

Technology and Geographical Education: A Pragmatic View

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Abstract

The role of technology in education has been the object of a lot of attention and many of its proponents are often enthusiastically embracing its potential. This paper contributes to the debate by providing a pragmatic view based upon a decade long attempt to integrate many technologies in geographical education. Although the advantages of using technology are numerous, especially at improving the quality of the material and of its delivery, it appears that so far technology does not improve significantly the quality of education. For each advantages technology brings about, there is a corresponding pitfall. So far technology has not delivered what was anticipated implying that technology and education needs to be properly assessed. It is however argued that a critical mass has been reached, notably with course management systems, meaning that technology is having a growing positive impact on education.

Keywords: Educational Technologies, Geographical Education, PowerPoint, Courseware.

1. Introduction

A well acknowledged trend underlines that the use of technology is becoming a central component in university education. The less acknowledged trend is that the application of technology generally appears to be more a failure than a success so far. Paradoxically technology is perceived of strategic importance by many universities and a growing commitment is being made on these issues in terms of hardware, software and personnel, all of which having a substantial effect on budgets. The enduring belief, which is shared by the author of these lines, is that educational technologies, when used properly, can contribute significantly and positively to a college education. However, the role of information technologies remains to be honestly assessed. As such, this article will pragmatically investigate the role of technology and education and what are the lessons to be learned by integrating technology within a geography curriculum, especially in terms of strategies and pitfalls.

It is quite clear that technological change is percolating both from above and below and can no longer be dismissed with ease. Our society, and the educational system which is part of it, is being transformed by a Schumpeterian wave of IT innovations that have yet to find their role and potential in respective economic, social and educational structures. It was recently reported that about 128 million Americans (two thirds of the adult population) are using the Internet which is now becoming part of many every day activities. Concomitantly, it is believed that students are also more tech savvy as they grew up with rich media contents and are increasingly expecting to see technology applied to their educational curriculum. It is

reasonable to assume that technology, more specifically its level of application, is gradually becoming a way, among others, which students judge the competencies of their professors. Paradoxically, students rarely themselves make comprehensive use of technology outside being able to run many concurrent sessions of Instant Messenger¹ or browsing the web mainly for entertainment purposes. This author has not observed any significant increase in the students' use of information technology, especially for college work such as term papers. College papers produced these days have little media content, if any, that could enrich their relevance in spite of the tremendous availability of this media information and the powerful software tools at the writers' disposal. Students rarely create graphs or figures² and use only the most basic word processing features. If the use of information technology has not percolated that much among the student population, a similar observation applies to faculty which have generally done limited attempts at integration to their educational curriculums. At best, faculty will be able to use email to communicate with students and make basic bulleted PowerPoint slides that will be shown on an overhead projector. Concomitantly, this shortcoming on both the supply (faculty) and demand (student) sides represents a significant drawback in the application of technology in education.

2. Technology and Education

First, a stark conclusion must be made; the uses of technology in education and in geographical education in particular, are fairly limited. Very few professors are willing to undertake an investigation of the role, extent and impacts of IT in the educational process, especially from an operational perspective which implies applying IT for concrete purposes instead of using technology as a matter of discourse. The level of integration and use of IT as an educational tool remains surprisingly low. Recent reviews confirm this observation:

“By and large, higher education is still a lecture-based enterprise, with only a few faculty members experimenting with innovative new models. There are not many campus experimental learning environments to compare and evaluate.”³

Many arguments could be brought forward to explain this shortcoming. It is quite true that conventional teaching often works very well, especially when professors have spent a great deal of their career improving upon it, so there may be little incentive for professors to change their curriculum or their pedagogy. If it isn't broke, why fix it? It is quite easy to be dismissive about the role of technology under such circumstances, a mentality which often permeates all levels of the academic system. The lack of basic IT skills also undermines the understanding of the opportunities, the potentials and also the limitations of technology in a classroom setting and may even lead to unrealistic expectations, “irrational exuberance” or entrenched criticism. Much work remains to be done on this issue.

2.1 Information Technologies and Learning

¹ Programs permitting peer-to-peer text (and also voice) chatting.

² When they use them they are often only “copy-and-paste” of images from the web.

