas of human geography, environmental management, geomorphology, and earth observation, suitable for use by students of the physical or man-made environment. Through a number of carefully explained case studies, connected to digital libraries of geographic resources and preserved for future re-use in the Jorum digital repository ([www.jorum.ac.uk](http://www.jorum.ac.uk)) developed by the Joint Information Systems Committee (JISC), we provide guidance to geography teachers and educational professionals intending to work in the vibrant and growing field of electronic/online learning. For consistency we use the term e-learning throughout this book, but we do not seek to assert any special differences between this term and technology-enhanced learning (TeL), also currently in widespread use.

The contributors to the book were all involved in the JISC/NSF funded Digital Libraries in the Classroom Programme as members of the Digital Libraries in Support of Innovative Approaches to Learning and Teaching in Geography project (DialogPLUS, <http://www.dialogPLUS.org>). The authors are experienced teachers, researchers, and e-learning developers at Pennsylvania State University, the University of Leeds, the University of California at Santa Barbara, and the University of Southampton.

## **BACKGROUND**

### **Geography and E-Learning**

Many geographers have enthusiastically embraced the Internet as a tool for supporting learning. The discipline of geography, by its very nature, lends itself more than most to multimedia teaching, as it is a spatial science, which greatly benefits from a visual narrative. E-learning has been warmly embraced by geographers since the mid-1990s with the general advent of Web-based learning technologies allowing for flexible delivery of courses. Studies on e-learning and geography higher education discuss the value of Web-based resources, the role of virtual case studies, and the development of study skills in Web-based environments (Gardner, 2003; Stainfield et al., 2000; Goett & Foote, 2000). The role of multimedia is often championed and widely supported as enhancing learning and teaching in geography (Castleford et al., 1998; Lemke & Ritter 2000; Jain & Getis, 2003). However, few geographers have developed and delivered materials within a context of successful international collaboration (for material development, delivery, and access) with strong pedagogic and design support and rigorous evaluation as we have with our material development.

The development of e-learning for geographers falls within a wider series of e-learning initiatives in HE teaching and learning. For example, within the UK the Higher Education Funding Council for England (HEFCE)'s ten year e-learning strategy (from 2005) refers to the need to embed e-learning into teaching and learning. Implemented by HEFCE's two lead partners, the Higher Education Academy (HEA) and JISC identify their e-learning strategy as contributing to the aims of increasing student numbers, retaining a more diverse student group, facilitating high quality learning for students, and promoting lifelong learning (Hamburg, 2007).

The growth of information and communication technology in higher education has paved the way for experiments in teaching and learning, including the practice of linking faculty and students worldwide using Web technologies. Allied to this is the significant development in the internationalization of the

university curriculum, a trend that many scholars view as likely to become a defining force in higher education in the twenty-first century (Goodman, 1999). It is argued that in the light of shrinking levels of public funding for higher education, many academic institutions will find themselves tapping the revenue-generating potential of online courses and degree programs and increasingly doing so to an international market (Solem et al., 2003). We have seen, since the 1990s, geographers engaged in collaborative and international education (Hurley et al., 1999; Solem et al., 2003). This is seen as providing numerous advantages for the student including access to knowledge and resources and development of cross-cultural relationships - all providing the skills they need to compete in the global economy (Shepherd et al., 2000). The internationalization of geography teaching is also seen at the learner level where students use communication technologies such as electronic discussion boards to support collaboration at a distance. For example Warf et al. (1999) taught a course concurrently in the USA, UK, and Ireland in which students shared their views on issues facing developing regions.

There is not a strong base of evidence to support the theoretical advantages of computer-supported collaborative learning, particularly in the context of international education (Bonk & Cunningham, 1998). It is argued that due to the lack of resources, training, and research, it is difficult for many geographers to understand how to plan and carry out international teaching collaborations using multimedia (Shepherd et al., 2000). However, in this book we showcase the successful development of collaborative (and international) material creation ranging from the simplest of interactions between colleagues to the use of more sophisticated, pedagogically-supported design and concept tools.

