

October 6 – 8, 2009

**Higher Colleges of Technology – Abu Dhabi Women’s College
Abu Dhabi, United Arab Emirates**

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ICEM-CIME

International Council for Educational Media


ICEM-CIME 2009 Conference.

ICEM-CIME 2009 Conference *Literacy and You in a Digital Age* - October 6-8, 2009

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 **ICEM-CIME 2009 Conference *Literacy and You in a Digital Age* - October 6-8, 2009**

Higher Colleges of Technology - Abu Dhabi Women's College; UAE

Foreword:

ICEM: the International Council for Educational Media brings together experts from the fields of education, media, IT, and educational media production. In 2010 ICEM will celebrate its 60th anniversary. Since its formation in 1950, the organization has witnessed and contributed to educational media in an international forum. ICEM had provided a nexus for theory and practice to merge, developing partnerships and potential for education worldwide.

In 2009 the state of literacy is undergoing fundamental change. Language is used flexibly in modern mobile media: pictures, photos, icons and more have produced a semiotic form of literacy. Online gaming is changing the concept of learning and experience. This type of change is reflected nowhere more than in the United Arab Emirates. In the last 40 years, the U.A.E. has moved from a male only, one-school-class, rote-learning system, to primary, secondary, tertiary education of both sexes, with blogging, wikis, interactive boards, and multimedia as *standard*. The dilemma of socioeconomically engendered “digital divides” is fully overcome in the Petrodollar economy. Educational Theory becomes practice in this technology rich online, wired environment.

This environment poses challenges for literacy not only in the native language, but also in the L2 lingua franca English. Many families are proud to have a first literate generation attending college. Books and the written word are not greatly in evidence in this traditionally oral culture. This is a culture where Koran-literacy in L1 has moved to digital literacy in L1 and L2 whilst overtaking and subliming from teacher’s ideas of reading, writing and critical literacy. The need to bridge the gap between traditional teaching and digital literacy is central to the UAE teaching experience. And so it would seem that reading and writing in the traditional sense have been side-stepped in favour of a more immediate and richer literacy experience.

The new web generation or *generation W2* is fully versed in the technologies of today. Indeed, the web generation learners in the UAE communicate skilfully via texting, blogging, Facebook, Twitter, SMS, chat, video call, and Online Games. Typically, research looks into the application of W2 media in cultures with established modes of text literacy, such as Hanna Gerber’s Study

of Adolescents in the USA, or at the challenges faced by those without the means to afford the exotic technologies of the hour such as in Maria Lourieo's study of ICT in Mozambique. In this ICEM conference there is a focus too on the UAE aspect. How the large desert can be overcome to provide resources in an interactive video classroom, such as in Ghassan Frache's Paper on teaching in the Western regions of Abu Dhabi.

The 2009 ICEM conference *Literacy and You in a Digital Age* has brought international and local expertise to bear on the possibilities presented by media in promoting and developing literacy and knowledge. The paper sessions vary from all aspects of digital learning. From the pilot distance learning Project (simultaneous video link) between the Madinat Zayed and Ruwais colleges of the Higher Colleges of Technology – separated by some 180 km of sand desert, to the integration of digital archives to improve undergraduates work in Taiwan. Or from a study of 10th grade boys' literacy attainment with video games in the USA to the pioneering steps in ICT in Mozambique.

Finally, great thanks go to ADWC acting director Steven Munns and also Dr. Ken Beatty for tirelessly assisting in the reviewing of papers, and the whole of the Higher Colleges system, including the most honoured patron, His Excellency Sheikh Nahayan Mubarak Al Nahayan, (Minister of Higher Education and Scientific Research and Chancellor of the Higher Colleges of Technology), and the Vice Chancellor of the HCT System Dr. Tayed Kamali. Without their support and vision, this conference would never have become a reality.

The international Council for Educational Media in Collaboration with Abu Dhabi Women's college are proud to present authors ranging from professors to student, with papers from all avenues of education. The collection of papers represents a snapshot of the current state of digital literacy in an international context.

Alex McTaggart

(Conference Chair)

Abu Dhabi October 2009

INFORMATION, KNOWLEDGE AND DIGITAL LEARNING: A POST-MODERN APPROACH

Dr Constantine Andoniou

ABSTRACT

The paper reports on the underlying principles of a philosophical study on the structure and organization of the system of information and social knowledge in learning environments based on digital and electronic communication. It calls for a reconsideration of our views in dealing with the application of information communication technologies and it provides the theoretical background towards the development of an analytical model for information and knowledge in digital and electronic learning environments. The paper reports on the primary hypotheses established to support a series of theoretical approximations on the structure and organization of information, on the new dimensions of [hyper] reality and on the *fractalization* of social knowledge. The proposed model of *Infogramic Analysis* aims to advance our understanding of how learning occurs in digital communication and of how information communication technologies in digital and electronic communication based learning environments re-organize our representations and 'realities' of the world within and around us, and consequently dictate and influence decisions of social action.

KEYWORDS

post-modern theory, sociology of knowledge, information theory, learning theory, digital learning, educational technology, information communication technologies, ICTs

INTRODUCTION

In a digital world where 'everything is, everything is not, or everything can be at the same time' the quest for 'true' and absolute 'realities' becomes highly debatable and problematic. Attempts to satisfactorily explain the contemporary world and human nature are often inadequate and insufficient justifications that simply generate more confusion and refreshed disillusion. In an information dominated world, as human and machine information processing converge with unpredictable futures, we need to seek fresh new perspectives of understanding and reasoning, we need to accept that there can only be variations of given facts and 'realities', *theoretical approximations*, as Lefebvre (1991) put it, to 'the true' or 'the real'. If the quest for scientific truth and reality themselves has become at best ambiguous, our priority should be to reset our world views and standpoints to cope with, and respond to, the speedy technological developments and the emerging new bodies of knowledge within a global and inter-connected learning environment.

The challenge nowadays, is to re-consider the value of the available and ever-increasing information, to re-validate our social experiences and the produced knowledge in the context of the global electronic communication and digital technologies. To do so, it requires ontological, epistemological and conceptual shifts in the ways we think and theorize about ICTs and learning with ICTs. It involves a re-examination of the ways we analyze and process information to reach a satisfactory degree of understanding of how our daily digital environments and informational landscapes are constructed. The pedagogical implications of what we teach and of how we learn in our digital environments will then become manifest, and, for this, we will urgently need to rethink and reorganize our teaching methodologies and strategies, our learning resources and short- and long-term educational objectives and aims.

INFORMATION AND KNOWLEDGE IN THE DIGITAL AGE

An in-depth analysis and contextualization of the structure and organization of digital information systems and knowledge can be realized within four inter-related hypotheses:

- The *Information Flow hypothesis* states that mediated flows of information provide a way of describing (discourse) contemporary history, politics, economy and culture. Such discourses of representational information construct our social knowledge at different levels of human information processing. Informational representations are language and visual images, which in turn shape ideology and are expressed through responsive patterns of social communication and action.
- The *Social Knowledge hypothesis* states that these technologically mediated flows construct social knowledge, identity, and action. Social knowledge is to a great extent controlled and shaped by global communication media. In their spatial environment of operation, that of hyperspace, human/machine information processing and exchange, converge to fractal levels of distortion of the system of information.
- The *Code of Information hypothesis* states that these mediated flows of information have specific structures, channels and processes that effect society and knowledge. The structure and organization of the system of information can be analysed to its distinct code. Isomorphies and analogies can be identified among systems of social knowledge. The line between 'generic' human information processing, and 'external' cybernetic interference is thin, challenging authenticity and free expression in human communication.
- The *System of Information hypothesis* states that a distinctive, contemporary epochal organization of information exists in space and time that influences cognition, everyday life and society. The system of information is characterized by three levels of spatial organization across time: the *era of Romanticism*, the *epoch of Ersatz*, and, the *age of Chimera*, representing, freedom, exploitation and domination of the system of information, respectively. Their levels of intensification regulate the relations of meaning, and consequently the organization of the social.

To establish the contemporary historical and socio-cultural conditions of these hypotheses one needs to look into theoretical accounts of contemporary social organization and structure, ideological systems and cultural trends, information theory, cybernetic control and human communication. Systemic properties, interdisciplinary analogies and isomorphies, identified throughout these analyses provide the basis for a fresh philosophic description of the current epoch, consisting of theoretical

approximations, more speculative and futures-oriented, regarding the organization and implication of the system of information in the era of global electronic communication and digital technologies. The current paper though reports more on a description of the hypotheses that establish the proposed model of philosophical assumptions, and less on the model itself.

TOWARDS A SPATIAL UNDERSTANDING OF DIGITAL LEARNING

The Information Flow hypothesis

Our view and perception of the social, the world out there, are shaped by our accumulated life experiences, which exponentially add up to our banks of social knowledge. The discourses of history, politics, economy and culture, as separate, though inseparable to each other, as discourses of representational information, construct a real and imagined at the same time vision of this world within the human mind. As a result informational representations are constructed at the subjective and collective levels of human information processing, and are therefore dependent on the organization of the system of information within which they originated. Informational representations take form and shape in language and visual images, are reflected and manipulated in ideology, and finally they are expressed through patterns of social communication and action as a response to historical, political, economic and cultural conditions (Figure 1).

An analysis of contemporary social theory reveals of the dominant historical, political, and socio-economic attributes of the world society. In theoretical accounts concepts such as the information society, the post-industrial society, the public sphere, flexible specialization, heightened surveillance, the network society, and digital capitalism, and so on, the concept of information is identified as a key form of representation, which is structuring and organizing social knowledge, consequently social life, at diverse cognitive levels and geographical configurations. The concept of information emerges as the defining feature of our contemporary society. It has always been a defining characteristic of industrial modernity, but the technological innovations in the late 20th century have led to the intensification of its volume and usage. This intensification is conducive to an emerging global social experience. This in turn has been traced to mixed effects, ranging from the radical reorganization of advanced, developing, and under-developed world economies and practices of everyday life, to the growth of a global youth consciousness and understanding among people.

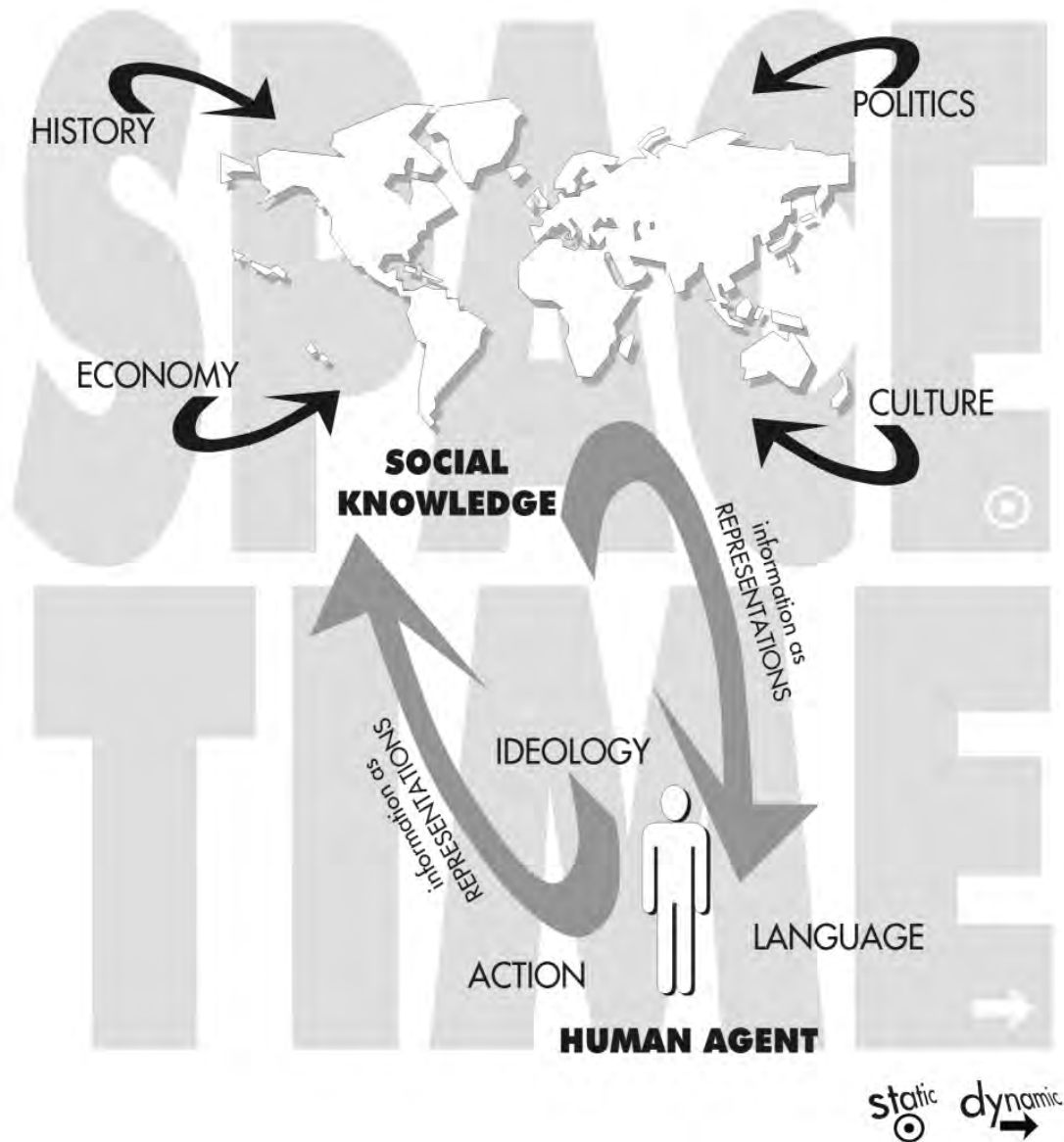


Figure 1. The Information Flow hypothesis.

In this respect, social 'reality' is now an informational product, generated by the processing and management of the dominant flow of information, through means of electronic communication and advances and applications of digital technologies. Therefore, the organization of social structure and associated processes can be seen as a reflexive response of the organizational patterns of the system of information. What is needed today is to direct our thinking towards multi-perspectival, inter-disciplinary and in-depth micro-analytical conceptualizations and theorizations. Such theorizations can become one

of many starting points for a reconstruction of social theory dealing with human and/or machine (computer) communication in the era of intensified digital technologies and applications.

The Social Knowledge hypothesis

Within the boundaries of our physical space and across the arrow of time our perception of what constitutes (collectively and/or individually) acceptable social knowledge is to a great extent controlled by the global communication technologies and media of all forms. The system of information entails controlled representations of the intentions and the financial interests of transnational media corporations and their affiliated corporate and governmental infrastructure. At another level of spatial consciousness, that of hyperspace, human and machine information processing and communication, converge and align along fractal levels of distortion of the system of information. It is this distorted system of informational representations which in turn shapes our knowledge of the social – often to comply with distinct corporate interests. Let alone the nature of knowledge per se, more importantly, events of social change and decisions of social action, in this respect, become ambiguous and questionable, as to whether they are expressions of individual choice and freedom or reproductive of well-established patterns of exploitation and domination. They are expressed in the form of ideological systems, which influence and are influenced by the cultural conditions and environment within which they emerge (Figure 2).

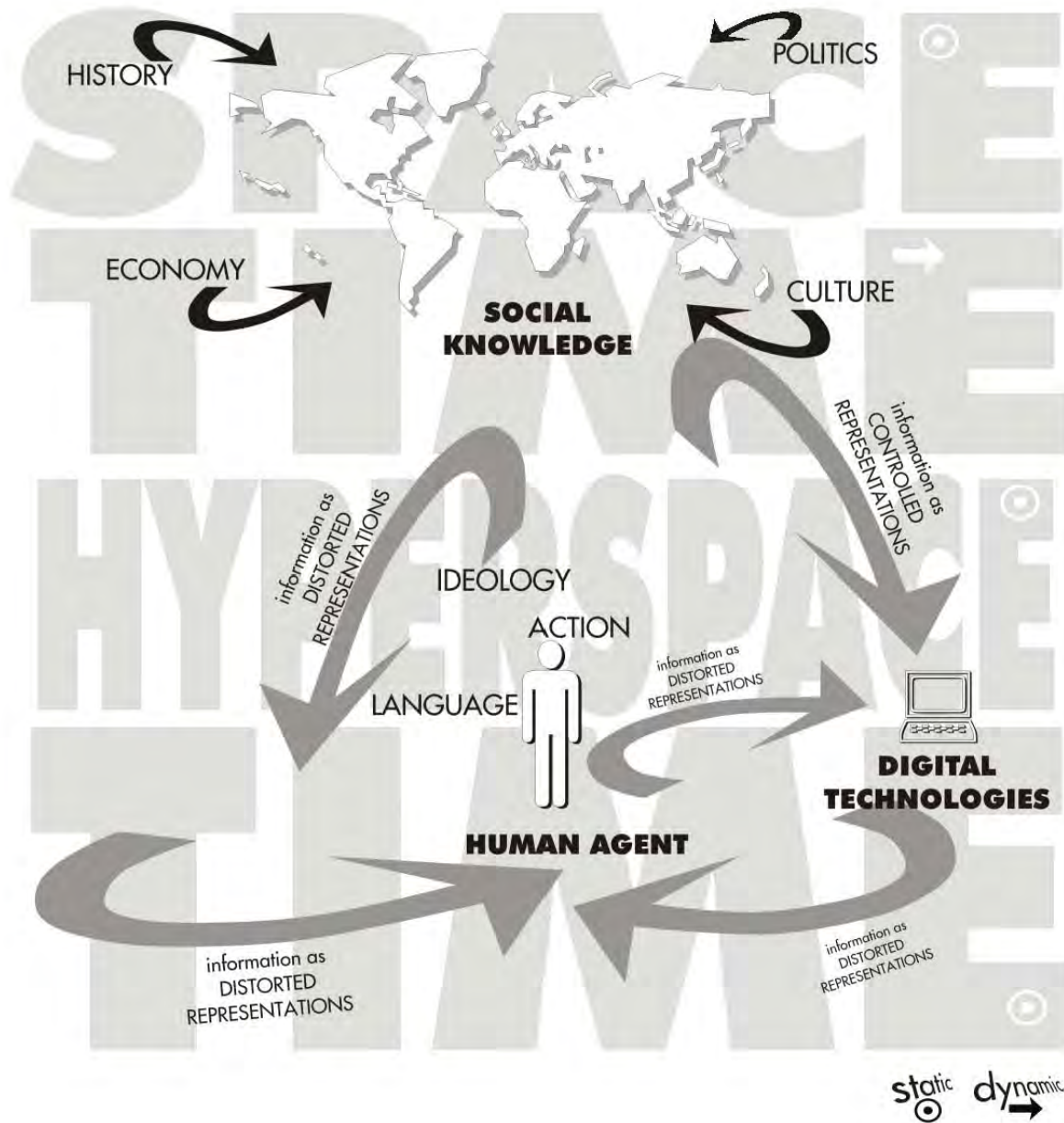


Figure 2. The Social Knowledge hypothesis

The development of information communication technologies and telecommunications networks has intensified the production, generation, regeneration, circulation and exploitation of the system of information in an endless vicious circle. Human interaction and communicational practice with computer technologies form and recreate new social attitudes and modes of spatial thinking. The increasing flow and management of the system of information reconstructs social knowledge and re-organizes social life. Its mechanics are characterized by interactivity, networking and flexibility. The new relations of human experience and construction of meaning are re-negotiated in the hyper-real cultural environments. They are globalized through economic systematization, the design and promotion of a

global culture and consciousness, which seemingly integrates and unifies the world on the surface, but leaves the particular details of the validity of the underlying changes and transformations unresolved.