³ J. McCredie (2003) “Does IT Matter to Higher Education”, EDUCAUSE Review, November/December, pp. 15-22.

Information technologies are transforming the educational process from a closed and controlled environment to an open and lightly regulated environment. Productivity gains are likely to be a deciding element of this transition as only if the use of technology results in an improved educational experience, both for the faculty and the students, that it will be experimented and implemented further. A convergence of “multiplying factors” expanding the relevance and usefulness of IT in the educational process, namely portable computers, wireless access (truly mobile computing), fast internet access (expands the diversity of applications and media access) and large storage capabilities (expands the quality of the digital media) is being observed. Course management systems⁴ (CMS) are now a maturing technology making the operation of a course curriculum a rather easy and straightforward activity. In addition, they have emerged as a multimillion dollar industry where a substantial amount of investment is made to improve their usability. The Internet and all its components (email, hypertext transfer protocol, file transfer protocol, etc.) have become of very high importance to maintain a cohesion in the complex set of interactions students are establishing among themselves, with professors and also with the curriculums they are following. Surveys have found that about 89% of the students receive e-mail class information from faculty, that 75% of them use e-mail for clarification or information on assignments, that 73% use the Internet more than the library for their research and that 56% say the Internet has improved their relationships with faculty.

The conventional perspective about education and its outcomes involves three levels of learning; shallow, deep and profound. The table below summarizes the major modes involved in each level of learning.

Table 1: Main Modes of Learning⁵

Modes	Shallow Learning	Deep Learning	Profound Learning
Means	Memorization	Reflection	Reasoning
Outcomes	Information	Knowledge	Wisdom
Evidence	Replication	Understanding	Meaning
Relationship	Dependence	Independence	Interdependence
Stimuli	Single source	More than one source	Multimedia
Teaching mode	Didactic / Presentational	Group participation	Inquiry-based

⁴ Blackboard being one of the most popular CMS.

⁵ J.D. Bransford, A.L. Brown, and R.R. Cocking (eds) (1999) *How People Learn: Brain, Mind, Experience, and School*; Committee on Developments in the Science of Learning, National Research Council.

It is up to the professors through their approaches to evaluate the outcomes of their pedagogies. Obviously, attaining a profound level of learning represents a substantial challenge and commitment. Per se, technology is entirely *independent from the learning process*, but has a substantial potential to enrich, diversify and expand the learning experience. The following table provides examples on how technology can be integrated to reflect those issues.

Modes	Shallow Learning	Deep Learning	Profound Learning
Use of technology	Passive / Display	Interactive	Knowledge base development
Examples	PowerPoint presentation w/o student access. Digital video presentation.	PowerPoint presentation with student access and flow control as well as with class discussion. Digital video access (streaming). Online Q&A.	Integrated courseware Simulation

As the above table illustrates, the use technology is linked with every modes of learning, from shallow to profound. An inappropriate use of IT is no panacea to a well designed curriculum. Two particular focuses can be developed:

- **Interactivity.** Can involve many dimensions related to students' input and response, but at least the students must have a level of control over the flow of information. They can consequently establish a closer rapport with the class material.
- **Knowledge base development.** Involves the organization of all the course related material in a comprehensive environment. The student has access to a variety of media elements ranging from text, images and even videos with which he/she can interact with. This environment also includes communication capabilities outside class time between the students and the professor and between students themselves (e.g. discussion boards).

Building "knowledge bases" is of strategic importance so that education, which significantly involves the transmission of information (using all sorts of strategies), become a more open, accessible and democratic process.

In general, a knowledge base is a centralized repository for information: a public library, a database of related information about a particular subject. In relation to information technology (IT), a knowledge base is a machine-readable resource for the dissemination of information, generally online or with the capacity to be put online. An integral component of knowledge management systems, a knowledge base is used

to optimize information collection, organization, and retrieval for an organization, or for the general public.

Many strategies can be used to develop knowledge bases. One of the most simple and convenient found so far by the author is using programs such as PowerPoint to encode, store and retrieve educational information. Each slide thus represents an organized idea in whatever form, namely textual, tabular or graphical (charts, figure or maps). Web development languages, namely HTML/XML are also very convenient for such a purpose as information and relations (linkages) can be encoded in a multitude of pages that can be non-sequentially retrieved (through search engines for instance).