## The DialogPLUS Project

This book has developed out of the DialogPLUS project and serves to showcase the outcomes of our endeavors. The project aimed to develop e-learning materials for university courses and to do so for four geography exemplar topics: human geography, geomorphology/environmental management, geographical information systems (GIS), and earth observation. These materials were to be linked with digital libraries of resources (particularly those funded by JISC) and preserved in a suitable repository (JISC's Jorum repository). Allied to this was the additional experimentation of collaborations between universities within the UK and in the USA. Specifically, the collaborations involved the development of materials, the exchange of topic materials within modules, of generic materials, of whole modules and of students. These collaborations form the focus of Section I of the book.

At the heart of the project lies the creation of learning objects (L'Allier, 1997; Wiley, 2002; Gibbons et al., 2000). Although already familiar to the educationalists and computer scientists involved in the DialogPLUS project, the academic geographers found the concept to be rather too restrictive and preferred instead to use the rather more flexible concept of a *nugget*, a re-usable and exchangeable e-learning object. The concept of the nugget used here is scaleable - part of a lecture, a practical or a whole module. Our nuggets come in a variety of type and size: full courses developed from e-learning materials; individual learning activities, for example, census nuggets; and generic learning materials, for example, an academic integrity nugget. This terminology allowed the geographers to collaborate over elements of learning that were readily identifiable in practical teaching situations without initially attending to issues of granularity, metadata, and formal definition. We also experimented with various styles of delivery of the nuggets, from Web-enabled individual activities delivered within an existing face-to-face course to a range of blended learning scenarios within an entire module or course where a mixture of face-to-face and online delivered activities consolidate and support each other. Our nuggets are mostly stored and accessed from institutional virtual learning environments (VLEs) for particular teaching needs. However, in order to benefit the wider HE/FE community we have maintained a project

Web site and placed nuggets on the Jorum repository. The lessons learned from the development and varied delivery of our nuggets provide invaluable insights to e-learning provision within a curriculum - this forms the contribution of Section II of the book.

As well as outputs in terms of learning materials and the knowledge gained from their creation and delivery, the project has aimed to provide tools for materials design. We developed a *Learning Activity Toolkit* to guide teachers through a process of articulating their information needs in order to produce a “lesson plan” for a particular learning activity. Teachers can then modify learning activities from the toolkit’s suggested pedagogical approaches and tools and resources. We also developed a conceptual mapping approach to aid the process of collaborative learning activity design. Both these tools can aid the tutor in designing their own e-learning nuggets. The introduction of these and other learning design tools, and the process of evaluating our teaching endeavors using our new nuggets, forms Section III of the book.

## HOW TO USE THE BOOK

### What Type of Reader are You?

This book is intended for a readership spanning the community of higher and further education academics who are engaged with or moving to online learning. We identify several types of users for this book and here make suggestions as to how they may find the book to be most helpful.

#### Section I: Chapters I, II, and III

As a director of learning and teaching programs you may find it most helpful to begin with our introduction to e-learning within the academic field of geography. This addresses the ways in which we have successfully collaborated to produce new materials, repurpose old materials, and provide access to students and programs both nationally and internationally. We would direct you initially to Section I of the book.

#### Section II: Chapters IV to VIII

As a faculty user you may be most interested to begin with our case studies in Section II, which cover the development and delivery of a range of online learning materials spanning human and physical geography topics. In particular, you may fall into one of the following categories:

1. A *lecturer* interested in developing e-learning materials in your teaching; ranging from the enthusiastic champion of e-learning, to a passing interest in new teaching methods, to the technophobe not wishing to change in style from their much valued traditional face-to-face lecturing (but slowly realizing that change is afoot)!
2. A *drop-in tutor* who requires topic-specific online activities for a particular teaching exercise.
3. A *research student* thinking of becoming a lecturer and faced with the new e-learning environment.
4. *Master’s students* in education and geography who are referred to materials by their tutors.

If one of these descriptions sounds like you, we would suggest that you start with the chapters in Section II.

### Section III: Chapters IX to XIV

As a prospective user of your own learning materials we would also direct you to Section III of the book. As a novice online tutor you may greatly benefit from acquiring new teaching skills and examples by accessing our material design tools introduced within these chapters.

Many of our chapters are useful to a variety of users and not just those with a background in geography. Several of our chapters are of generic use across all fields; for example collaboration and exchange of e-learning resources are covered in Chapter II; instilling academic integrity in your students is addressed in Chapter VIII; and conceptual models and tools for learning design are discussed in Chapters X and XI.