With regard to the hyper-real cultural environments within which new knowledge is digitally constructed, I suggest that we are now in a phase past post-modernity, which can be termed *post-modernity-and-beyond*. *Post-modernity-and-beyond* it is characterized by a virtual intensification of social characteristics, related to the concept of the system of information. Postmodern positions, generally characterized by a spirit of relativism, irrationalism and nihilism, criticize the insufficiency of the modern, and reject notions of causality in favour of multiplicity, plurality, fragmentation and indeterminacy. Postmodern views emphasize the deconstruction of traditional societies, language, signs, and images, knowledge and technologies of the self, schizos, rhizomes and nomads, implosion and simulacra, desire and discourse. I maintain that the postmodern organization of the world society around digital communication technologies is responsible for the reconstruction and regeneration of cultural systems worldwide. It is powered up by an uncontrollable flow of information, responsible for the reconstruction of a digital hyper-real world, that we only start to understand.

The Code of Information hypothesis

The emerging new forms of post-modernity are dominated by the *code of information*. These forms do not consist separate historical periods, rather they are manifestations of the intensification of certain cultural attributes because of the ever-increasing surplus of information. New relations between spatiality and time are generated by the code of information in the hyper-real cultural environments. In our traditional physical world, the past exists in the form of memories and as practiced and acknowledged experience that has been interweaved in programmes of intended future action. The future exists only in the sphere of our imagination, and exists only as a projection of calculated evaluation and desired outcomes (Figure 3).

The organization and structure of the system of information can be analyzed through the *code of information*. The *code of information* refers to general patterns of organization both of content and of relationships. In particular, the code can incorporate the nature and character of information, processes of association and interaction, the source, the destination point and the channels of the communication of the system of information, and so on. The concept of information in the age of electronic communication and digital technologies can be distinctively identified to have *systemic characteristics* - as they are defined within systems theory. The structure and organization of the system of information presents *analogies and isomorphies* to macrocosmic and microcosmic knowledge systems, primarily informational, still diverse and seemingly unrelated. The system of information can then be defined as a complex, self-organizing entity which can affect and organize other systems. Its organization can be characterized as one of chaotic organization in constant change towards a dynamic fractal system.

The digitalization of the system of information makes the code vulnerable to control and programmability. The code of information is also susceptible to the weaknesses of human information processing but also to the exploitative tendencies and interests of external interference and disturbance. In the world of digital technologies and applications, particular concern is needed to principles of human information processing and communication and how these principles may be disturbed by external cybernetic interference. Moreover, the fractalized outcome of this cybernetic interference claims to substitute any notion of authenticity and originality and replace free expression in human communication, with patterns of imitation and domination. Information theory provides basic concepts and relationships of the organization of the system of information. An investigation of the information process reveals attributes of the system of information, such as, entropy, redundancy, and noise. Further investigation into language, code and grammar provides some insight into communication, construction and processing of information, and in particular of the construction of meaning. Cybernetic experiments and theories point to the possibilities of external interference to human information processing, therefore, interference in the construction of 'reality' and on human behaviour. Cybernetic principles demonstrate the importance of information in the development of human consciousness, perception and construction of 'reality'. Studies on human communication and interaction also reveal how human behaviour can be affected by discrepancies in the communication of information, which may lead to paradoxical and, indeed, pathological situations.

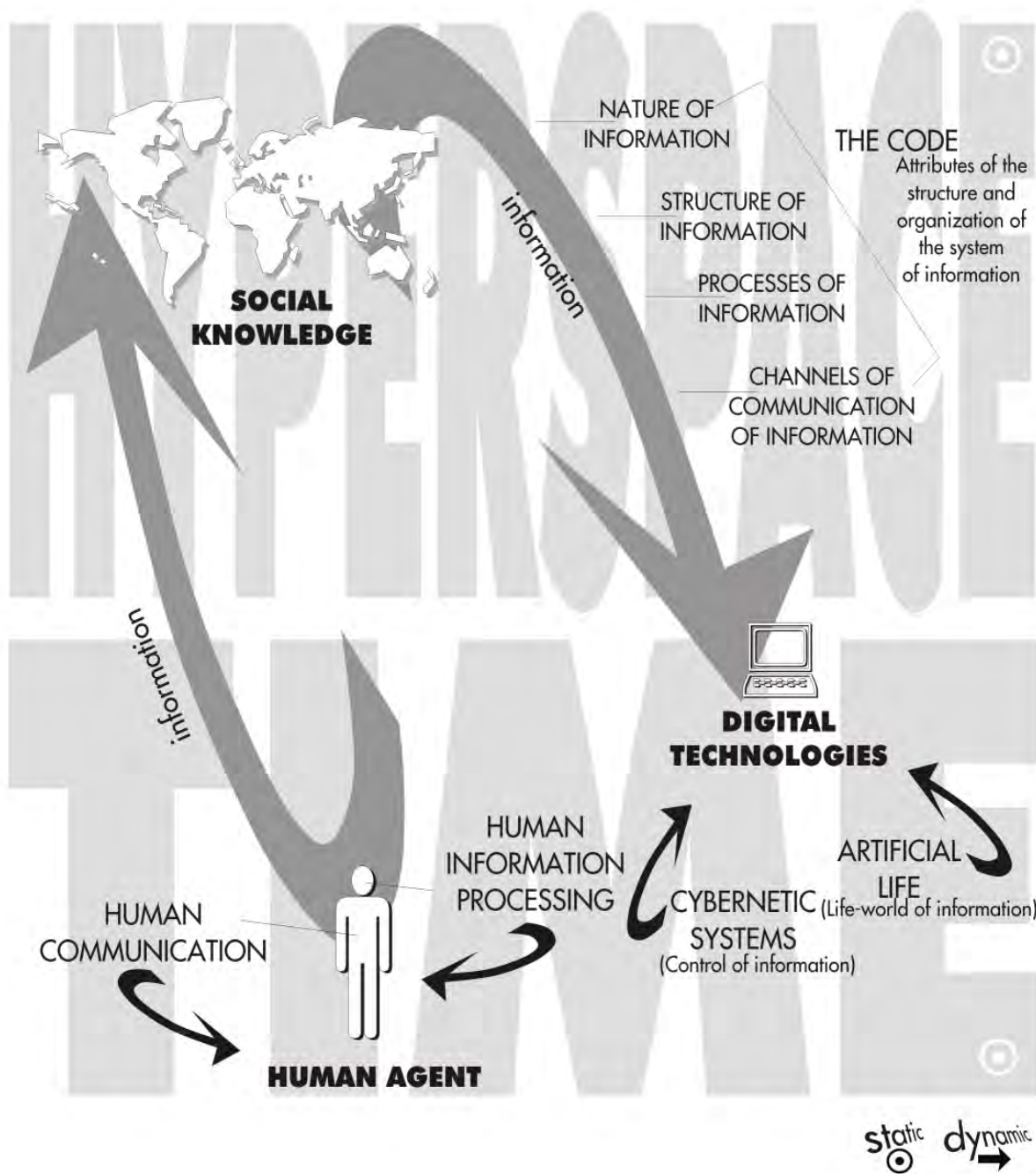


Figure 3. The Code of Information hypothesis

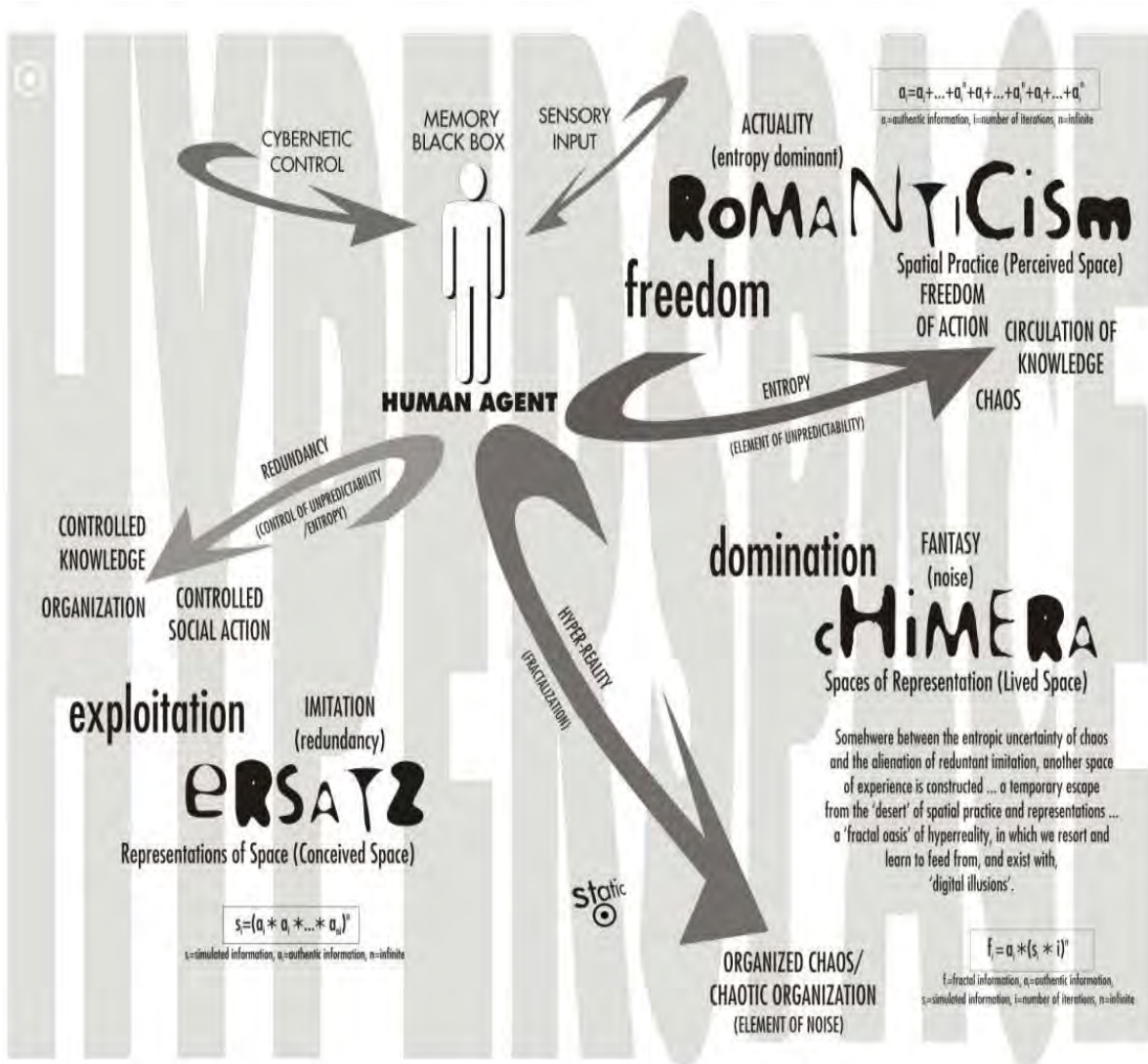


Figure 4. The System of Information hypothesis

The System of Information hypothesis

The system of information spans along multiple coexisting spatial levels of organization across the arrow of time, which represent conditions of freedom, of exploitation and of domination of the system of information, respectively. These organizational levels of the system of information (corresponding to entropy, redundancy, and noise of its volume and intensity) coexist at any time at different levels of intensities, and mark certain socio-cultural and historical periods. In the contemporary era of information communication and digital technologies, of hyper-real landscapes and fantasy worlds, the fractalization the system of information establishes new relations of meanings and understandings (Figure 4).

Information communication technologies are digitally constructing reality, or to put it in another way, *they are digitally reconstructing hyper-reality*. The re-organization and transformation of the system of information is taking place within the boundaries of hyperspace or cyberspace. Still, the human obsession with this electronic spatiality, recreates the conditions of the organization of the system of information in every aspect of contemporary social life. The code of the system of information is structured along coexisting and interacting with each other, levels of organization, each characterized by various degrees of intensification of information.

At any point in the arrow of time, the system of information presents coexisting and alternating levels of authentic, simulated and illusionary segments of information which are reflected in the organization of social life and the world. In the era of digital communication and computer technologies, the system of information implodes towards fractalization. The meaning that justifies the relation of the system of information to the social configurations and entities which reflexively are organized by it, is undergoing a gradual transformation of deconstruction, differentiation and reconstruction. Consequently, all logical justifications and confirmations of social reality in the postmodern world and beyond, are destroyed, intensified, transformed, reborn and set free of the tyranny of reason.

I argue that the digital re-organization of the system of information reassigns the meaning of reality and reorganizes the reality of meaning. Based on alternative envisionings of spatiality such as Foucault's (1986) heterotopias, Lefebvre's (1991) trialectics, and Soja's (1996) thirdspace, a series of theoretical proposals, are put forward, in the form of approximations, which apply to the construction of the digital justification of reality or *the digital reconstruction of hyper-reality*. The proposed model of theoretical approximations is a meta-philosophical proposition, a proposition that moves towards a radical reconstruction of long-established thinking of the production of social knowledge. This also acts as a warning that the proposed philosophical considerations on the code of the organization of the system of information may be unavoidably abstract and probabilistic and possibly paradoxical and controversial.

Romanticism, *Ersatz* and *Chimera* are conceptualized as an inter-connected triad of associated spatial level-states of organization, a form of space-time coordinates of the system of information, which remain unaffected as a triad globally, but they differentiate individually and locally, across the arrow of time. They refer to the volume and intensity of available information during various historical periods, not necessarily distinct ones, but related to the historical, socio-economic and cultural conditions of these periods. They co-exist as general spatial frameworks across time that encompass and host diverse systems and organization networks. At different space-time coordinates one level-state may predominate to the expense of the others depending on the degree of intensification of the flow and organization of information within a given system (Figure 5).

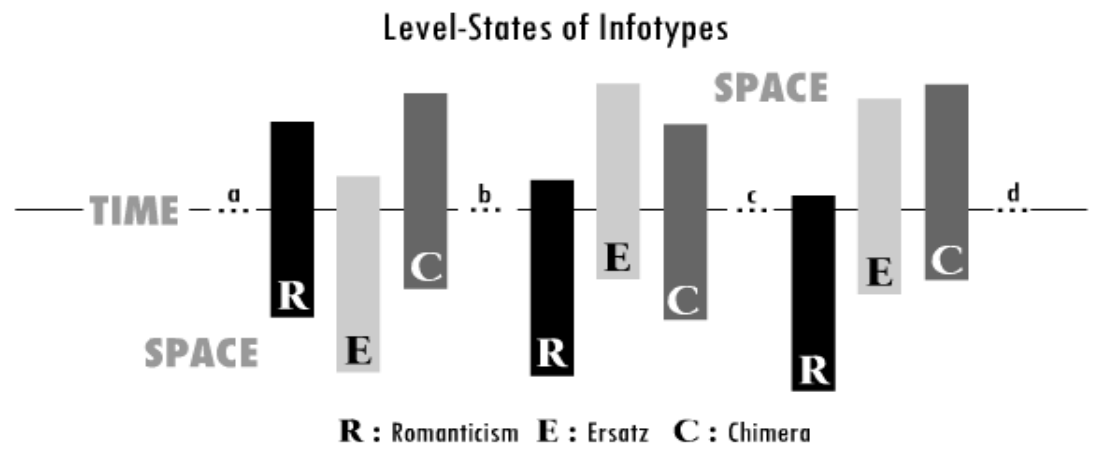


Figure 5. The Infotype Level-States of the system of information

The Era of Romanticism

The *Era of Romanticism* is predominated by the intensification of *spatial practice*. The perceived physical space is the main domain of the negotiation of information and social knowledge (actuality). At this *level-state* the system of information is characterized primarily by the authenticity, and subsequently by the simplicity and originality of its components. The *Era of Romanticism* would probably characterize socio-spatial formations of primary and basic organization, where the networks of information are almost non-existent or just emerging, where communication of the information is scarce and elementary, and where social transformation and change is time-consuming. It is an era of potential progress and development as a result of social exploration, error and trial, based on the unhindered 'freedom' of information (Figure 6).