A substantial amount of efforts must be spent to insure that the use of technology would at least involve a process of deep learning and thus have a good level of interactivity. It can involve the development of an extensive array of PowerPoint slides, digital videos and online interactive material that are freely and entirely available within a courseware package for a CMS. It is important to move beyond the standard didactic lectures that characterized initial attempts at integrating technology in the classroom. Digital content creation is of utmost importance to ensure a successful use of educational technologies.

2.2 Media Presentations

A great deal of the act of teaching involves interacting with a group and inducing their participation in the learning process. There are numerous forms in which this interaction may take place, but presentational and didactic skills are of foremost importance in college education. Many technological tools are available for this purpose. For instance PowerPoint has become a widely used presentation tool, mainly because of its ease of use and maintenance, of its powerful design capabilities and its high level of adoption making files widely sharable. Through a comprehensive use of PowerPoint for educational and scientific purposes, namely as a structure for the development of knowledge bases, its impacts as a didactic tool can be observed. Among the most notable advantages are:

- **Comprehensive course contents.** A well built PowerPoint knowledge base provides content rich didactic material, especially if figures, maps, photos and graphs are jointly used. Each PowerPoint slide is a parcel of information and it is the role of the professor to insure that this information becomes at least knowledge for the student. The drawback of this approach is that much more time and effort must be allocated to course preparation, namely gathering information and building a complex knowledge base. The design of each slide thus involves more than just the creation of information, but also keeping in mind how it will be delivered in the classroom. PowerPoint is jointly a media and a medium. Significant time and effort must be committed to such a purpose and the process involves constant modifications and re-design of the material through trial and error. By using slides, each lecture thus tends to have a higher level of preparation than a lecture not relying upon PowerPoint (especially from the student's side). Economies of scale are also observed as the greater the number of slides being created, the easier it becomes to put contents together on a wide variety of topics.

- **Availability of the material.** Education has certainly a lot to gain if it is practiced as an open and accessible process. By letting students have access to class notes, a contribution to this climate of openness and fairness in terms of the material they will be evaluated on. If they have the possibility to download and print the slides before class, the learning outcomes should be enhanced. Accessibility of class material to be used by other professors is also a positive factor as it promotes the diffusion of ideas and points of view in the academic community.
- **Easier and uninterrupted information flow.** Once a PowerPoint presentation is running, each slide becomes a reminder of the material being covered. Under such circumstances, a professor does not require the use of any notes and faces the classroom more often. A lecture becomes a “coordinated improvisation” where the material is presented to the students according to the professor’s perception of how well the students understand the topic being taught. The material flows uninterrupted from one slide to the other at a pace fit with the level of class understanding. Opportunities to use additional examples can also be grasped as they arise. With the diffusion of wireless technologies (initially a wireless mouse and later a wireless tablet PC), a professor no longer needs to stop his/her discourse to trigger the next slide in the presentation. The majority of teaching time is thus spent in the classroom right in front of the students, instead of behind a podium (or turning having one’s back turned to write on a blackboard). This conveys the message of a more accessible and engaged professor.
- **Avoid an over-reliance on note taking.** It can be argued that note-taking is an important part of the learning process as it gives an opportunity to assimilate a lecture and transcribe its core elements in one’s own words. However, heavy note taking can undermine the student’s understanding of the material as their focus is on the transcription of what they hear into notes. While doing so, they do not necessarily listen and understand what is being presented to them. If students can listen and take notes in a more structured way, learning outcomes can be improved. They can thus spend more time listening and understanding the material. A particularly effective strategy is for students to print the slides before coming to class in such a way that note-taking adjacent to slides is possible. It combines the benefits of having full class notes and the didactic benefit of note-taking.