### Section IV: Additional Selected Reading

Our publisher has arranged for us to include in the book three additional chapters from previously published collections. Chapter XV will be of interest to teachers of geography, environmental science and related subjects who wish to get their students engaged with current online materials pertinent for courses on the environment. Chapter XVI introduces a useful portal library developed by colleagues in South East Asia, who show how those resources can be used for geographic learning. Chapter XVII presents a view of “collaboration” in employing GIS that supplements our account in Chapter III. Collaboration in Chapter XVII is concerned with encouraging participation by “customers” in opinion formation, while the earlier Chapter III stresses collaboration in design of materials by a team of authors.

## Accessing the Online Learning Materials

### Web Site

All of our e-learning materials are available through the DialogPLUS project Web site: <http://www.dialogPLUS.org>. We are allowing free access to this site and the learning objects it holds and invite users to take the materials and repurpose them in their teaching.

### Online Repository: Jorum

The project e-learning materials are also housed on the new JISC online repository Jorum (<http://www.jorum.ac.uk/>). The repository is freely available to registered members of the UK HE/FE academic community. Materials can be downloaded and repurposed for teaching use, the site allows for user feedback in order for authors to review and update their materials. Each exemplar chapter in Section II lists the materials deposited on Jorum.

## BOOK SUMMARY

The book describes the experience of developing electronic learning materials in geography topic areas. In particular we address three main parts: (i) collaboration in e-learning; (ii) developing and delivering

learning resources ranging from the use of census data to understand population distributions to the principles of earth observation; and (iii) use and creation of material design aids.

## Section I. Collaboration in E-Learning Development

In Chapter I, Rees et al. outline the learning philosophies, styles, and strategies that inform the development of e-learning materials. The “learning object” is defined and critiqued, emphasizing the importance that geographers place on their students’ need to access a wide variety of digital resources that inform them about the world. From this point the authors define a learning material unit termed the “nugget” (discussed in a previous section) of materials for student use with one or more activities designed to develop understanding combined with student evaluation of the knowledge gained (tests, exercises, reflections). Nuggets connect to external digital resources held in libraries, repositories or Web sites. The chapter illustrates the different styles possible for putting together nuggets from a number of geography exemplars. Out of the inter-disciplinary collaboration of the book authors has come new understanding of the range of approaches to learning (by the geographers) and new understanding of the enthusiasm of subject specialists (by the non-geographers). The authors also report on the understanding gained through working with colleagues in another country. The chapter also provides an example of how e-learning was developed in one master’s program. Lessons are drawn from this experience.

In Chapter II, Leung et al. explore the exchange of e-learning materials, modules, and students. The authors illustrate how e-learning materials require careful design and repurposing before they can be adapted and reused in a meaningful manner by considering pedagogic issues such as course curricula, learning outcomes and intended audience as well as technological aspects including local VLEs and any agreed learning technology standards. The authors illustrate how these issues have been addressed in the successful exchange of e-learning resources at three levels: (1) at the content level, where nuggets are packaged for interoperability; (2) at the institutional level, where learners are transferred from their home institution’s VLE to the collaborating institution’s VLE; and (3) at a higher system level, using an emerging Web single sign-on technology known as federated access management to allow cross-institutional authentication for learners to roam freely in different learning environments.

Durham, Arrell, and DiBiase in Chapter III reflect on the experience of a multi-institution approach to the creation of e-learning material from the design phase through the development stage and onto the embedding of learning activities into existing modules at HE institutions on both sides of the Atlantic. In Chapter III we are introduced to Collaborative Learning Activity Design (CLAD), the approach taken by a group of academic and e-learning material developers at Pennsylvania State University and the University of Leeds to develop a series of learning activities to support the use and understanding of the global positioning system (GPS). The authors reflect on the impact of identifying mutual learning aims and objectives at design phase and their collaborative experience aided through the use of concept mapping and Web-conferencing facilities.

## Section II. Geography Exemplars

In part two of the book we showcase our online geography topics: how they were developed, delivered, what they contain, and how they can be accessed.