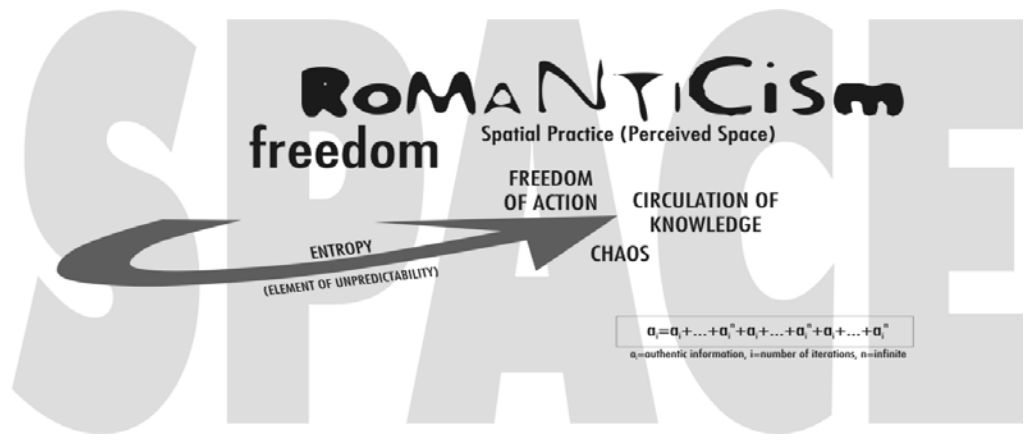


Figure 6. The Era of Romanticism.

The Epoch of Ersatz

The *Epoch of Ersatz* is characterized by the intensification of *representations of space*, in which information is disputed, infected and dominated. The *Epoch of Ersatz* signifies the ‘conceptualized space’ of the system of information. The social during the *Epoch of Ersatz* is constituted through the control and exploitation of information. Information is classified and categorized into controlled knowledge and defined signs and codes are responsible for the construction of ‘social reality’. During this *level-state*, the system of information becomes redundant with the elements of unpredictability and entropy being controlled. Informational constructs are generated through imitation and floating signifiers define the limits of social experience. Reason and logic dominate social action and change. The *Epoch of Ersatz* can probably apply to developing and developed patterns of organization, with well established networks of communication. This would be a system indicative of experimentation, justification and potential exploitation of choices and alternatives (Figure 7).



Figure 7. The Epoch of Ersatz.

The Age of Chimera

In the *Age of Chimera*, fantasy becomes the predominant component of the system of information. Information becomes illusive, provocative and hyper-real. The *spaces of representation* become intensified with the original authenticity of the *Era of Romanticism* and the ‘original’ simulations of *Epoch of Ersatz* becoming incorporated and assimilated in the domination of lived experience. The system of information shows a highly complex organization, with ‘reality’ being encoded, and ‘hyper-reality’ being decoded as the dominant socio-spatial dominant. At this *level-state* the system of information is dominated by the rejection of authenticity and originality, by increased tensions of imagination and hallucination, and by the emergence of distorted spatial formations. The system of information reactivates its entropic tendencies within a system environment alternating between states of chaotic organization and of organized chaos. The *Age of Chimera* is a period of subordination to the code of the system of information which controls and regenerates ever-emerging spatial realities. The *Age of Chimera* is intensified in advanced modes of organization characterized by networked flexibility,

flexible networking and infinite possibilities of communication. Change and transformation is fast and at its extreme leads towards the fractalization of the system of information (Figure 8).



Figure 8. The Age of Chimera.

INFOGRAMICS: THEORETICAL APPROXIMATIONS FOR LEARNING WITH DIGITAL

TECHNOLOGIES

The theoretical considerations and observations in the four hypotheses indicate a pattern of structural and organizational characteristics of the system of information which, I argue provide the background to develop an argument for *the digital reorganization of information* in hyper-spatial environments towards the implosion of meaningful and authentic information to an ambiguous state of what I term *fractalization*. Fractal information is characterised by self-similarity of components and fractional dimensionality. Self-similarity refers to the same element of information that at level after level repeats itself, like multiple copies. The fractal dimension of the system of information means that smaller magnifications (simplified versions), or arbitrarily partial components of information, appear to be the same as the original ones. In other words, scaling down does not change the appearance of the ‘original’ system of information. The relative instability of a system of information, towards order or disorder, creates potential fractal conditions.

This dynamic retransformation or *fractalization* of the system of information is defined as *Virtual Implosion* (an extension of the Baudrillardian concept of *implosion*) and develops in distinct phase spaces (spatial changes across time). Through virtual implosion, information mutates to a fractal, continuously alternating phase space. *Virtual Implosion* is empowered by *Fractal Dynamics* (Figure 5). The later refers to interconnecting micro-processes that support and make possible the process of implosion, and they become a pattern of powerful organizing principles of societies, social processes, of human agents, into entities of unpredictably programmable identity and ‘consciousness’. Moreover, the impact of this process of *Virtual Implosion* on both society and individuals is the development of interrelations, which directly affect the construction of the cultural environment within which, *Virtual Implosion*, acts as a potentially controlling force of change and transformation of the world-society. It emerges in hyperspatial

environments and powers up social change of worldwide societies and the reconstruction of homo-sapiens to an emerging global digi-sapiens.

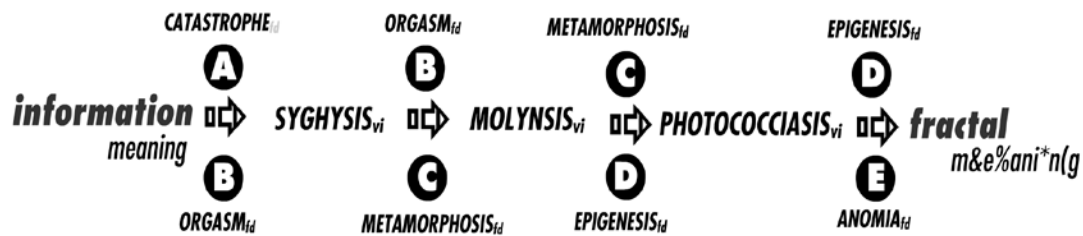


Figure 9. Phase spaces of Virtual Implosion and micro-processes of Fractal Dynamics.

CONCLUSION

The current paper assumes that information, or the system of (all available) information, organizes every aspect of social life and human consciousness. It suggests that patterns of social organization reflect the organization of the system of information, and provides a brief account of the code that defines the organization of the system of information from a post-modern perspective. To this end, it introduces a theoretical model, in the form of a series of theoretical approximations, for the analysis of the organization of the system of information, in a world dominated by the presence and use of computer and digital technologies, and by an increasing human consciousness integrated with such technologies. Consequently this model can be the basis for understanding how learning occurs in digital environments where the focus is on the processing of information and the content of digitally produced knowledge.

Finally, the theoretical proposals put forward here stress the need for developing different ways of thinking when learning with ICTs, a move away from conventional epistemologies to more radical and open ended ones, to cope with the speedy and unpredictable transformations of the system of information in social development and change. In contrast to developing Baudrillardian fatal strategies, this is a tactic of encouragement for developing diverse strategies of survival in an informational ocean of lived illusions and lost meanings, where human consciousness and awareness finds it more and more difficult to recognize directions, to survive and to sustain its existence.

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A Conceptual Model for Small Screens: A Case of Design, Redesign and Application in the Context of an Outdoor Educational Activity

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Abstract

This article presents a set of recommendations for design of conceptual models for applications via handheld/mobile devices such as PDAs (Personal Digital Assistants) and some mobile phones. The author discusses one conceptual model and its design, and applications in learning within an outdoor educational activity, and describes how this experience lead to the recommendations. A conceptual model is an interactive visual representation designed to depict a concept or a number of connected concepts, and allow manipulation of properties and relationships. It is assumed that exploration of a conceptual model, process of manipulation and interrogation of represented properties and relationships, and effect of visuals will support conceptual learning. When used in the field via handheld technology, conceptual models can serve as tools to support students' learning activity. Overall, the paper aims to provide useful information for design and application of conceptual models and other learning objects for uses via handheld technology.

Keywords: Design, Conceptual Models, Learning Objects, Handhelds, Outdoor Learning

Introduction

A conceptual model is a particular type of a learning object (see the classification of learning objects developed by Churchill, 2007). A learning object can be described more generally as a representation designed to afford uses and reuses in teaching and learning contexts. A conceptual model, more specifically, represents one or more related concepts. It is a representation designed to facilitate development of learners' conceptual knowledge. Affordances of today's technology enable design of representations of concepts in a form that is suitable for teaching and learning. This form is predominantly interactive and visual but it can also contain other modalities such as text and audio. The idea of a conceptual model builds upon theoretical work such as: external multimedia representations (Schnotz and Lowe, 2003), dynamic visualization (Ploetzner and Lowe, 2004), information visualization (Bederson and Shneiderman, 2003), visual explanations and envisioning information (Tufte, 1990; Tufte, 1997; Tufte, 2001), visual and multimedia displays and conceptual models (Mayer, 1998; Mayer 2003), multiple representations (Van Someren, 1998), modality and multimodality (De Jong et al. 1998; van

Someren, Boshuizen, de Jong and Reimann 1998) and pedagogical models (Fraser, 1999). Overall, literature suggests that technology creates opportunity for design and applications of conceptual models and other forms of multimodal representations that can effectively support teaching and learning (De Jong et al., 1998; Fraser, 1999; Tufte, 1990, 1997, 2001; Van Someren, 1998). It is also suggested that learning with these representations is supported through activation of certain cognitive processes such as mind modeling (Churchill, 2008a; Mayer, 1989) and linking between internal representations (Mayer, 2003). However, literature does not provide specific recommendations for design of conceptual models neither it sufficiently addresses an issue of planning of learning tasks for their uses.

Emerging handheld technology (e.g., portable digital assistants and mobile phones) opens a spectrum of opportunities for support of teaching and learning (Churchill & Churchill, 2008; Clyde, 2004; Csete, Wong & Vogel, 2004; Luchini, Quintana and Soloway, 2004; Sharples, Corlett & Westmancott, 2002). Designing and implementing conceptual models via handheld technology might open possibilities for more effective use of this technology in a context of outdoor educational activities (Churchill, Kennedy, Flint & Cotton, in press). However, this requires understanding of effective design for presentation via small screens of handhelds, as well as how a conceptual model might support learning when delivered via such technology during learning contexts such as an outdoor educational activity. This paper discusses design, redesign and application of a particular conceptual model with secondary school Geography students in the context of their outdoor educational activity. This experience resulted into integration of three sets of recommendations into an approach for design. In particular, the paper discusses how a conceptual model supported the outdoor educational activity and attempts to integrate this experience into a wider set of recommendations for design of conceptual models for implementation via small screens.

An Example of a Conceptual Model

An example of a conceptual model is presented in the Figure 1. This conceptual model presents a concept of a triangle and its associated properties and relationships. It allows students to manipulate base and height of the triangle by dragging corresponding sliders. Manipulating either of the two parameters of the triangle (base or height) by dragging of sliders will result in immediate update to the display in multiple modalities: the triangle will be redrawn in a corresponding size, and the numerical information regarding associated parameters will be updated (such as the value of the hypotenuse).

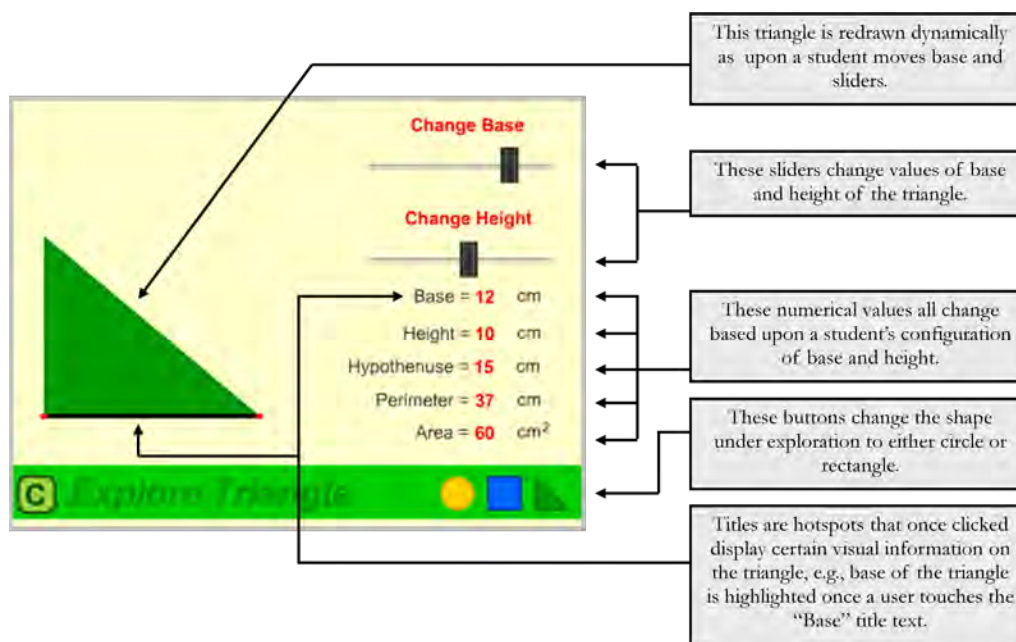


Figure 1: “Explore Triangle” learning object (from Churchill and Hedberg, 2008)

This conceptual model can be reused with different purposes and with different groups of students, such as for example, lower grade students can use it to explore properties of a right angled triangle, while more senior students might use it to explore properties such as Pythagorean Theorem and basic trigonometric functions (sine and cosine). Purpose of the conceptual model in learning depends on a learning task that is designed to make use of it. For Foo, Ho and Hedberg (2005), learning task design should be the central task for a teacher when planning lessons. Such task might take the task-form of troubleshooting, strategic performance analysis, case study, design challenge or resolving a dilemma (for more detailed classification of problem types, see Jonassen, 2000). Alternatively, this conceptual model can be used as an aid to a teacher’s presentation or to engage students in discussion about the presented properties and relationships. After learning, a conceptual model can be provided for student to support their homework, assignments, preparation for tests and independent learning activities. Accordingly, it is important to recognize two separated processes related to conceptual models: (1) process of design of conceptual models, and (2) process of design of learning tasks for their use and reuse.

A Case of Design of a Conceptual Model

In February 2008, the author traveled to Northern Thailand with a group of 72 secondary school students and their Geography teachers from Hong Kong. During the trip, the students were required to conduct a study of a river. A study of a river is one of the key topics in the students’ Geography curriculum. This

topic includes issues such as how river changes downstream, how farming and various human settlements influence its changes, obtaining key measurements such as a river's width, depth, velocity and gradient, and calculating values of other parameters such as discharge and hydraulic radius. Teaching and learning about all these concepts requires time (in and out of the classroom) while always it remains challenging for students to put these together into coherent understanding. Understanding all these is essential for students' ability to meet the final demands of their curriculum assessment.

Prior to the field trip the students were taught in the class about the rivers and their properties. During the field trip, the students were equipped with handheld devices. The device that was used was the HP iPAQ rw6828 Multimedia Messenger. This PDA/Phone device uses the Windows Mobile operating system. In addition, there was one notebook computer available per every five to six students. Handheld devices were used mostly during outdoor activities while notebooks were used when the students returned from the field to their base-camp to summarize their day's learning into an ongoing report of a case study of a river. Amongst other things such as recording collected data and taking images, the handheld devices were used to access a conceptual model that was designed specifically to support their outdoor educational activity.

Prior to the trip, the author held a number of discussions with the two Geography teachers in relation to the content of the conceptual model. These discussions resulted in hand drawn sketches, which essentially become a storyboard or blue print for production of the conceptual model. The author produced a first and a subsequent version of the conceptual model using Adobe Flash authoring software. The first version of this conceptual model is presented in the Figure 1.