Although many elements in using PowerPoint in a classroom setting lead to positive feedbacks, pitfalls that undermine the effectiveness of presentation technologies as educational tools have also been observed:

- **Passivity and class participation.** Over reliance on PowerPoint may encourage passivity and discourage participation in classroom discussions. Students facing comprehensive and well organized presentations may fall into passivity as they may get the impression that the work has been done for them. They make the mistake of confusing the act of seeing information with the act

of learning its meaning. A lecture can become a spectacle with which the audience does not feel compelled to get involved with. The efforts that have been spent in class preparation may backfire into a form of intellectual laziness on behalf of the students. Under such circumstances it is important to keep the focus on the lecture and the professor instead of the presentation. The physical setting of the classroom may play an important role in this pitfall with factors such as lighting and the arrangement of sitting spaces encouraging or preventing a disconnection from the lecture depending on the situation. The problem becomes exacerbated if online access is available to students in the classroom (such as workstations). An additional opportunity to lose contact with the lecture is then possible.

- **May fix the lecture contents in a preset structure.** Many lectures have often no specific structure, outside the topic set up in the course outline. It is at the professor's discretion to control the flow of information in view of how well the class performs and understands the material as it gets taught. Structuring a lecture around a PowerPoint presentation provides an organized curriculum. However, this curriculum can be in a rather rigid linear structure that may not leave enough margins for improvisations based upon issues randomly arising, especially if the professor is unwilling to digress. From another perspective, ill-structured lectures are often perceived negatively by the students as they leave the impression, quite rightfully, that the professor does not provide much to their education.
- **Possible small reduction in class attendance.** When PowerPoint presentations are provided as part of a comprehensive courseware, a common misconception by some students is that class attendance may not be fully required. Online availability of class notes can be perceived as a panacea to attendance and the learning taking place during lectures as the ability to recall any slide afterwards confers a false sense of belief that classroom learning can be replaced. It has been noticed by the author that students doing so tend to have low motivation levels and are not performing very well. This leaves the impression that whether presentation technologies are used or not, the interest and involvement of such students would not change by much⁶. Online availability of class notes may also be a positive factor as students who cannot attend a class because of medical or personal reasons have an opportunity to access the material and keep up with the course. Under such circumstances, this issue is of little relevance as the drawbacks are more than compensated by the advantages.
- **Information overload.** A large amount of information can be encoded in PowerPoint slides. The ease at which information can be structured within a presentation tends to favor a larger use of it. The outcome is often a lecture that covers more material than usual. The issue is difficult to mitigate as the intrinsic goal is to improve the quality of education by providing the most

⁶ This is also known as the "bimodal distribution syndrome" where an acute variation in the motivation and performance of students is observed.

accurate and relevant information about a topic. Efforts to present the information in a symbolic format, namely figures and graphs, so that their understanding is facilitated must be made. A positive feedback has also been observed as students see a large amount of information as an effort on behalf of the professor to improve their educational experience. They also tend to see the professor as a more knowledgeable individual.

- **Hardware and software glitches.** In spite of more than 20 years of maturation, IT has become so complex in terms of hardware and software that there are numerous potential to see one component fail at a critical moment and correspondingly disrupt a technology dependant lecture. A program may crash or the hardware may not be properly configured to support the didactic material, an issue commonly outside the professor's control but to which a responsibility must be assumed since students will link a glitch with the lecture.

Considering those pitfalls, the use of PowerPoint, or any presentation software, has raised many debates in recent years concerning its relevance, use and abuse. This has been particularly the case in the business sector, but also increasingly in education where many educators reassess its usefulness. The term "*PowerPointlessness*"⁷ has even been coined:

In a PowerPoint presentation, any fancy transitions, sounds, and other effects that have no discernible purpose, use, or benefit. Also refers to an ill-prepared presentation where the presenter contributes little to the message.

Both sides of the debate agree that the key element of a presentation is the presenter and that PowerPoint is at least (or at best depending on your side) a tool that can be used for such a purpose. Like all tools, the results are related to the proficiency of the content creator both in building the presentation and presenting it effectively. Among the many possible strategies to improve the quality of a presentation are:

- **Support function.** PowerPoint should only be used to support a presentation and should not be the dominant focus. The attention should as much as possible be on the presenter with all the conventional presentational skills involved, such as eye contact, intonations, pauses, gestures and queries. New presentational technologies have greatly improved the separation between the presenter and the hardware and on the long run educational technologies are likely to become so effective and ubiquitous that they will "disappear".
- **Visual effects.** Special effects, such as animations, transitions and sounds, should be used sparingly, if at all. They tend to distract the audience from the core message of the presentation. Efforts must be made to make a simple and esthetically attractive presentation with presentations having a simple graphic design, no animations, sounds or transitions. However, animations should be used when they serve an educational purpose, such as explaining a complex idea.