In Chapter IV, Martin et al. present the development of a series of shared learning materials developed to facilitate teaching in census and population topics in human geography. The principal focus of this work is demographic, with the created materials intended to support teaching of social geography and demographic analysis. As much of the data describing population characteristics are themselves



published online, the teaching exemplars are particularly well-suited to blended learning; for example, understanding census content through the use of an online census questionnaire, analysis methods through the provision of visualization tools to show demographic trends through time and substantive examples by comparison between urban social geographies in the USA and UK. The authors highlight the particular challenges presented by the different nature (format, content, detail) of the census data available for student use in the UK and USA.

In Chapter V, Darby et al. outline the issues involved in developing, delivering, and evaluating a module designed to support undergraduate learning in fluvial geomorphology. The central concept of the module, which was designed to be delivered in a blended mode, involving a combination of traditional lectures and online learning activities, was the use of a suite of online digital library (DL) resources, comprising both data and numerical models. The module is designed to develop learners' knowledge of the physical processes influencing the evolution of drainage basins, while simultaneously developing their abilities to (i) access spatial data resources within the digital library and (ii) provide a focus for developing skills in scientific data analysis and modeling. The authors discuss the process of course and assessment design, explaining the pedagogy underlying the decision to deliver a unit in a blended learning mode, and the issues highlighted by course evaluation.

Wright et al. (Chapter VI) argue that e-learning offers a mechanism through which to bridge the potential gap between environmental management as professional practice and as concept or philosophy, by allowing enhanced skill and understanding through *virtual* practical experience. The work describes the delivery of information and challenge (question or problem) to students through the communications and decision-support technologies that they will increasingly find taken for granted in professional practice. In this chapter the undergraduate focus of DialogPLUS (a module on Upland Catchment Management) is compared with e-learning projects for postgraduate delivery (a Worldwide Universities Network [WUN] module on GIS for Environmental Management) and a suite of e-learning modules on river management designed for professional training in the Environment Agency (for England).

In Chapter VII, Mackay, Leung, and Milton illustrate the versatility and variety of earth observation as a geography topic in its translation to e-learning—from content-orientation covering a full lecture course in the physical principles of earth observation to smaller topic-specific e-activities such as atmospheric modeling. The authors discuss the development and delivery of a blended learning module where lectures are delivered online and show how learning benefits from the delivery of media-rich materials that can link to earth observation image databases. Equally, the Web is of benefit as a highly adaptable medium where legacy and DOS-based remote sensing programs and courseware can be renovated and reprogrammed to provide a more user-friendly interface. Examples are discussed in this chapter to show exactly how the Web has improved teaching of earth observation.

In Chapter VIII, Durham et al. showcase the development of a generic learning material designed to introduce the development of academic integrity (AI) in students, highlighting its relevance across all academic disciplines. Students need an increased awareness of AI and a clear recognition of the penalties of plagiarism throughout higher education and on into their professional career. At the same time, educators need means to monitor and enforce the rules and regulations regarding plagiarism within their institution. This chapter describes the development and embedding of repurposed AI learning materials from Pennsylvania State University (USA) into the geography programs of the Universities of Southampton and Leeds (UK). The use of the online plagiarism detection service, *Turnitin*, to police plagiarism cases is described; and the effect on skills gained by the geography students from their AI experience is evaluated.

### Section III. Software Support for Learning Material Design

In the third and final part of the book we introduce examples of tools and concepts in learning material design: thus providing the novice e-tutor with a wealth of resources for learning material creation and provide insight to the benefits gained from evaluation of materials for improving material revision.

Fill et al. (Chapter IX) discuss the development of a Web-based application that guides the design of learning activities - *The DialogPLUS Toolkit*. Developed to support the project's geographers, toolkit users are encouraged to consider and specify factors including learning and teaching approach, environment, aims and outcomes, assessment methods, learner and tutor roles, and requisite skills as they design any number of tasks within a learning activity and select the tools and resources needed to undertake them. The output from the toolkit is a design template that can then be used to guide the instantiation and implementation of online learning activities and is saved for repurposing. The chapter authors present the rationale for the toolkit and its taxonomies; they describe the software design, development and implementation, including the approach to contextual "help" and then provide examples of learning activity designs created using the toolkit with feedback from users.