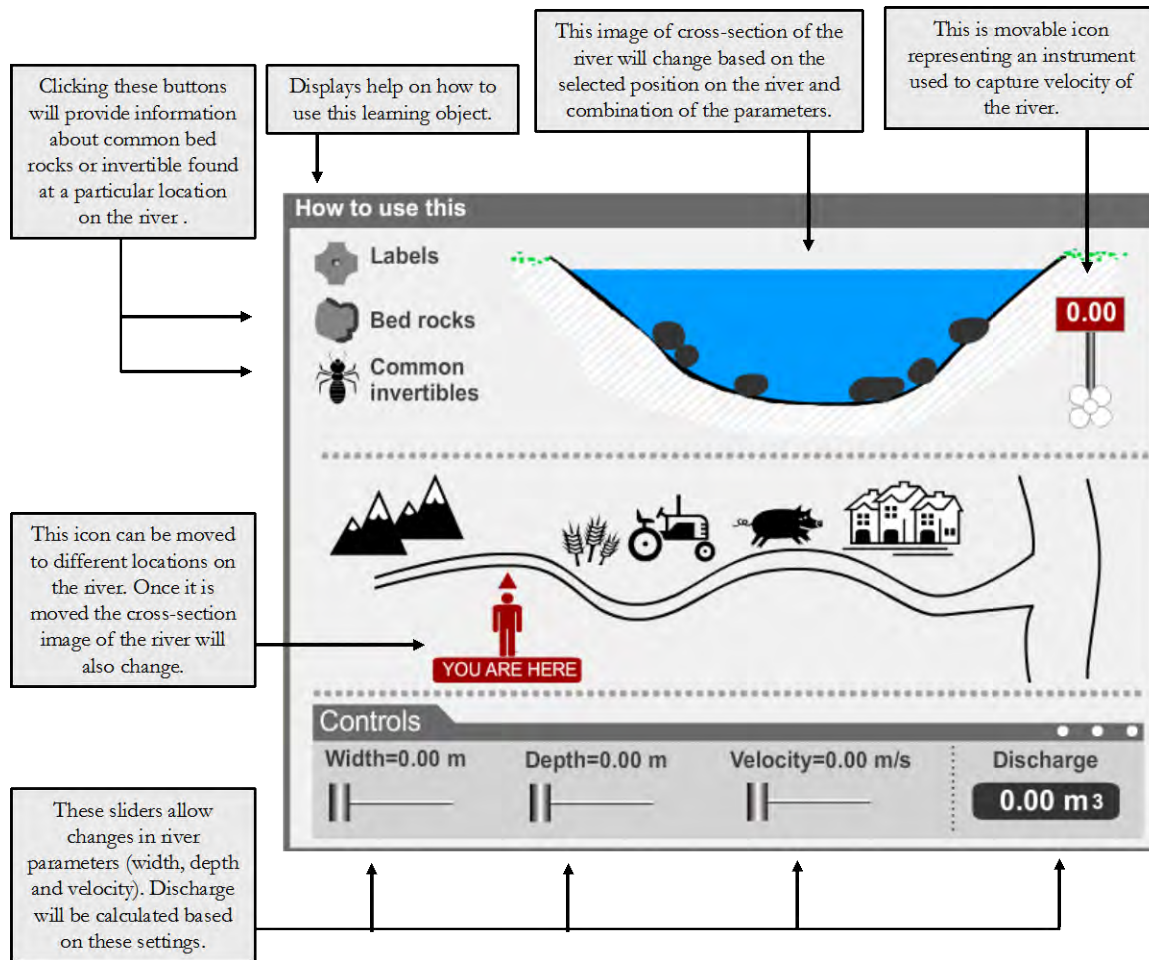


Figure 2: The first version of the conceptual

The conceptual model contains information about a number of important river parameters, enables calculations of river discharge, presents the impact on flow rates caused by the shape of a riverbed, and allows identification of common bad rocks at different locations along the river. Various bits of information are presented based on a student's interaction with the conceptual model. A student can arrive at understanding of the river issues through interaction and manipulation of specific parameters (e.g., how the cross-section of the river changes as one moves down the river), and by systematic exploration of specific information (e.g., how the river discharge is calculated based on values of width, depth and velocity).

Observations were conducted during the teachers' uses of the conceptual model as a visual aid in their classroom teaching in preparation for the field trip. Students' use of the conceptual model before and

during the field trip was observed and interviews with some students were conducted to understand their experiences in use of the conceptual model and possible improvements the design.

Two sets of recommendations informed design and redesign of the conceptual model. These included recommendations for design for presentation, and more specific set of recommendations for design for small screens. The experience reported in this paper lead to a third set of recommendations that more specifically address issues of uses of a conceptual model in support of outdoor educational activities (design for learning recommendations).

Design for Presentation

The design of the conceptual model was guided by previously developed recommendations for presentation. These recommendations were articulated by the author from the review of a collection of conceptual models, reflection on personal experience as a designer, and reflection on experience working with others involved in design such as teachers and trainee instructional designers. Some of the conceptual models from the collection are available for preview at <http://www.learnactivity.com/lo/>. The following is the lists of the recommendations for design for presentation of a conceptual model:

1. *Present information visually*-- Information in a conceptual model should be presented predominantly through use of visual elements (e.g., photographs, illustrations, diagrams, graphs, colors, icons and symbols). Sometimes, the same information can be presented in a number of modes simultaneously (e.g., as a text, a visual, and audio effect). However, visuals are the central mode of representation.
2. *Design for interaction* -- Relationships should be displayed in interactive ways to allow a user of a conceptual model to manipulate parameters and observe outcomes (e.g. by manipulating sliders, clicking on buttons, or inputting text/numbers). Outcomes of the manipulation can be presented in a single or several modes at the same time (e.g., as a number, or a graph).
3. *Design a holistic scenario* -- Design elements should be arranged in ways that integrate bits of content into a holistic presentational scenario that depicts the concept that is represented. In other words, all areas of the screen need to feet together into a holistic scenario that supports representation of a concept.
4. *Design for a single screen* -- A conceptual model can be most often presented in a single screen. A single screen allows a student to have a holistic focus on all elements of the required conceptual knowledge. A single screen would enable a student to manipulate relationships and properties, and to access outcomes of this manipulation all in one place. At the same time a single interactive screen can be easily mashed with other media into structures such as web pages.
5. *Design for small space* -- The design of a conceptual model should utilize only necessary amount of screen space to present all the required information, properties, relationships and interactive elements. From the experience of the author, most of conceptual model can be designed in the screen space that does not exceed 640 by 480 pixels. This recommendation has two important implications. Firstly, a learner will concentrate visual attention on a smaller screen area. Secondly, a conceptual model might later serve as media objects to be embedded into larger structures such as blog posts and PowerPoint slides.

6. *Use audio and video only if it is the only option* -- Audio should be rarely used, only if it can be effective for representational purpose or to enhance realism when this is required (e.g., specific sound of a faulty machine). Similarly, video should be used only if it is the only option, for example, when manipulation of relationships requires different segments from a video to be presented based on the configuration of parameters. Often, content from a video might be presented with several images of the key frames with short blocks of text explaining each of the frames.
7. *Use color in moderation* -- In order to clearly present the content, color should be used in moderation. Often, color can be used to connect related information (e.g., connecting positive numerical value displayed in red color with a red bar on a bar graph). Different shades of color can be effectively used while use of sharply contrasting colors must be avoided. The focus must be on simplicity and clarity of presentation and support for learning rather than to pursue unnecessary artistic beautification of the display.
8. *Avoid unnecessary decorative elements* -- Unnecessary decorative elements might add complexity to the representation and must be used in moderation or not at all. All the elements of the display should have purpose to represent a concept (or facilitate this representation) and allow a student to manipulate its properties and explore relationships. In addition, cartoon-like characters should be avoided unless they serve some representational purpose. Many designers assume that cartoon like characters will motivate students, however this assumption is less than productive for learning. Motivation lies in a learning task that engages a student to use a conceptual model rather than in the model itself. A conceptual model is a strategy for effective representation of educationally useful concepts, and unless its display elements support this representation, they should not be included.
9. *Design with a single font* -- In order to keep the presentation simple, single font should be used (e.g., Arial font in different sizes, shades and styles). Same color fonts can be used to relate pieces of information.
10. *Use frames to logically divide the screen area* -- Frames can be useful to divide the presentation screen into functional and logical areas and groupings. For example, interactive elements such as sliders and buttons can be grouped together in one area of the display, while the other area can be used to display output information.

Design for a Small Screen

The second set of recommendations that informed the design and redesign on the conceptual model related to small screens of handheld technology. Handheld technology (e.g., portable digital assistants and mobile phones) opens a spectrum of opportunities for support of teaching and learning. One important affordance of this technology is 'multimedia-access tool' (see Churchill & Churchill, 2008). A variety of multimedia resources can be delivered using this technology, such as e-books, web pages, presentations, interactive resources, audio files and video segments. These resources can be accessed any time, anywhere, by connecting to the Internet using 3G mobile telephony network or WiFi, from the memory of the device or storage card if the resources were previously downloaded, or through synchronization of a handheld device with a computer. However, merely moving resources from a computer to a handheld device might not lead to effective learning. Resources for use via handheld devices must be designed with certain learning and design principles in mind. Conceptual models might be effective resources for handheld technology, as these can be made available to students in a variety of situations, any time and anywhere via such technologies (Churchill, 2008b). Handheld technology, if equipped with appropriate resources, might serve as powerful intellectual partner for learners. From a study of the design of learning

objects the author previously developed a set of recommendation for design for small screen presentation. These more specific guidelines for design for small screens suggest the following considerations (Churchill & Hedberg, 2008):

1. *Design for full-screen presentation* -- Full-screen presentation of a conceptual model increases amount of available space and this appears to create an improved user experience.
2. *Design for landscape presentation* -- Typically a screen of a handheld device is presented in portrait layout. The landscape presentation offers more flexibility for design.
3. *Minimize scrolling* -- Scrolling should be avoided or at least minimized.
4. *Design for short contacts and task centeredness* -- A conceptual model should be designed in a way that provides for learning task-centered information.
5. *Design for one-step interaction* -- The design goal for a learning object should be to provide through visualization and interactivity all necessary information with a single display that fits in the screen of the handheld device. Single interactions, such as changing a position of a slider, should result in immediate updates on the screen presented in way that is perceptually and immediately noticeable by a student in response to an action.
6. *Provide zooming facility* -- when appropriate to enlarge display beyond the physical limits of the screen. Allow a user to zoom and drag the entire screen in any direction to access hidden areas of the display beyond the physical limits of the screen.
7. *Design movable, collapsible, overlapping, semitransparent interactive panels* -- Utilize floating panels in order to maximize amount of information presented on a display.

The two teachers involved received the conceptual model with enthusiasm, however, certain problems emerged. Original intention was to design a conceptual model for presentation via small screens of handheld devices for use in the outdoor education activity. However, the final product emerged suitable for presentation via computers and a projector, but its design was not effective for presentation via handheld devices. The author installed the conceptual model on a handheld device and asked the two teachers and two of their students to interact with its interface. It immediately emerged that some interactive elements were perceived as too small and that some information was not clearly visible for the students.

By this stage much stronger consideration was given to the design for small screen recommendations. In particular the “Design movable, collapsible, overlapping, semitransparent interactive panels” recommendation guided the redesign decisions. The content of the new design was now organized into four groups presented in panels accessible by clicking relevant tabs. These tabs were allowing the students to easily navigate from one panel to another. These groups of content under panels were connected to the main scenario of the river. As the author engaged in the redesign and while testing the different interface features based on the design recommendation, the process also led to revision of the content. Teachers realized that some more information would be useful (e.g., hydraulic radius) while some other information was not necessary (e.g., common invertibles). Actual process of redesigning the conceptual model led the teachers to re-examine the content. Effective design of interface, simpler presentation, and improved utilization of presentation area through groupings of elements, created possibility for content to be better arranged in the small screen space. The process of involving the teachers in the design was a productive activity for them as they appeared to have been revising their knowledge of the content while questioning most suitable ways for presenting that content to their

students. At the same time, they increased their understanding of affordances of technology for presentation of educationally useful material. The final version of the conceptual model is presented in the Figure 3.

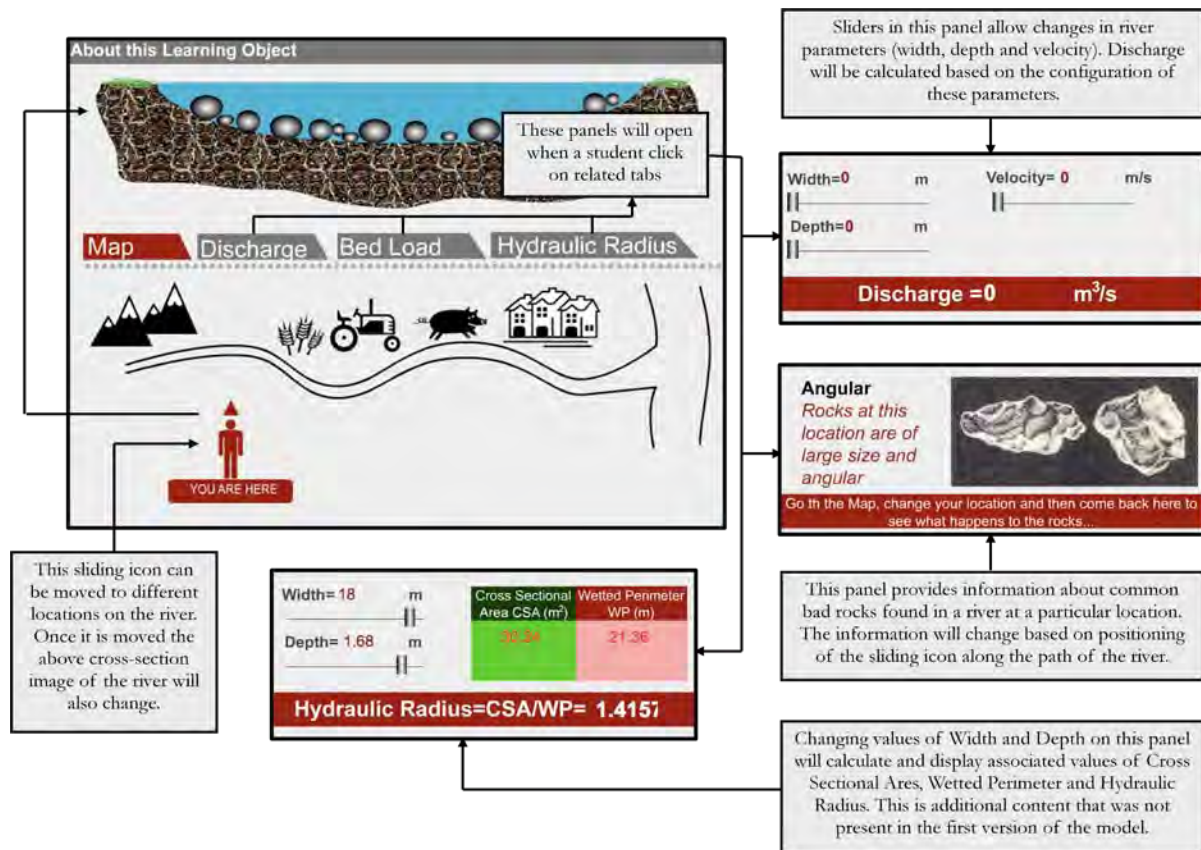


Figure 3: Redesigned version of the conceptual model

Design for Learning

Besides the recommendations for presentation and design for small screens, the design of conceptual models also needs to consider how and in what ways these representations can be designed to support learning. The experience reported in this paper explored how the particular conceptual model was used in learning context in order to explicate further set of potentially useful design recommendations. The author refers to this third set of recommendations as to “design for learning” recommendations.

During the implementation of the conceptual model the author spoke to the teachers and students involved, and observed their uses of the conceptual model in the class and in the field. The data provided interesting ideas about various ways that the conceptual model supported teaching and learning. Prior to the field trip the teachers displayed the conceptual model via a projector and used it as a visual aid for their explanations of the key concepts of a river (e.g., depth, velocity, discharge). During the explanations, the students were taking notes. The teachers then distributed handheld devices containing the conceptual model and asked students to interact with it while focusing on few guiding questions (e.g., how bad rocks change as you move down the river). These questions led to class discussions of the key properties of a river. Understanding of the key properties was required for students to effectively complete related outdoor activity (e.g., collect and compare water discharge values at a number of points along the river, or describe with a support of evidence, how physical properties of the river change along its path as it progresses downstream). The conceptual model allowed students to develop some form of mind representation based on the multimodal information presented. This mental representation was useful latter as an aid for the students' thinking and enabled them to better visualize the key concepts once there were working on their assignments or activity on the river. The author is currently engaged in further study to investigate forms of cognitive residues and associated mind processes when these residues are used. Such understanding should lead to further refining of design recommendations. Once outdoor, the students used the conceptual model to support their activities in any way that they perceived it as useful. After the outdoor activity the conceptual model was useful as a tool that facilitated reflections and writing of a river case study report. This report was constructed in a digital form. The students were provided with a PowerPoint template, which they populated with their data, evidences and media from the field and presented conclusions. During the outdoor engagements students used handhelds to store measurements, collected images, video, audio-recorded notes, etc, and these were used as data, evidences and media for the report. The template also contained embedded conceptual model with relevant questions requiring students to refer to it when developing their arguments. Overall, the experimental use of the conceptual model and involvements with the teachers and students resulted in a number of specific ideas about ways in which the conceptual model supported learning in context of the outdoor educational activity:

1. *Preparation tool* -- Prior to the field trip the teachers projected the conceptual model via a projector and used it as a visual aid for their explanations of the key concepts of a river (e.g., depth, velocity, discharge). Also, prior to the trip the students were issued with handheld devices to explore the conceptual model and other functions. These enabled students to form some initial conceptual understanding before the actual field trip.
2. *Collaboration tool* -- The students often showed some configuration of the conceptual model to each other, and discussed relevant issues. In addition the students used the conceptual model to collaboratively work with data. For example, one student was collecting measurements on the river and informing the other student who was then entering these values in the conceptual model in order to obtain some other associates calculations. The second student was then passing these values to third student who was recording them in a spreadsheet. Following the data collection, the students used the conceptual model to double-check the data that they entered in the spreadsheet.
3. *External cognitive supplement* -- During the outdoor activity, the conceptual model appeared to provide students with external cognitive supplement to their knowledge, that is, some limitations in students' knowledge were supplemented externally as the students were able to access representations of required concepts at any time when needed.
4. *Aid to observations* -- The conceptual model enabled the students to configure parameters according to their observation of the reality. For example, if they observed certain shape of the bad rocks in the

river, they could configure the screen of the conceptual model accordingly, and then identify other associated parameters not directly observable in the reality.