⁷ The term "death by PowerPoint" has also been used.

- **Flexibility.** It is important not to become embedded in the structure of a created presentation and to recognize the need to digress when an opportunity arise. Although the organization of didactic material is commonly set up as a linear and sequential process, opportunities to explore an arising issue, namely a question from a student or a random recollection of an anecdote, should always be acted upon.

2.3 Courseware

Colleges can no longer simply compete on the issue of IT availability on their campuses. Competition ceases to take place on the ground of innovation, but on the ground of know how, integration and efficiency. As hardware becomes ubiquitous and is no longer a factor of comparative advantages⁸, the importance is now gradually shifting towards the level, the quality and the level of integration of respective educational courseware.

Courseware, a term that combines the words course with software, is educational material intended as kits for educators or as tutorials for students, usually packaged for use with a computer. Online access has become a common mean of accessing courseware contents, which can encompass any knowledge area, but information technology subjects tend to be the most common.

For instance, the Massachusetts Institute of Technology has initiated a massive open courseware initiative⁹ where the contents of more than 500 courses are made freely available. This underlines that the most important phase of integration of technology into education is not related to the diffusion of IT hardware, but the creation of digital contents and its use by professors and students. By doing so, the MIT builds on its prestige and position itself as a courseware provider.

Course design and management tools have become readily available, simplifying the process of placing course-related information online. Most courseware are however restricted in access. A standard courseware interface, such a Blackboard, is a shelf that can be filled with any form of material supporting a class and only made available to registered students. This educational strategy is closely imbedded with the curriculum of many professors. Under such circumstances, a course becomes more than a professor and a textbook. It becomes an organized learning structure rich in information and where the professor assists students in the learning process. An online courseware typically contains:

- **Announcements.** Used to inform students about general class events such as examination dates or assignments deadlines. Students can be notified of last minute changes (such as a cancelled class) or that new class material is now available. Students appreciate the ability to be informed of course developments outside the classroom as they can plan and react accordingly.
- **Syllabi.** The course outline can be made available, as well as office hours, contact information and a link to the faculty home page. This is particularly

⁸ For instance, stating that a campus has Internet access and computer labs is irrelevant.

⁹ <http://ocw.mit.edu/index.html>

useful as the course outline tends to be the document that the students lose the most.

- **Assignments.** Assignments are posted, enabling students to keep track of their workload during the semester. Putting each assignment in their electronic calendar is also a supplementary way to help them with their workload. A strategy that has been particularly useful is the provision of templates, which is a blank preformatted word-processing document in which students can type their assignments. A template contains a title page, suggested divisions (abstract, introduction, subsections, bibliography, etc.) as well as consistent margins, font type and size and line spacing. A common problem is the wide variety of formats students use to hand in their assignments, often making it difficult to assess if they satisfy the minimum length requirements. Several students are purposely using mono-spaced fonts (such as Courier), wide margins and extended line spacing to make their assignments appear longer than they really are. Requesting students to use templates goes a long way to ensure a consistency in the format and length of written assignments.
- **Digital drop box.** This feature turned out to be a very convenient feature, as students can now submit their papers online. They simply need to upload their papers in the drop box, which electronically stamps the exact time which the paper was submitted. It goes a long way at removing the common hassle of having students submitting their papers on time, with the classic “misplaced paper / being placed under the door” situation. Papers can then be graded electronically, and handed back to the student’s drop box.
- **Online PowerPoint slides.** Posting PowerPoint slides adds specific knowledge bases to the courseware and represents its most substantial component. PowerPoint slides can be used both as a didactic tool and as core material for class notes. By making slides available as courseware, the students have the capacity to print the slides and review the material before coming to class. This reduces unnecessary note-taking and let students have more opportunities to be involved in class participation.
- **Online quizzes.** They are one of the most convenient courseware features. A wide array of queries can be built, such as multiple choice questions, true or false, terms matching, etc. The most common use of online quizzes is to evaluate the level of understanding of the material covered in each lesson. They are also used to help students understand specific topics.
- **Additional readings and related websites.** The Internet contains a staggering amount of reading materials (news, articles, books, databases, etc.). Facing the disorganized state of this information, the professor can provide a list of selected / suggested electronic references. The outcome is a focused electronic library. Links to selected material and web sites can be of much relevance to coach students into a deeper understanding of concepts and case studies. They

are also of use to assist them in the research of information related to their assignments.