Chapter X (Gahegan et al.) investigates the problem of connecting advanced domain knowledge (from geography educators in this instance) with the strong pedagogic descriptions provided by colleagues from the University of Southampton, as described in Chapter IX, and then adding to this the learning materials that together comprise a learning object. The chapter describes the authors' efforts to enhance their open-source concept mapping tool (*ConceptVista*) with a variety of tools and methods that support the visualization, integration, packaging, and publishing of learning objects. Learning objects enhanced with formal descriptions of domain content and pedagogy are exemplified and used to illustrate improved communication of educational aims and processes. It is proposed that such learning objects might be deployed within next-generation digital libraries that provide rich search languages to help educators locate useful learning objects from vast collections of learning materials.

Smith and Zeng (Chapter XI) describe the design and implementation of digital learning environments (DLEs) organized around sets of concepts selected by an instructor to represent a specific domain of knowledge. The chapter provides an overview of a DLE that has been developed and implemented by the Alexandria Digital Earth Prototype (ADEPT) and is currently in operational use for teaching geography courses at the University of California at Santa Barbara. The DLE involves the design and implementation of various semantic tools facilitating the creation, integration, and use of heterogeneous learning materials from many distributed sources as well as their organization and access in terms of the authors' Strongly-Structured Model (SSM) of concepts. Evidence indicates that undergraduate instructional activities that are based on the application of these ideas in digital library environments are greatly facilitated with the use of such integrated semantic tools.

Learning style theory suggests students will have a preferred technique (or techniques) of learning such as factual, theoretical, or spatial. Since tertiary level geography students have chosen an area of study intimately related to maps, the majority can be assumed to prefer to learn spatially, that is, using maps, diagrams, and schematics. The design of data presentation in diagram form is traditionally presented on paper with an accompanying text commentary. Advances in software have enabled a new multimedia approach to be taken where the diagram is "built" in successive layers with a narrative text commentary. This enables concepts with a high intrinsic cognitive load to be understood whilst lessening the extraneous cognitive load. Recent software development has enabled any author with good skills in PowerPoint™ to be able to create Web friendly content directly. Best practice in learning design is discussed in Treves' Chapter XII in relation to a real case study of a series of distance learning, master's level GIS courses that use this multimedia technique.



Earlier chapters describe and discuss some of the online materials and activities developed to enhance learning for geography students. In Chapter XIII, Fill and Mackay explore the student-focused evaluation of these innovations using quantitative and qualitative methods including questionnaires, observation, interviews, and analysis of online discussion board activity. Subsequently, the analysis of student reflections leads to improvements in the resources. Additionally key project staff members were interviewed towards the end of the project about their experiences by both internal and external evaluators. The authors reflect on the lessons learned from the approaches and results of both the student and staff evaluations.

## Section IV: Additional Selected Reading

In the spirit of re-use and re-purposing of e-learning materials, which is one of the themes running through this book, we have included cognate, linked materials from earlier books concerned with e-learning, with the permission of the publisher and the consent of the authors. These additional chapters add different perspectives from experts in e-learning, which would otherwise be missing from our account.

## CONCLUSION

In our final chapter (Chapter XIV), the editors take a moment to reflect upon the experience and lessons to be learnt from the development and delivery of geography e-learning courses and learning activities. The benefits to teaching are summarized: creation of media-rich online materials that take full advantage of linking to digital libraries; development and adaptation of online, collaborative, and design software; and internationalization of materials through geography teachers in different countries working together. The chapter highlights the prospects for facilitating exchange of resources and student access and provides advice to the aspiring geography e-tutor. We champion the relevancy of the created materials beyond this book and propose that material, its delivery, and its style will not remain static but new developments will be shared via learning repositories (such as the new UK academic learning material depository Jorum), where readers can update geography e-learning materials and deposit improved versions.

The book will be of considerable interest to the expanding community of HE/FE academics who are experimenting with online learning in their courses and encouraging their students to make more intelligent use of the Web to access geographic resources. The book provides students with a guide to valuable learning materials prepared by the book authors, which are available to all in the HE/FE community. In the world of online learning, which is ever expanding and sometimes overwhelming to the user, the book provides a structured introduction to a set of valuable products available for re-use by geographers and educationalists.

We hope that this account, including both our successes and challenges, will inspire already e-literate geography teachers to experiment and develop their own materials and persuade the less electronically confident to take the first steps on this road to, we believe, enhanced learning for all students.

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