5. *Decision-making tool* -- The conceptual model also served as a tool that guided students' decision-making. The students were able to make their decisions, such as where to collect their next set of measurements based on expectations that they developed through the interaction with the conceptual model.
6. *Analytical tool* -- The conceptual model also enabled students to carry out certain calculations and analysis by configuring parameters according to data that they collected on the river (e.g., enter values of width, depth and velocity of the river based on their measurements and obtain the value of discharge).
7. *Tool for inquiry* -- The students appeared to identify certain unknown parameters of the river from the reality and then attempted to search for answers in the conceptual model (or vice versa).
8. *Experimentation environment* -- The conceptual model allowed students to experiment with the parameters from their observation and carry on certain predictions.
9. *Tool for generalizing* -- The conceptual model supported the students to easily move between observations and conclusions and make generalizations from their observations and analysis of the collected data.
10. *Tool for linking of theory and the world outside of the classroom* -- Often during the outdoor activity the students appeared to compare something from their knowledge with what they observed in the reality (e.g., shape of the river bed) because the conceptual model provided them with a link. It might be claimed that in this way, the conceptual model enabled links between theoretical knowledge and reality, that is, between what the students learnt in the class and the world outside of the class.
11. *Environment for articulation of components of knowledge* -- The conceptual model also enabled students to make connections between different parts of their knowledge and observations as once they identified an element from their knowledge or observation in the conceptual model, it also presented other associated elements.
12. *Reflective tool* -- After the outdoor activity the conceptual model was used as a tool that facilitated reflection and possibly contributed to consolidation of the knowledge. It also was perceived as useful revision tool for students to revise the required conceptual knowledge when working on assignments or preparing for examination.

Conceptual models for outdoor educational activities might be designed in a ways that support these specific learning uses. These possibilities should be considered together with other recommendations (design for presentation and for small screens) when designing a conceptual model for application via small screens of handheld devices. Also, recommendations for design for learning provide a useful link between the design of a conceptual model and its use in learning tasks.

Conclusion

This paper discusses design, redesign and application of a particular conceptual model with secondary school Geography students in the context of their outdoor educational activity. The experience resulted into integration of three sets of recommendations into an approach for design of conceptual models. Two sets of recommendations informed design and redesign of the conceptual model. These included recommendations for design for presentation, and more specific set of recommendations for design for

small screens. The experience from the field lead to a third set of recommendations that more specifically address issues of uses of a conceptual model in support of learning. These three sets of recommendations are integrated in the Figure 4. It is important to recognize two processes related to conceptual models: process of designing conceptual models, and process of designing learning tasks for their use and reuse. The third set of recommendations can be useful for both of the processes and accordingly it can be useful tool to designers who develop conceptual model, and to teachers who plan uses and reuses of conceptual models in their instruction.

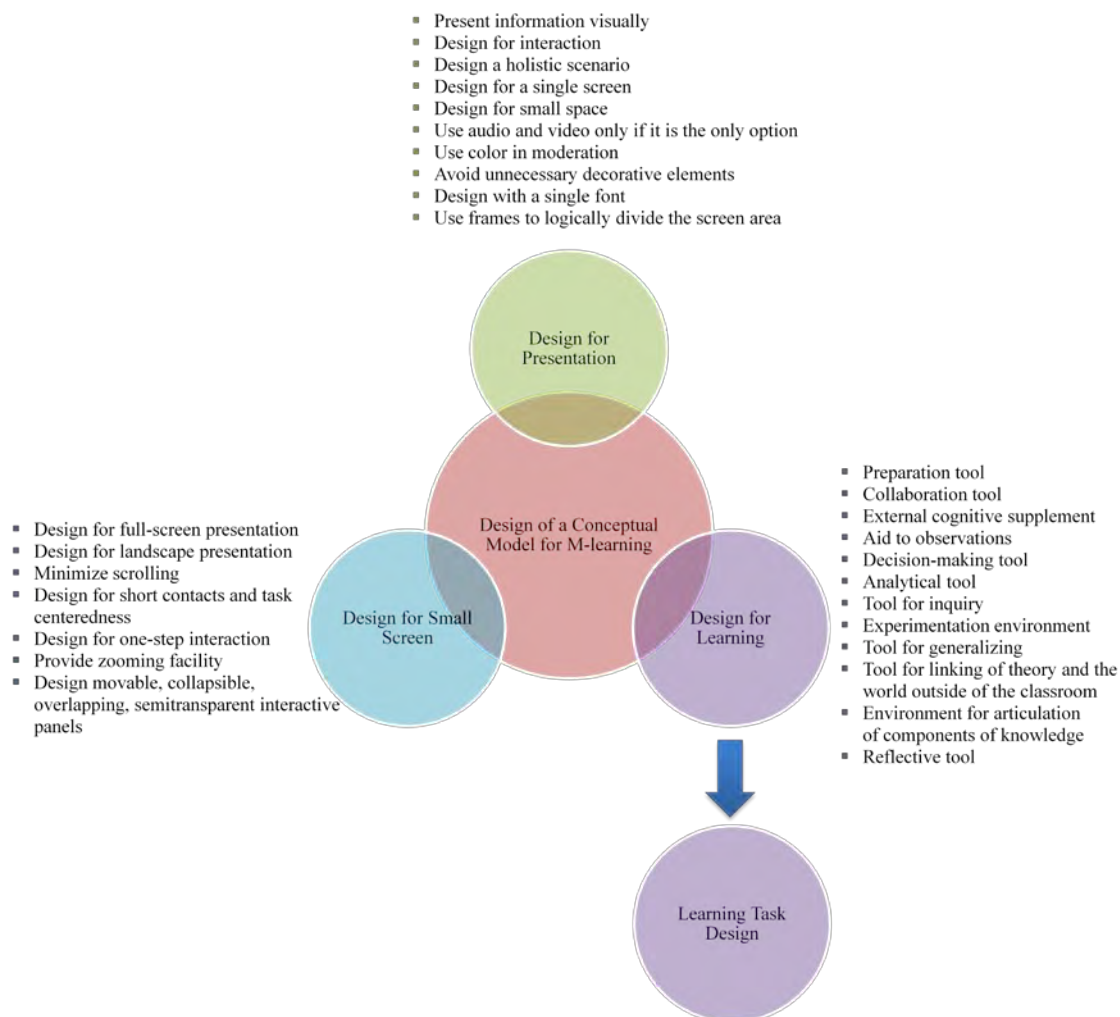


Figure 4: Recommendations for design of conceptual models for outdoor educational activities

The author is currently engaged in further study to explore a form of cognitive residue of learning uses of conceptual model. It is believed that this will provide further ideas for improved design of conceptual models as well as for design of learning tasks for their uses and reuses.

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The Use of Technology to Support Learning at Higher Colleges of Technology

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Abstract: New and emerging technologies, combined with highly innovative approaches to learning, are transforming classes and delivering a richer and more engaging learning experience for student and teachers worldwide. This paper investigates the impact of technology on the distance learning of the Emirati students. The aim is to provide a flexible format to encourage new approaches to teaching and learning of the Emirati students remotely. Three distance learning classrooms were installed at Madinat Zayed campus and another three at Ruwais campus of the Higher Colleges of Technology (HCT). The Emirati students from these colleges receive teaching and learning through live interaction using video conferencing equipment and shared interactive Smart boards across the HCT wide area network. Students in these classes did not engage in virtual classrooms rather, they participated in one extended connected class. While general feedback from the students and teachers showed clearly the benefits of this technology in teaching Emirati students, four main guiding principles can be drawn: creating learning and instructions for interactive distance learning classroom environments; Instructional Strategies; Student Interactions; and Faculty Development and Technical Support. Those four principles are highlighted in more details throughout this paper.

Keywords: Technology, Learning, HCT

1. Introduction

The guiding principle in creating interactive distance learning classrooms (IDLCs) at Madinat Zayed and Ruwais colleges, HCT was to provide a consistent and accessible learning environment to students in various rural locations of the Western Region of the United Arab Emirates. It was also a requirement for IDLCs to support a variety of established pedagogical needs, as well as to provide a flexible format to encourage new approaches to teaching and learning. To this aim, three distance learning classrooms were installed at Madinat Zayed campus and another at Ruwais campus.

To maximize the use of the technology and to simulate face-to-face lecture classes, it was necessary to provide a variety of options for users while not complicating the system; that is, to enhance ease of use by teachers with varying levels of technology experience. The current *videoconferencing system* (complete with all the necessary display, audio, and presentation system capabilities) utilizes a touch screen control panel as the only input variable required of users. The classrooms appear to have a complex array of equipment, and they do, but all are controlled by one touch-pad device. Aside from the expected desks and chairs, the equipment in IDL classrooms include web cameras, track-view mats (from which cameras follow the presenter), as well remote-control devices which allow students to direct cameras to them. Additional equipment includes interactive Smart boards, projectors, and an LCD display panel that offer

many possible combinations for interactions to take place on both ends. For example, aside from the live feed, IDL classrooms can be used transmit live video, recorded medium, as well as projecting documents (including hard copies of student homework) via a scanner across the distances.

The fully-utilized interactive distance learning classrooms are providing a bridge for students and staff at two campuses across the Western Region of Abu Dhabi. They allow “real time” visual contact between students and the instructor or among students at the two different locations. The resources invested in setting up the IDL classrooms, is not merely filling the gap of teacher shortage, but creating state-of-the-art opportunities to reach the special needs and at-risk students as well as improve teaching and learning at those two campuses.

The contents of this paper capture teachers and students feedbacks as well as identify the IT and training requirements to effectively use the interactive distance learning classrooms. The teachers and students, who have already used the IDLCs, shared their comments and feedbacks through the use of discussion boards, face to face dialogues plus recorded interviews. Some very useful information came out from the discussion with all teachers and students involved in using the interactive distance learning classes. However, four main guiding principles can be drawn from the feedbacks and comments from teachers and students.

2. Creating learning and instructions for interactive distance learning classrooms environment

Good distance learning practices are primarily identical to good traditional face to face teaching practices and “those factors which influence good instructions maybe generally universal across different environments and populations.” (Wilkes & Burnham, 1991). Teaching using interactive distance learning and its technology requires extensive planning and preparation, and teachers must consider those factors in order to improve their effectiveness (Schlosser& Anderson, 1984).



When designing learning and instructions to be delivered in and over interactive distance learning classrooms, the teacher should focus attention on all the students, not just those at the home site. As was learned from anecdotal teachers’ feedback, lessons should incorporate a variety of activities for all the students. It is best to use tasks with shorter time frame, small

group activities and an occasional break to add variety to the lesson. In other words, in one lesson, teachers will need to switch from lecture to question-answer to small group activities on a regular interval.

Extensive preparation and formative evaluation is necessary in distance learning classes. Teachers can’t “make it up as they go along”. Students using distance learning value instructors who are well prepared and organized (Egan, et al., 1991). Students also benefit immensely from a well-structured program and presentation outlines.

When preparing lessons and class visuals, teachers must keep in mind to tailor those visuals to the characteristics of the medium (voice, audio, visuals, bandwidth and speed) and students. For example, small fonts and light colors don’t show up well over the monitors. Reed and woodruff (1995) pointed out that a mixture of different instructional formatting will also assist in maintaining students’ interest and

attention.

From the technology point of view, teachers must be properly trained in how to use all the features of the equipment as well as in those techniques that prove effective in the interactive distance learning environment. It would also be useful to provide the teacher with a quick reference guide that outlines all the major functions and capability of the system. Egan (1991) stated that learners gets more from the courses where teachers seems more comfortable with the technology; “they seem to maintain eye contact with the camera, repeat questions, and possess a sense of humor. In our college case”, we have one IT technician assisting the teacher from the start to the end of lesson. This proves be very costly method.

A suggestion which also came from one of the teachers is to train one student in every class as class assistant to operate the IT equipment in home and remote site as they might be called upon to operate the equipment if the instructor is at another site.



3. Instructional strategies

Early in the course, teachers had to establish clear class expectations through well planned and focused presentations with emphasis on student-teacher interactions. Otherwise Students might adopt a more relaxed attitude toward learning expecting the course to be entertaining, not educational (read and Woodruff, 1995).

It is absolutely critical to examine very carefully and thoroughly on how to teach in the interactive distance learning classrooms. “Having gone through the process, students results at the end of the semester were much higher than the ones which were taught in traditional face to face environment” one teacher said. Teachers merely put that down to the different teaching styles they were incorporating in their teaching.

The interactive distance learning classes can be an effective instructional tool for the distance teacher. As with other technologies, its usefulness and effectiveness is directly related to the teacher’s understanding of its benefits, limitations and utilizations. Therefore the teacher should prepare the student for the active experience using the interactivity features of the distance learning classes. By asking questions and engaging students in dialogue and noting body language of the students at both sites, teachers, can find out the interest and comprehension of the students. This will make the students enjoy and engage more in the course. Special attention should be paid to those students sitting at the back of the classrooms as the vision of those students normally is not clear. Special remote controls are used to draw the camera to the person initiating or responding to the question.

Students should also be alerted to the need to minimize all type of noise and activities (read and Woodruff, 1995). Both detract from the quality of the course. With the use of sensitive microphones, teachers at one site were hearing the whispering of students with each other on the remote site. Sometime they were hearing the opening of can of drink and the crunch of chips eaten by students in class. Some teachers dealt with this problem by asking the class assistants to tell the other students to be quiet or not to eat in class. Some others were using the site-facilitator at the remote site to settle students in and operate the equipment at the beginning of every class.

4. Students interactions

Many distant learners require support and guidance to make the most of their distance learning experience ((Threlkeld & Brzoska, 1994). This support is already happening at our college where we have a lot of student-to-student interaction and some teacher –student interactions at the home site. Some suggestions came from the existing IDLCs teachers that next academic semester, we should try to get teachers to travel occasionally to the remote site and conduct the teaching from there. Using this approach will create greater interactions between all students and the teacher.

Students felt the need to have frequent interactions with their teachers. More structured interactions might be utilized as a motivational tool (Coldeway, et al., 1980). As a result two hours were allocated as office hours and students could call or drop-in the office during those hours. Timely feedback on completed tasks, course assignments and projects were highly valued by our students as anecdotal evidence had shown in the discussion forum. Literature supports the collected evidence as well (Egan, et al., 1991).

Students benefit a lot from their involvement in small learning groups. These groups provide support and encouragement along with extra feedback on course projects and assignments. Most importantly, the groups promote the feeling that if help is needed it is available easily within the group. The brightest student in every class was trained as class assistant. Creating on-site class assistants proved to be successful as students were easily supported within the class by a familiar face. Burge & Howard (1990) stated that the utilization of on-site facilitators who develop a personal rapport with students and who are familiar with equipment and other course materials increases student satisfaction with courses. As active learners in the learning course, students create their own way in which they deal with the material to be learned. Learners must have a sense of ownership of the learning goals (Savery & Duffy, 1995). Saettler (1990) acknowledged that the learners must be both willing and able to receive instructional messages. He found that the mental effort which a learner will invest in a learning task depends on his own perception of two factors: the relevance of both the medium and the message; and his ability to make something meaningful out of the material presented. At our college we captured both aspects by giving the opportunity to our students to evaluate the course and the instructor at the end of the semester.

5. Faculty development and technical support

It is difficult to keep up with the fast pace of technological change that is being introduced to the education system. Many teachers lack the knowledge and skills to teach using interactive distance learning classes, yet colleges lack the IT support staff to assist with technical problems.

(Miller (1997), Murphy and Terry (1998) and Nahdi (1999) all firmly agreed that there is a recurring theme in the education sector which is the need for faculty development for distance education, particularly using ICT. Faculty at all levels, from University professors to secondary teachers, typically reported that they lacked knowledge and skills needed for effective delivery; in addition, many faculty report that they have had no experience in distance education or ICT delivery. Therefore it is of paramount importance for institutions to have staff training programs to improve the technical and pedagogical skills for their staff. At our college, we have Professional Development training sessions scheduled to train teachers to use the IDLCs effectively; these sessions are led by experienced teachers who have used the interactive distance learning classrooms. Team teaching with the same subject teachers is another concept we are trialing.

6. Conclusion

Interactive distance learning classes at the Western Region Colleges, HCT are providing the necessary bridge between separate campuses with shared resources.

Using the real-time connected classes' shared learning environment, the colleges have been able to meet pedagogical needs of students using variety of educational technology tools. After a short period of use, focus groups revealed that the positive attributes of the IDL classrooms and student success in those environments far outweigh their challenges. Much of the discussion about teacher needs focused on appropriate training in three areas: instructional strategies; creating instructional material; and use of the specific equipment. Concerns about the technology faltering were addressed via on-site technology support and classroom assistants



from amongst the students. Other issues highlighted by teachers were that they themselves offered increased attention to the course content and more preparation for classes in IDL classrooms; however, students also appeared to have a stronger connection to the content and engaged more fully. That is, the IDLCs provided a richness of engagement around topics and issues learned by students that far surpassed expectations, and receptiveness by teachers that would ensure their full integration into the college environment for years ahead.

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INTEGRATING LITERACY THROUGH VIDEO GAMES

Hannah R. Gerber, Ph.D.

ABSTRACT

This article explores case studies that examined the intersections and disjunctures which occurred between in-school and out-of-school literacies with adolescent males. Participants in the study were enrolled in tenth-grade English language arts. The study found that engagement in literate/reading activities within school and at home is vastly different in form, function, and type. School curriculum in literacy/reading was very segmented in nature, while at-home literacy and reading was integrated and collaborative. Practical applications for applying the findings are discussed.