- **Digitized video clips.** Many instructional videos can be encoded and edited to maximize their relevance. Advances in personal computing now permits video editing, including the production of video streaming. Students are thus able, with a high bandwidth connection, to view videos online to enhance to material seen in class.

Jointly, all these elements of a courseware provide a rich environment, when used properly, in which learning takes place.

2.4 Digital Media

Integrating technology in education underlines the importance of developing digital media, as its core purpose is to facilitate the creation and diffusion of media. Media elements are fundamental as information in a classroom can only be transmitted in an auditory of visual format. The quality of this format improves the educational experience. One way to improve learning outcomes is to offer material or ideas that the student would not otherwise have seen. The use of digital media in courseware supports such opportunities. Graphic design skills are important so that the result is esthetically pleasing as well as efficient to convey a message to an audience using visual symbols. Geography is a discipline particularly prone to the development of such media as it has a long tradition of visualization, especially with cartography, giving the discipline a unique perspective on the creation and display of information¹⁰. The creation of digital media is thus an issue that has received a lot of attention and effort, as it is a core element in the development of knowledge bases. Of particular relevance are maps, graphs, figures and digital videos:

- **Digital Maps.** Maps offer a powerful way to explain locations and spatial patterns. Maps help understand physical, economic, demographic or social processes in a fashion that data shown otherwise would not. The effectiveness of maps as a didactic tool is very high, especially when those maps are displayed in color and can be interacted with.
- **Digital Graphs and Figures.** They are conventional tools used to either display a concept or quantitative data in a way easier to understand and thus more useful in the educational process. They provide substance to ideas as students can more clearly see relationships between variables.
- **Digital videos.** They represent an extension of a well used media in education. Advances in digital video technologies now permits video capture and editing on a standard PC. Then, those videos can be edited for content, which means that content that is no felt to be relevant or out of date can be modified or removed. The outcome are shorter and more to the point video segments, increasing their educational usefulness. Visual or audio comments can even be

¹⁰ Brunn, S.D., S.L. Cutter and J.W. Harrington (eds) (2004) *Geography and Technology*, Dordrecht, The Netherlands: Kluwer.

added. DVDs can also be made that would contain class material, videos and even taped lectures.

3. Conclusion: Technology in Education Still a Controversial Issue

In spite of all the issues discussed above, it is too early to fully assess the impacts of technology in the educational process, especially since its use can sometimes be controversial. As far as this author is concerned, the use of technology in many ways has made him a more effective educator, especially by giving students access to high quality and up-to-date information in the form of Courseware. The feedbacks from the students have been overall positive as they often tell that the digital material helped them a great deal to understand the topics and wished that more professors would do so. Courseware made freely available online is often increasingly being used in other institutions¹¹ and as faculty and researchers keep posting such elements online, the pool of courseware increases accordingly, creating a virtuous circle.

From the author's experience, it may either come as a surprise or an expectation that the use of technology has not resulted in any significant increase in teaching evaluations. On some issues, such as the perceived quality of feedbacks, scores have declined with the increased use of technology. The obvious conclusion is technology is no panacea to good teaching methods, class interactions and that a balance must be found between conventional and technology related didactic strategies. Technology may even make teaching more challenging by adding an extra layer of difficulty to class preparation and to its delivery with for instance hardware and software glitches disrupting lectures. Even if the maturation of Courseware packages has considerably simplified the process, it remains a complex task. The pedagogical dimension of the use of technology certainly remains to be improved by technological and non-technological strategies alike. It is a significant investment in time and effort from which on the long run substantial benefits are derived in terms of better class preparation, flexibility of the material and high quality and up-to-date contents.

¹¹ The author often receives requests from professors and professionals to include parts on the material made available online into their educational curriculum.