KEYWORDS

video games, literacy, new literacies, adolescents, technology

INTRODUCTION

Today's students are tech-savvy and they enjoy a multitude of media and new technologies (Prensky, 2005). These same media are providing students with the opportunity to engage in many different types of literate activities, including but not limited to reading and writing. However, all too often these same students are becoming increasingly disengaged with the forms of reading that are presented within the traditional school curriculum (Gee, 2003; Jenkins, 2006; Prensky, 2005). Increasingly, adolescent males are becoming disconnected to traditional school literacy and in-school reading. These forms of in-school reading within schools vary from reading from textbooks, worksheets, to reading of canonical literature. Very rarely do these forms match the multimodal representations of literacy that students engage with outside of school such as videogames, social networking sites, blogs, and instant and text messaging. Examining how students are engaging with these multimodal forms of literacy will provide researchers, teachers, and curriculum developers with better ways to engage students in the reading process while in school.

LITERATURE REVIEW

Boys and Literacy

Statistically and anecdotally boys are more resistant to literacy as it is taught within schools and English classes (Newkirk, 2002; Smith and Wilhelm, 2002). The type of reading taught in English classes, reading novels and extended forms of narrative, does not match the highly social needs of many adolescent boys (Smith and Wilhelm, 2002). Boys quickly become alienated from school, and the view is that school reading and writing are not related to things that matter to them; they partition their lives into "schoolwork" and to "things that really matter" (Newkirk, 2002, p. xxi).

Smith and Wilhelm (2002) examined adolescent males' literacy practices and determined that literacy as taught in school does not make use of the peer network that many adolescent males deem important. When adolescent males attempt to recreate these peer networks within the classroom they often disrupt and disturb the progression of lessons and teaching and are reprimanded or sent out of the classroom. Because traditional literacy teaching and schooling does not make use of the peer groups that many adolescent males have already established they are not receiving crucial instruction in being critical consumers and producers of the various forms of literacy.

Functions and Strands of Literacy

English is the core subject that is required of the 69 million students enrolled in today's educational institutes and being literate is the foundation of all learning (Morrell, 2005). Being literate involves the ability to be able to work within the different functions of literacy. Rosenblatt's (1979) seminal work points to two functions within reading and writing--the efferent and the aesthetic. The efferent stance, or function, refers to the reading where gathering information is most important. The aesthetic is seen as reading for feeling and emotion in a story or novel. The two should not be seen as dichotomous, but rather complimentary to each other. All too often schooled-literacy focuses on one to the exclusion of others (Smith and Wilhelm, 2002), but out-of-school literacy often is a blend of both (Gerber, 2008).

However, it is important to recognize that literacy is not just reading and writing text; literacy is made up of multiple strands. The National Council of Teachers of English and the International Reading Association have identified six strands that are integral and important to literacy development: reading, writing, listening, viewing, speaking, and presenting. Each of these strands of literacy functions differently depending on the situation in which it is being used (efferent and aesthetic), however, all six are important to become a fully literate person. Whether examining literacy through the traditional print-centric view, or looking at it through the lens of the new literacies, it is important to understand the value that each strand plays in the development of literate individuals in today's society.

New Literacies

New literacies differ from traditional literacies in the manner by which they are presented and utilized by people. New literacies are often, but not always, multimodal in nature and are sometimes referred to as digital literacies. This area of research is burgeoning with the increase in usage of digital technologies by today's youth. However, it is important to recognize and understand what new literacy is, and how it is used, to begin to make changes to curricula. New literacies, such as video games, can often be used to deepen understanding of many print literacies used in today's classroom, such as the young adult novel (Gerber, 2009).

New literacies are not just the media that are being used (i.e., cell phones, computers, Internet), rather new (or digital) literacy deals with multimodal ways of thinking, learning, and knowing (Lankshear & Knobel, 2007). New literacies promote learning through producing and participating, rather than consuming (based on the binary of producing/consuming), and more often than not new literacies offer an integrated approach to learning and literacy through the intersections of reading, writing, listening, viewing, speaking, and presenting (Gerber, 2008), which, as stated above, are the strands that have been identified as integral to being a literate member of today's society through the National Council of Teachers of English (NCTE) and the International Reading Association (IRA). New literacies enable integrated and collaborative learning to occur because they provide opportunities for students to participate in learning situations where they have a voice in what is being said and a hand in what is being produced. Students become active learners in a community of people with similar interests, also referred to as affinity groups (Gee, 2003).

By examining adolescent males, their out-of-school and in-school literacies, traditional school literacy can be made more engaging (Compton-Lilly, 2009) and can more closely match the skills that students will need to succeed in today's global society.

METHODS

Qualitative case studies enable researchers to get into the heart of research and to begin to build connections between the questions asked and the data collected. In order to better understand the nature of adolescent males in school and out-of-school literacy habits--with a focus on the new literacies-- I conducted qualitative case study research.

Data Collection and Analysis

It is important to recognize and appreciate the various ways that students today are engaging in and within literate communities both in the classroom and outside of the classroom. To get at the heart of this I conducted case studies where I followed four adolescent males enrolled in a general 10th grade English language arts class during a six-week grading period in class and at home. The students were selected for the study based upon the answers they gave on a questionnaire about their new literacy use. This questionnaire had questions about the types of new literacies used and the amount of time spent with each new literacy per day and per week. It was administered in the 10th grade English teacher's class during the semester in which they would be testing for the state-mandated exam. The questionnaire was given to all three periods (on block scheduling). I selected the four males who had the greatest diversity among new literacies usage and who spent the greatest amount of time per week using the new literacies. Out of the four selected participants, one was in first period and the other three participants were in the final class period of the day.

Upon selecting the four participants I conducted individual interviews with the participants, their English teacher, and their parents and/or guardian. The interviews were done individually. The questions asked dealt with new literacy usage and perceptions of new literacies and traditional literacies. Each interview took approximately 45 minutes. The interviews were transcribed and later coded.

In order to see how the participants interacted with the subject of English language arts, and within their English class, I conducted observations during their scheduled English language arts class period over a six week time period. Each class period lasted 95 minutes. I went three times a week for six weeks. I took detailed field notes about what each student was doing in class, who they were talking with and how they were engaged in literate behaviors. In addition to this, I kept a checklist that allowed me to track how each strand of literacy was engaged in by each participant. (Figure 1). I also kept a detailed time log of each student as they engaged with the various strands of literacy. I conducted similar observations of the adolescents outside of school when they were engaged in new literacy practices. I conducted one observation a week for six weeks of each participant. Each observation was video recorded and later transcribed. Additionally, I took detailed field-notes and kept a detailed checklist, similar to the in-school checklist, the only thing difference was in the section titled "Literacies Used"; this section listed various new literacies.

Literacy Checklist/School

Date _____

Literacy Purpose

Title of the Literacy

___ Reading _____

___ Writing _____

___ Listening _____

___ Viewing _____

___ Speaking _____

___ Presenting _____

Literacy Stance

___ Aesthetic

___ Efferent

Literacies Used in Class:

___ Books ___ Internet Sites ___ Essays ___ Articles
 ___ Workbooks ___ Handouts ___ Videos ___ Speeches
 ___ Textbooks ___ Powerpoint ___ Freewriting ___ Journaling ___ Notetaking
 ___ Grammar Lessons ___ SSR ___ Read to ___ Read aloud ___ Read text silently
 ___ Other

Notes on how the literacy was used:

Figure 1. In-school literacy checklist

The data were then coded by the strands of literacy. I looked for patterns of interaction and type of literacy that was being used (from worksheets and novels in the class, to websites and video games at home). in both cases I coded the data for strand of literacy (reading, writing, listening, etc.), form of literacy (novel, web-site, video game, etc) and function (aesthetic and efferent). I then calculated the

percentage of time spent on each strand and with each form and function. For the purpose of this article I will focus my analysis on the strand of reading. The reason is that while reading is one strand of literacy, it is often the most stressed form when it comes to state-mandated exams. The following results depict the differences in how today's adolescents engage with reading at home and how they are engaged in reading within a test-preparatory curriculum.

RESULTS

In-School Reading: Solitary Confinement and Connecting the Dots

Within the classes observed, reading made up 11% of the total time each class period. Based on a ninety-minute block period this equated to an average of ten minutes of reading per day. The majority of the items read in class on a daily basis were reading directions and/or questions on worksheets, and occasionally following along as a CD of *Julius Caesar* was played. Students were required to do the bulk of the reading of the unit novel, *A Connecticut Yankee in King Arthur's Court*, outside of class. They would be assigned 30-50 pages an evening. The reading of the novel did not include deep, critical thinking skills, nor did it include student connections to the novel. Rather students were required to complete fill-in-the-blank study guides to supplement the reading, which also allowed for easily testable answers. This method allowed for the teacher to quickly see if each student had done the reading the night before. This method turned many students off from reading and many could be seen quickly copying answers from one another before class started. One participant, Jason, said "I barely read the book 'cuz it's boring and I can get the answers before class anyway."

However, Davis (another participant in the study, admitted that he enjoyed reading, but that he really disliked the way that they were required to read for class, and that they never talked about it other than answering the study guide questions. He also disliked the amount of reading that they were required to do on a daily basis, "so like tonight, we have over 50 pages to do and I am not sure if I can read it all." His dislike came from the fact that he considered himself to be a slow reader. Davis, along with the other students in class, was not given options on the materials or novels that were read; additionally, no independent silent reading or choice novels were assigned. The reading that they were assigned always came from the textbook or the class novel of *A Connecticut Yankee in King Arthur's Court*. Figure 2 shows the various forms of literacy that students read in class, and shows the percentage of time that they were used in class.

Very little of the activities or literacies used were multimodal in nature. The daily assignments required students to recall surface level details and to regurgitate information in order to fill out worksheets. Figure 3 shows an example of a worksheet that students were required to complete on a daily basis. These worksheets only required students to recall surface level facts from the novel and did not ask them to engage in critical inquiry. All too often, worksheets like these are used in classes because of the ease in grading them. Time is also a limiting factor, so worksheets like the one in Figure 3 often do not take up extensive amounts of class time. However, the teacher felt that her hands were often tied and that planning and the curriculum were not within her control; she explained that the curriculum was mandated and these were the items that she was provided—the texts and materials were limited for class, which did not allow for a lot of variability in assignments and activities.

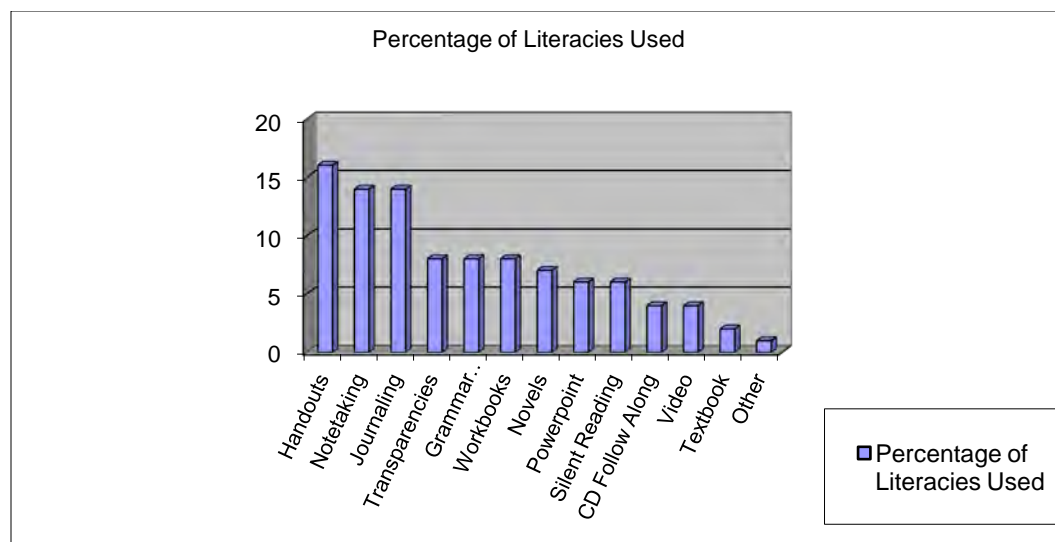


Figure2. Percentage that each form of literacy was used during the 6-week unit of study.

Additionally, the structure of the class and the mandated curriculum did not leave room for allowing students to work collaboratively. The majority of the reading assignments and questions about the reading required students to work by themselves and to produce a set of answers that could be easily graded. In fact, when students did work together it was only to fill out worksheets that asked surface level questions about the text. Students were rarely asked to co-construct knowledge, or to discover new ideas and to further research and examine those ideas. Creativity and collaboration did not exist because of limited time and lack of materials hindered development in those areas. This meant that students were not getting the ability to critically engage with reading at school. However, for some students, opportunities for utilizing multimodal literacies and becoming involved in critical and collaborative reading, came at home while engaged in literate activities.

Out-of-School Reading: Collaboration and Collective Intelligence

On a completely different side of the spectrum, reading made up an average of 56% of the total time outside of school according to daily logs and direct observations of the participants. This equated to approximately 70 minutes of reading a day during out-of-school hours. (Each out-of-school observation was based on a two-hour time period). The majority of the reading activities observed and recorded on the participants logs centered around the computer/internet and consisted of gaming (playing and researching videogames); reading was employed to gain information to further a videogame or to learn a bit more about the game. This included researching cheats, reading web sites for tips, and researching new games and websites devoted to games and events in history. Figure 4 shows the types of literacies and the percentage of time that the new literacies were engaged in while outside of school.

For one of the participants, Davis, reading also helped him to more fully develop his writing. An example of this was when he was researching ancient Irish warfare to develop an understanding of weapons used in a particular game. He then took the knowledge that he gained from playing the game and researching the claymore as he calls, “an Irish weapon of destruction,” to develop his own weapon for the book that he was in the process of writing. He researched the claymore online, and then he developed a version for a game he was currently playing, *Morrowind*, which is set in a fantasy world; he utilized what he had learned from his reading and experience when he started developing the weaponry for his novel. As he stated during the game of *Morrowind*, “Ah, the Claymore. Gotta love the Irish. The Irish were the original ones to come up with the claymore itself. And honestly, you set that thing on the ground and it is probably as big as me [his character/avtar].” This reading and then application of what he found, was what allowed him to subsequently create (highest level on Bloom's Taxonomy) his own version and put it into writing.

One of the more interesting observations to come out of studying the participants at home and at school as they engaged in literate activities, is the fact that the majority of the literate activities at home were interrelated with other strands of literacy. Reading was always subsequently linked to writing, listening, speaking, viewing, and presenting. Whereas at school reading would mainly only be linked to writing (and not the type of writing that engages students in inquiry and exploration, but the type of rote answers seen in Figure 3) reading at home was integrated across the strands of literacy. The participants would often simultaneously engage in reading, writing, listening, viewing, speaking, and presenting. The multimodal and dynamic ability of the technology and the Internet afforded the participants these opportunities.

It also gave the participants the ability to engage in collaboration and collective inquiry. For example, two participants Jason and Davis would often instant message and text message each other to work through difficult parts of games that they were both playing. Additionally, Davis was writing a fantasy novel, which was also his favorite genre to read. He would rely on conversations with friends to work through the ideas that he had. These collaborative efforts helped to further multiple experiences with literacies that were engaged in on a daily basis.

Limitations of the Study

This study was limited by several factors. First, the study took place only over a six week grading period and all participants had the same English teacher. Second, other subjects were not observed. I did not get to see how the students were reading material in their science class, history class, or math class, I only observed their literate behavior in their English language arts classes. Third, as the focus was on adolescent males I only observed males, however, it would give the study a different perspective and deeper look at literacy with youth today if I had included females in the study.

6. Merlin says the fountain cannot be fixed because it's possessed by demons which cannot be removed unless someone says its name, an act that would mean death.
7. After Merlin gives up, the Yankee patches the well and sticks fireworks in its chapel to make his miracle flashy. That night, the Yankee puts on a great show of exorcizing the demon with fireworks and a pump to send water gushing out the chapel door before the multitude.

► Chapter Twenty-Four – Twenty-Six

1. After the fountain is fixed, the monks are eager to bathe in it, but they are afraid that doing so will anger God and cause the water to stop flowing again.
 2. The Yankee tells the Abbot that he has discovered the water stopped the first time years ago because of another type of sin altogether, and that bathing is okay.
 3. After recovering from an attack of rheumatism, the Yankee goes out walking and finds a telephone office set up in an abandoned monk's cave.
 4. He calls Clarence and finds out Arthur is raising an army. What about the king's selection process bothers the Yankee?
-
5. Who does the Yankee feel threatened by at the monastery? magician.
 6. What does this person claim he can do?
he could tell what anyone is doing at this time
 7. How does the Yankee prove that this person is a fraud?
He asks what he is doing with his right hand behind his back
 8. What is the man's response? (p. 161)
He only says what kings, princes, and emperors are doing, not the doings of a subject.
 9. What is the "conflict of authority" faced by the monks? (p. 162)
They don't know who to believe between the Yankee or Magician.
-
10. The man says that tomorrow the king will be north of Camelot, but the Yankee predicts they will be in the Valley of Holiness. The Yankee knows this because Clarence told him they were coming earlier via telephone.
 11. The king brings with him part of his administration and holds court while he's in the valley. He is a Wile and Humane judge, but he unconsciously favors the well-born over the lower classes.
 12. The Yankee meets the king's officer examination board, which is made up of three priest who refuse to examine a cadet because he is a weaver's son. The Yankee appeals to the king to let two of his West Point professors handle the examination. The cadet then dazzles the king and his board with his knowledge of the science of war.
 13. The next candidates are nobles who cannot read or write, but because they come from four generations of nobility, they are eligible to be officers.
 14. The Yankee compromises by convincing the king to finish officering his first regiment with nobles, but to choose effective Commoners to fill up the ranks of the other regiments.
 15. King's-evil: The king touches the sick, thus curing them.
 16. While the king is "curing" people, "one greater than a king had arrived—the News Boy."
 17. When the Yankee decides to travel the countryside disguised as a peasant, Arthur requests to join him out of curiosity. He tries hard, but the Yankee still has to constantly save him from

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Figure 3. Excerpt from daily study guide from the unit novel, A Connecticut Yankee in King Arthur's Court.

PRACTICAL APPLICATIONS

With more and more students becoming increasingly engaged with multiple literacies, and having a majority of their reading and writing experiences through these literacies, it is up to teachers and schools to attempt to bridge the gap that currently exists between home and school literacies. Additionally, it is up to schools to recognize that not all students will have the same experiences with the new forms of literacy; schools need to help prepare students who do not have these opportunities at home to be equally competitive when it comes to future jobs and experiences.

All too often, technology and multimodal literacy are seen as an add-on and are not utilized as the diverse learning tools that they can be (Jenkins, 2006). Too often new literacies and technologies are used with traditional teaching methods and teachers are still assessing students' use of them in traditional manner. In order for new multimodal literacies to be fully recognized as a diverse and exciting way to engage learners, they must be recognized for the ways in which they engage students today and cannot be taught and assessed in the same manner. Because multimodal literacies are expensive and are not available in all classrooms, I am suggesting how to use traditional classroom literacies to replicate the learning aptitudes that emerge in multimodal environments.

Collaborative learning through critical inquiry is one such strategy that some 21st literacies employ. This can be incorporated in class instruction by setting up reading/literature circles, where each student has a role to play such as Connector, Literary Luminary, Questioner, Summarizer (Daniels, 2002). Students could keep blogs about their respective role in the group. Group members should be required to comment on members' blogs, and to critically question each other on their findings. Class time should be built in for blogging, this way students who do not have access to computers and technology are not left out of the experience. Students could also be required to design their blogs to match the tone, mood, setting, characters, or any other number of literary elements of the novel or story that might be taught in class. Students could represent these elements through music, font, photos, clip art, or skins (these are the backgrounds that can be applied to a blog or social network to give it design and color). Doing this would also mean that integration of the multiple strands of literacy is occurring. A free blog-site that can be used to accomplish this type of integrative learning is <https://www.blogger.com>. Both the teacher

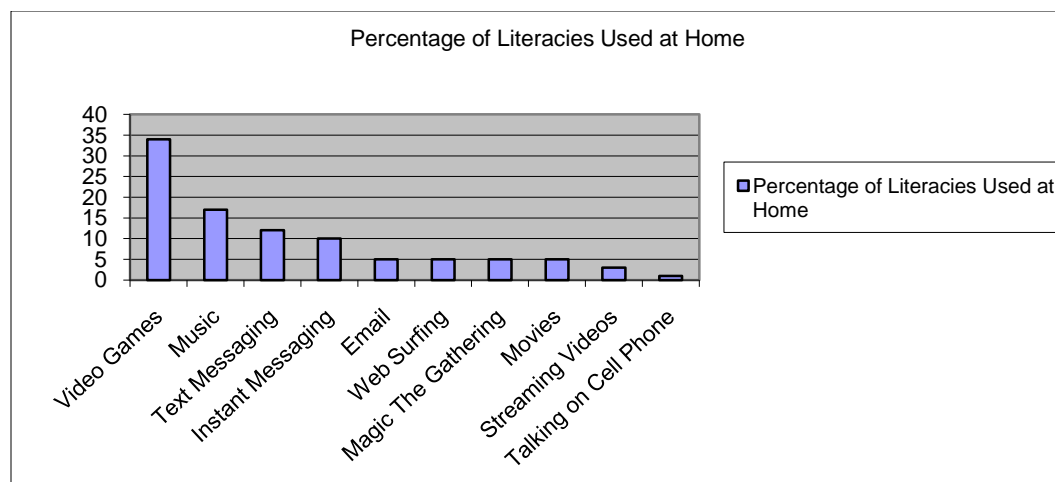


Figure 4. Percentage of time spent on each type of literacy at home over the six weeks.

and student can easily set up free accounts and manage them in-school and at-home. The blogs can be made private and viewable only to classmates, thus eliminating the possibility that others outside of the class will be reading and commenting on them.

It is important to recognize and validate the multiple literacies that students bring to the classroom, while at the same time realizing that not all students will have the same experiences or opportunities as others. It is important to therefore utilize existing new technologies to engage students in the multiple reading and literate activities that currently exist in a more digital society. By engaging students in collaborative thought and critical inquiry, and by incorporating multimodal literacies that require students to integrate the various strands of literacy, students will have the opportunity to engage in twenty-first century reading within the classroom.

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DIGITAL PLAY AND SOCIAL NETWORK SERVICES

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ABSTRACT

Social network services such as Facebook, Myspace, Friendster, and Bebo are used prolifically by today's digital native students (Lenhart, et. al, 2008). In fact, many students can be found conducting their daily communication and networking through these digital media. they will instant message, make social plans, tell stories through folksonomy, which is the art of storytelling through the tagging of pictures and videos. When students return to the classroom they are often bored with the curriculum of the class. This research explored using social network services as a tool with pre-service teachers as they engaged in critical inquiry through avatars and role play. The researcher found that social networks increased students critical inquiry through the ability to assume different roles and perspectives in an anonymous manner.

KEYWORDS

social network services, pre-service teacher education, role-play, avatars, case studies

INTRODUCTION

One only needs to walk into the university library and see students deeply engrossed in a range of media on their computer screens. The information on the screens holds these students captive. One might watch a student scroll down, click a button, start to type, and bounce to another page to start the process all over again. However, most of the time students are not engaged with school assignments and research for class, more often than not they are browsing through social networks and seeing what is happening in their lives and the lives of their friends. Social network services, such as Facebook, Myspace, Friendster, and Bebo, are used prolifically by today's digital native students (Lenhart, et al, 2008). Social network sites, with Facebook taking the lead with over 200 million users worldwide, are visited multiple times throughout the day. In fact, many students can be found conducting their daily communication and networking through these digital media. They will instant message, make social plans, tell stories through folksonomy, which is the art of storytelling through the tagging in pictures and videos. It is no wonder that when students return to the classroom they are resistant to the curricula that they are presented with; compared to the multimodal, fast-paced structure of their digital lives, school material is quite boring.

Social network services allow students to engage dynamically with one another throughout their college experience and beyond, but they also move beyond that and allow students to see someone's life through different eyes. Social media actually has caused students to be more socially aware and civically engaged (Lenhart et al, 2008). It is with this knowledge that the researcher began to examine the effect that social networks and role play could have on pre-service teachers. Role play, a much older form than social networks, has been used in many fields and areas to open up different avenues of thinking for individuals. Video games often rely on role play in order to have individuals think through situations and simulations, and educators in various fields have utilized role play as a method for introducing and engaging students in dynamic learning. Social network services allow educators to bring role play to the Internet and their classroom in order to make the conversation and learning more active and more engaging. And role play on social networks is not new--multiple profiles exist for celebrities, however, the majority of these profiles are fake, created by fans who assume the role of the celebrity and build a complete profile imagining that they are in the celebrity's role. This same concept can be used when using social network services to develop role play activities to engage students in learning about a particular topic from a different perspective. Most of today's students are already familiar with social network services and this

familiarity can be incorporated in the classroom in order to have students critically engage with material from diverse viewpoints.

In order to better understand how social networks could be used as a teaching and learning tool with students, the researcher posed questions that would help to develop a deeper understanding of social networks services and the benefit they could have on learning. The questions that frame this study examine: How students interact with social networks when they are introduced into the curriculum?; How role play is enacted within a class social networking service to enhance learning?; How students utilize the tools of Web 2.0 within a social networking service in order to self-select and enhance their own learning?

Methodology

Qualitative case study methodology was utilized as a means to understand the dynamics of a whole class social networking service. The freeware, *Ning.com*, was used in a secondary methods class at a university in a border town in the mid-West as a method to enhance students understanding of school culture and events. Twenty-two students were enrolled in the class, eighteen volunteered to take part in the activity. Each student was given a role—roles from parent or superintendent to bus driver or student were given to the students. Student then created their own profile based upon their assigned role. Students were then given case studies of real events that have occurred within local schools, and they were to interact with one another via the class *Ning* in order to determine how they would deal with the scenario. Forms of data include end of the project questionnaires, discussion board chat transcripts, and screen captures of students' social networking profiles. Data were analyzed using pattern matching and were coded into themes of interaction and self-selection of Web 2.0 tools appeal.

Findings

This study found that social network services are beneficial to encouraging students to understand multiple perspectives and roles that make up schools. A deeper understanding of the topics that were discussed in class, by understanding them through various roles, allowed the students to move beyond traditional pen and paper responses to a more dynamic, multifaceted, and multimodal approach to learning, literacy, and communication. Additionally, the researcher found that students' interaction with one another replicated ideas of socialization within pre-existing schooled roles.

The digital medium of the social network service allowed students the ability to communicate with one another and to socialize with one another in a non-threatening manner due to the fact that all students had pseudonyms and no one knew who was taking the part of each role; as a result cliques that were formed in class did not exist within the social network. Interestingly, the students who played the roles of the janitor, bus driver, cheerleader, and teachers, etc pages were visited more and more comments were left on those individuals walls than the students who participated as principals, superintendents, and deans. This allows us to see how the climate of school is established before students enter the classroom.

Students understanding of the case study was also enhanced, but voluntarily, through their use of multimodal elements. Students responded to the discussion board and case study with text, but they also added YouTube videos, links to websites, and documents that supported their answer to the case study. Students were not told to do this, but two out of every three students added multimodal links. The students who utilized a variety of multimodal sources had a better understanding of the case study and offered more practical solutions of ways to approach and solve the case study that they had been assigned. These students engaged more deeply in the discussions and had more knowledge to draw from about the particular topics that were discussed.

Discussion

Today's students come to the classroom with a wide variety of digital tools that they utilize to make meaning in everyday life. When allowed to use these tools within the classroom setting they often will develop a deeper understanding of how to approach situations and discover new ways to understand something. Students will use scaffolded learning to help push each other to higher order thinking by viewing what others have done and adding their own knowledge to the community of practice. It is important for educators to understand that the digital “you”th that we are encountering in today's classroom can, in fact, use what they know about digital literacy to enhance their own understanding of a new topic and to help their peers to discover a richer deeper understanding through scaffolded learning.

Incorporating this type of role play through social network services is possible in all classes and content areas. There are multiple unique ways to bring this type of learning into your classroom and it begins with first understanding the goals and objectives of your class in order to see just how to bring this type of role play and learning to the forefront of instruction.

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Can Commercially Produced Blended Materials Be Globally Successful?

Jonathan Turner

ABSTRACT

This article will look at the work of commercial publishers in blended learning in reference to a particular project currently at the design stage by Cambridge University Press, with the global aim of exploring the balance of considerations that a publisher has to take into account, how to marry commercial interests with academic rigor and usability and asking whether the current model is an appropriate one for this new learning paradigm. We will also consider why blended courses such as have failed to make a significant impact in terms of publishers sales in the ELT segment, and argue that the time for a fully blended course from commercial publishers is still proving elusive, because of the fine balance needed between commercial and academic considerations to make this workable, which takes into account local needs and expertise.

KEYWORDS

Commercial publishers, academic considerations, blended learning, learning paradigm, ELT,

THE STATE OF PLAYELT publishers are at the threshold of what they perceive to be monumental changes in the field. Having seen the experience of music publishers in recent years, course book publishers believe that they should adapt or suffer the consequences. This article will explore the response of one of these publishers, from both a pedagogue's and publishing insiders' perspective Cambridge University Press in ELT materials (English Language Teaching), which like all major ELT publishers is investing heavily in blended learning.

What we mean by blended learning

Blended learning has been described succinctly by the *New South Wales Department of Education and Training (2002)* "Blended Learning is learning which combines online and face-to-face approaches". Whilst *Smith (2004)* also eloquently describes it as "a fairly new term in education lingo, but the concept has been around for decades. Essentially, blended learning is defined as a method of educating at a distance that uses technology (high-tech, such as television and the Internet or low-tech, such as voice mail or conference calls) combined with traditional (or, stand-up) education or training".

The shape of an ELT classroom

In order to understand the model I will describe below, a brief description of an ELT classroom is required. ELT has focused on a variation of a widely accepted paradigm, that there is a period of input, which may or may not include a focus on form (grammar and pronunciation for example), and a period of output, from a highly controlled grammar focused cloze writing exercise to a piece of student poetry with no linguistic guidelines at all. But independent of this perspective there are always some form of input and output phase.

The CUP learning project

The CUP blended learning project is an attempt by Cambridge University Press' English Language Teaching division to adapt this model to a blended paradigm, and in so doing challenge their existing business model. This aim is perhaps an unusual one for CUP to attempt, as one of the oldest publishers in the world, one would expect CUP to be traditional in its outlook. CUP is renowned for academic rigor and quality. There is an exhaustive writing and editing process for producing text materials, as time consuming as it is meticulous. But in juxtaposition to these traditional publishing values, CUP is also known for academic innovation. CUP has a small but successful catalogue, incorporating course books, dictionaries, grammar practice, vocabulary practice and professional books for primary education, secondary, higher and specialized areas such as English for law or nursing.

Of course CUP is not clairvoyant in its ability to see the way that the ELT market may develop, but it believes it has found a recipe with a high degree of functionality, in tune with learner needs, being launched into a market with a high state of readiness. Other publishers are not standing still either, and market leaders such as OUP (Oxford University Press), Pearson Education and MacMillan are betting on their models to be the tipping point for blended learning in ELT. The project described in this article has been chosen not because it is the model that is guaranteed to have the highest market impact, but as an example of a model with undoubted advantages and pitfalls that will share important commonalities with those being developed by other ELT publishers.

The story so far for blended learning courses

We have seen many blended products from print publishers, e-publishers and individual institutions, some from scratch, some using existing e-learning platforms, from Moodle, to Blackboard and Fronter to adapting Wikis, blogs and podcasts into their classrooms. Many of these solutions have been highly creative and innovative, but none have been an unqualified success, at least for this researcher, as a teacher and publishing insider. We have had popular distance courses for many years, but all the indications are that these courses have had very limited success in achieving desired learning outcomes. The limited success of current distance programmes seems to be largely due to the nature of language learning and the difficulties associated with learning a language without a face to face element, as anybody who has ever bought a "Learn Japanese in Three Weeks" self-study course will probably tell you.

The blend of this project is print, online and face to face. The delivery of the electronic element will be different to the current model employed by products such as 'Rosetta Stone'. In this model a license is acquired by an institution and must be renewed, or CD's or purchased by individual learners. In the case of institutions a learner has access to the teaching materials for as long as the license is valid. This usually involves installing special software and of course can imply contingent technical problems such as download speeds, server issues and the like, although of course it is just as likely this will not be the case, there is an important benefit to the model being used by the project, which proposes to use the internet, and that is that students will not be required to use a specific location or machine (often in a language lab), to access the course material.

The CUP model

In the interface design proposed by the project, learners will receive a print textbook containing a password for access to the material the online component textbook, accessed from any machine with an internet speed capable of supporting audio and video content. Learners work with print and online

elements, and assessment, instruction and practice will all take place online as required. This model has been launched using Touchstone, a four level American English course with interestingly, an emphasis on speaking. The entire content of the course has been put online, using the same page design as the print version. This means that learners will have access to a Student's Book, Work book, Audio CD's, DVD, the existing course web site and multi-media CD-ROM all on the digital platform. This digital platform, or Learning Management System will be familiar to many learners from outside the language learning environment and purports to use an easy to use familiar interface designed for digital native learners.

How instruction will evolve in this paradigm

In most current blended language learning paradigms, the roles that input and output play are clearly delineated. The classroom teacher provides the input through a variety of means. In methodological terms this could mean a traditional teacher fronted grammar explanation or a task based learner self-discovery process. Whatever the methodology the teacher somehow directs the input or learning the learners are expected to be exposed to, before producing some evidence of learning in a practice or output phase.

In the evolving paradigm, there is a sea change in terms of the role of the instructor as the online content is responsible for varying degree of instruction, whether as a focus on form, such as grammar or pronunciation, or on meaning, such as learning a lexical set (vocabulary). It could also mean instruction in meta-learning or skills instruction, e.g., how to scan a text successfully when reading in a foreign language, or how to use discourse markers ("I mean", "you know") in spoken interaction. In the new model, instruction takes place within the LMS platform. Learners will access flash presentations of language points made by teaching professionals, and the traditional scaffolding role provided by the classroom teacher will be performed by the material itself which aspires to perform this function.

This new classroom paradigm has ramifications for both learner and teacher, not least that learners will be able to access high quality instruction (rather than reading bald facts), as many times as required. However it is not our intention here to juxtapose instruction with traditional classroom instruction in qualitative terms, rather to state that learners will be able to more autonomous in their decision on when to access instructional content.

In this changing paradigm the teacher's role should become one of facilitator or manager of content, meaning that teachers will spend less or even no time on language input, and more time on providing and setting up opportunities for communicative practice, through role play, debate, language games and the like. The type of controlled practice currently seen in online products and print work books alike will still be a feature of a blended course (and will be the element that teachers and learners will most easily recognize) but this will no longer be the sole functionality of the online element of a blended course, as we have seen in current models.

The materials production process

There is considerable resistance to the wholesale adoption of commercially produced ELT materials and the relationship between teachers and commercially produced ELT materials is at times an uncertain one. Teacher comments include: the book is too general, it's not appropriate for our reality, it's too old, it's already out of date, it has too many/few units it doesn't fit in with our programme, there's too much/little emphasis on speaking/listening/reading/writing/grammar/ vocabulary. All of these comments are at times valid but they are largely a result of publishers being able to second guess every institution or group of learners or indeed every market. So what is the project solution to this perennial set of grievances of the teaching fraternity? In broad terms the publishing model itself will reflect the "pull" system described by Brown and Hagel *"instead of limiting it (content creation) to what companies can devise within their own borders, pull systems throw the process open to many diverse participants, whose input can take product*

and service offerings in unexpected directions that serve a much broader range of needs” (Brown and Hagel 2005).

In editing terms this means a more bottom up approach to feedback and revision process, which in print publishing involves rounds of piloting and editing and re-piloting, a process that taking months if not years. Feedback is limited to practitioners chosen for the piloting process and tends to be a one shot deal. Teachers will pilot the material with one group before feeding back to the editorial team. Any changes that might occur after a textbook has been published will have to wait for subsequent editions, which is usually years.

In the project there will be almost instant feedback and revision in what could be described as a continuous improvement cycle. Teachers can report directly to online content editors with suggestions and amendments or indeed any other type of comment or commentary that could feed into changes in content. This sort of direct communication channel could reflect a much more horizontal, democratic and bottom up shape to the relationship between publisher and content manager.

Currently publishers produce materials for a worldwide, a regional (let’s say Europe) or a large local market (let’s say Japan). Specific market content is limited to “re-purposing”, whereby a course or supplementary book is usually superficially re-designed for a local market such as adding the school logo to the cover of the book, or including an insert with some additional content at the schools request. Again such efforts are only made as deal clinchers for particularly large adoptions.

This model will change within the project, both commercially and pedagogically. In commercial terms clients will be able to request their own logo and page design to be integrated into the existing page design. So in the case of the pilot course for CUP, learners will log on to their site to find the name of the series (Touchstone, the CUP logo and the logo of the school using the course). In pedagogic terms teachers and learners will also have the opportunity to contribute to the materials’ production and editing process which would further extend the democratic notion of materials production in terms of ownership as well as subverting the roles of writers and editors of commercially produced materials.

There are further possibilities to extend access to learners who currently have limited access to costly print materials. Under the current model all materials are produced and printed in rich nations and shipped to poor countries for sale to what is largely an elite audience who can incur rich country costs. Publishers feel that locally produced materials would somehow compromise quality, but in this new model publishers will be able to grant access to poor countries at local cost, or indeed no cost. The “pay what you can afford” model that has been used in other electronic media could be extended to ELT materials and allow CUP for example to fulfill their charter of “*disseminate knowledge as widely as possible throughout the globe*”. It would be possible for rich country institutions to cover costs for poor country counterparts (who would for example use no print component at all), or indeed through poor country institutions to contribute more to the editing, piloting and content contribution facets of the project to offset paying for access. Another readily available model would be for publishers to have country codes included in the course passwords, with appropriate costing for each market.

Degrees of “blendedness”

The second implication is as revolutionary as it is simple. Institutions will be able to purchase whatever elements of a course they desire as characterized by Brown and Hagel’s ‘pull’ model, “*these platforms are invariably modular to help resources and activities be more accessible and flexible. Instead of being rigidly specified, as in push systems, the modular elements are “loosely coupled”: they can be easily joined, without friction or customization, and just as easily disassembled and reassembled” (Brown and Hagel 2005)*. This means an institution could use the online course in its entirety, or only half the units or

components. In the same way institutions will be able to acquire additional content using the same interface as the core course. This content will take the form of what is commonly called ESP (English for Specific purposes) in the ELT field. For example a private university will be able to offer the same core levels to all its students, and on completion of these levels learners will take English courses reflecting their majors, but with the same page design and format as the previously completed four levels. This ability to deliver appropriate content is of course not revolutionary in other media, and the niche market has now become a dominant force, but in language learning it is pioneering.

Going from a traditional print based classroom teaching paradigm to a largely online blended solution may be too much for many institutions, teachers and indeed learners to assimilate. It is arguably for this reason that many existing blended solutions have failed to produce the hoped for results. Online materials have been either in addition to, or instead of print materials. In the first case this means that online materials may be used as part of a wider set of course materials but almost inevitably assume the role of adds-ons, as optional extras whose content does not dovetail with the core print material being used. In the second case the pedagogical leap required to go from a print to an online paradigm is simply too great for teachers and learners. And from a more mundane perspective, institutions don't have the infrastructure in place to provide constant high quality limitless broadband connectivity.

Stumbling Blocks

If we are talking about affecting deep action level behavior, how can we bring about a cultural, operational change without a catalyst to act as a change agent?

We have seen many attempts at introducing blended programmes, but have any of them seriously challenged the print based format? Many individual institutions have introduced extensive PD (professional development) programmes, and that many students classify as Prenskie's digital natives, "*native speakers of the digital language computers, video games and the Internet*" (**Prenskie 2001**) but we have seen often reluctant adoption of technological innovation in the classroom, and even rejection. This gap between learners use of technology outside the classroom to accrue knowledge and their lack of interaction with technology within a formalised learning environments has been documented, "*student's conceptions of learning differed from those of web based learning. This suggests that the students might make some distinction between school knowledge and knowledge in different contexts*" (**Tsai 2009**). We have also seen an attempt at large scale PD on the part of publishers with the CUP project including teacher training into the course itself, but the results of these need to be analysed further.

It is feasible that with good interface design to teach the teachers the operational aspects of the project, this will be the last problematic aspect to large scale effective uptake, although some researchers have argued that for some this may still be problematic. In the same way the operational aspects for learners themselves will be relatively straightforward, coming as they do from a technological background, figures show (freely available on the internet of course), the kinds of ways that digital natives are using the internet. Rather this is a case a learners seeing a gap in their perception between the role of technology in an out-of-education context and an in-education context.

This problem can largely be categorised as cultural in nature, that is to say it is a question of hearts and minds, i.e. stakeholders, primarily learners and teachers, as well a programme directors and even parents will have to view this new learning paradigm as learning a language effectively, and achieving this goal of using technology effectively will involve effective groundwork and championing by stakeholders, "*technology and it's impacts are constructed and defined culturally: technologies do not speak for themselves or have an impact outside of people's interpretations*" (**Oskmann 2006**). If this core belief can be achieved it is necessary to transform behaviours, thus bridging the gap between beliefs and practice and at the same time the gap between current skills and new skills these new skills are defined in

terms of the dichotomy between e-learning and traditional face to face learning, “*e-learning (is) short, targeted, task-driven, and episodic while classroom learning tends to be longer, less well targeted, and programmatic*” (Schweizer et al. 2003). The level of control and feedback from the project is more extensive than we have seen in other blended courses and it will by its very nature require more unsupervised work from the learners. This may not be problematic for more autonomous minded learners, but for those from a more top down teacher centred learning tradition, this change, no matter how effectively controlled will be problematic. Walters and Vilches argue that end users should feel a sense of ownership, which can only be achieved by actively building towards a consensus, “*when the attempt is made to put innovation into practice, it cannot be assumed that ownership at these levels has already been established. Rather, it will usually be necessary to build towards this gradually, by catering appropriately to a range of innovation implementation needs*”. (Waters and Vilches 2001). This resistance will not only be amongst teachers from the technologically conservative end of the spectrum, but from those at the cutting edge. Many teachers are well versed in constructing materials from open sources, requiring no payment at all. To ask these teachers to relinquish this control and to see the benefits of using materials developed by expert pedagogues (and contributed to by the wider teaching community, will be difficult.

Resistance could extend to the publishing industry itself as well. If CUP, or any publishers hope to produce a “pull” based horizontal course with egalitarian access, then they should question the print component of this course. If the print component is a transitional phase to a complete online product we may yet see a worldwide course paradigm, but if it is part of a reluctance to subvert traditional models fully, then I would argue that the true potential of the project is not being exploited.

There are a number of stumbling blocks to any kind of institutional and intitutionalised change. A move towards a more autonomous, flexible online learning model will be a slow process, undoubtedly rife with stops and starts. However the backing of the major publishing houses, with their logistical clout as their strong academic tradition, may prove to be a catalyst for large scale adoption of a blended model in ELT.

If the “push” from publishers is coupled with a realisation on their part that a more bottom up inclusive approach is plausible then we could see the opting-in of teachers and learners coupled with a lighter workload for teachers, then the road to blended learning in ELT may be a long but inevitable one.

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Using a Web 2.0 application for communicating with students during work experience – the Tawasul experience

John Raven and Karen O'Donnell

ABSTRACT

Work experience is a key part of student learning at the Higher Colleges of Technology but, in some cases, students can feel isolated and cut off from their peers. Recently the growth of web 2.0 social networking sites, such as Facebook and Twitter, have become increasingly popular as a method of interacting online with others over distance. Participation in these sites can also improve digital literacy. This paper discusses how a Web 2.0 application called Tawasul was used by sections of students in both the men's and women's campuses in Sharjah at Diploma IT level as part of their work experience learning. Feedback about Tawasul from students and mentors presented a generally positive perspective of the application. The promises of the Web 2.0 technology were met although it is not clear how well this interest is centred on academic rather than social reasons.

KEYWORDS

Web 2.0, social networking, work experience, vocational education, digital literacy

INTRODUCTION

The Higher Colleges of Technology (HCT) is primarily a vocational or "employment-orientated" institution made up of numerous campuses in the UAE that train tertiary level Emirati students for the workforce (HCT Strategic Plan, 2008, p.7). Due to this vocational focus and its role in the Emiratization of the UAE workforce (see Tanmia 2004), work experience (WE) has been an important part of the curriculum since the college's inception in 1988.

There is a lot of support for work placements, or internships, in the literature, particularly within the realm of vocational education. This is primarily because, as Brodie and King put it, "the skills and abilities needed on graduation by today's students are the same as those of employees already in the workplace, who seek to manage and adapt to change and the demands of complex employment situations" (2007, p.12). As a result, "the bulk of employee work knowledge and skills are developed from work experiences" (Herling, 2008). Students on work experience benefit by learning in context, by constructing knowledge within an authentic community of practice, an activity supported by sociocultural models of learning (see Rogoff 1990, Wenger 1998, Wertsch 1991, Wood 1999). At HCT the faculty and work colleagues act as mentors, scaffolding learning and enabling the students to reflect on what they have learned through a series of interviews and reports following work experience.

There can be some pitfalls with work placement, however. As Lewis points out, “Too many students work in relative isolation, even though the benefits associated with working and solving problems as a team are well known” (2008). He suggests that the key to success is in encouraging collaboration via communication with peers, as well as with faculty and administrators. Indeed, at the two HCT Sharjah campuses, where students typically go out on work experience in their final semester for periods ranging from four to eight weeks, communicating with the students has sometimes been problematic due to the remote locations of some of the workplaces. Faculty can spend an inordinate amount of time locating and driving to visit students across the Northern Emirates to meet and discuss their progress on WE. Many of the students feel isolated both from their mentors and peers even though the faculty typically visit students at least three times on an eight week internship. One of the key concerns at the Sharjah Colleges, therefore, is to increase communication and scaffolding with students on work placement while being more efficient with faculty travel time.

Web2.0 technology as a possible solution

Although some question the validity of the term, “Web 2.0 refers to the second [generation](#) of [web development](#) and [web design](#) that facilitates [information sharing](#), [interoperability](#), [user-centered design](#) and [collaboration](#) on the [World Wide Web](#)” (wikipedia.com accessed 16th August, 2009). Well known examples of Web 2.0 applications include Facebook, Twitter, as well as innumerable blogs, forums and other interactive sites. The advent of this new generation of online applications allow the creation of virtual social communities that not only facilitate communication between a plethora of users potentially from anywhere but also help build users’ digital literacy skills by motivating them to write and respond to posts online in an interactive fashion.

At the Sharjah Colleges these new online tools present an ideal opportunity for overcoming the challenges of work placement by facilitating and recording communications between students, peers and mentors on a regular, formal and online basis from remote locations. We searched for a suitable Web 2.0 application that met our needs and downloaded open source code from elgg.org that we then configured with features we wanted specifically for use with work experience students. We labelled this application Tawasul.

WHAT IS TAWASUL?

Tawasul (which means *making connections* in English) is a personal learning network, it’s an innovative implementation of interactive Web 2.0 technologies which allows users to construct a personal learning landscape where they can create profiles, build and tag content, connect with users, blog, discuss, join communities, subscribe to news feeds, create social bookmarks, upload resources, share videos and podcasts and more.

Intended primarily to maintain an ongoing dialogue between the students and their mentors and also to build up a virtual community of practice, or platform, involving all of the students on WE together, Tawasul was developed on a Sharjah college server and opened up to all students on WE in the 2008/9 academic year. The implementation and pilot phase at Sharjah Women's College involved over 300 students across Business, IT and Education who used the system for work placement and job shadowing. This web-based personal learning environment (PLE) allows students to join their mentor's blog community as well as have their own space on which to post blogs and comments about themselves and comment on other students sites. The application has many tools for modifying profiles, adding resources and creating public and private communities. A screenshot of a Tawasul home page, or wall, with a link to a work placement community is shown below, for instance.



Figure One: A Tawasul personal wall

The main development objective was to provide a community platform where college mentors can easily and efficiently connect and communicate with their students, monitor their work placement or teaching practice experiences more effectively and more frequently, provide a greater level of support and thus increase learning opportunities. The aspiration was that this common platform would be easily accessible, rapidly adopted by the students and appealing enough to enable them to regularly share their experiences not just with their mentor, which has previously been the expectation, but also with their peers. In doing so, the hope was that students would learn about other work environments and

careers thus guiding them in making choices about their future. With the provision of a more robust support framework, we aimed to scaffold the students more effectively in the work place providing both peer and mentor counselling. The users of this system have the option to make their blogs public or private to the community – something crucial to the female students particularly in this cultural context.

The IT students involved in this study were required to complete set tasks on-line while they were on WE, as indicated in a post below, and these were then embedded into the WE assessments.

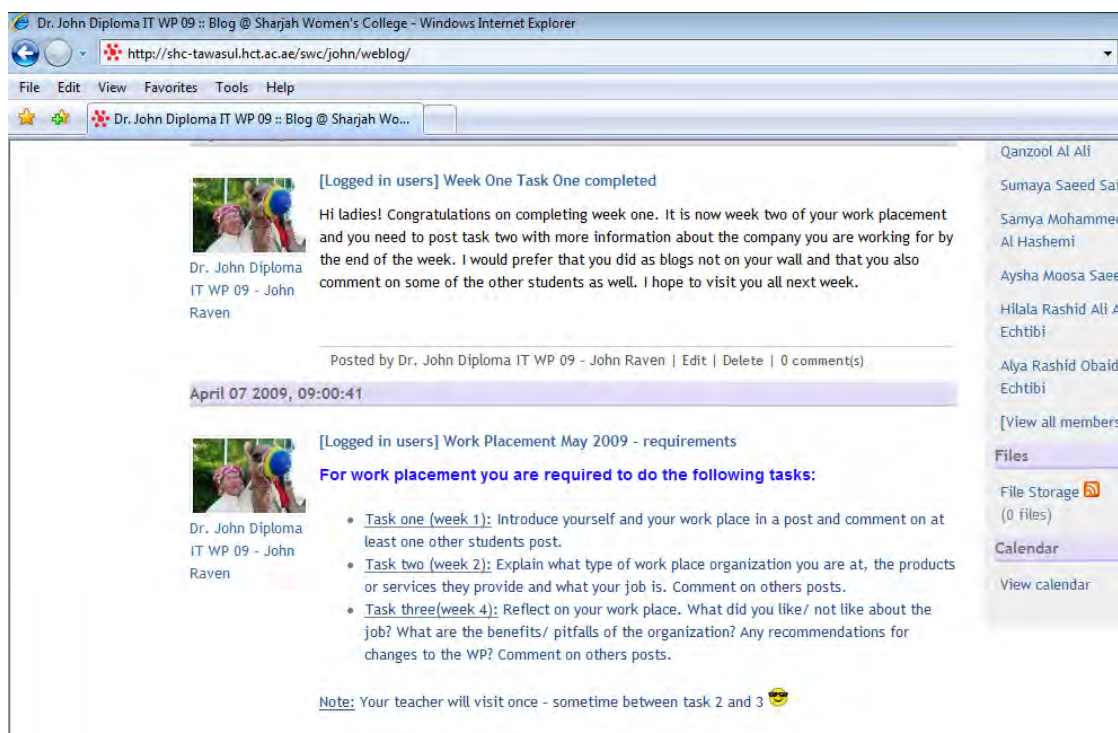


Figure Two: WE Tawasul task list

As well as respond to these set tasks, students using the system were also encouraged to use the platform to keep in touch with other students by commenting on their blogs and comments. Indeed this aspect of the application proved very popular with a sample shown below from one of the student's blogs.

The screenshot shows a web browser window with the address bar displaying 'Aysha Moosa Saeed :: Blog :: Task 3 @ Sharjah W...'. The main content area features a blog post by Aysha Moosa Saeed. The post title is '[Logged in users] Task 3'. The text of the post describes her time at a police station, mentioning the IT department, the presence of criminals, and her learning experience. Below the post, a comment is visible from a user named 'Hi Aysha', who expresses interest in the author's work placement experience. The right sidebar contains navigation links such as 'Tags', 'Reso', 'D.T.37s', 'Click here to add', 'Send Message', 'Blog', 'Personal blog', 'Weblog Archive', 'Friends blog', 'Bookmarks', 'Bookmark Stora', 'Friends', and a list of names including 'Sumaya Saeed S', 'Khawlah Abdulla', 'Shamaa Saif Sal', 'Qanzool Al Ali', 'Naeema Ali Abd', 'Raeesi', 'Khuloud Abdelha', 'Ahmed Al Hamm', 'Ayesha Mohame', and 'Abdulla Al Hamr'.

Figure Three: A student blog with a response

The potential benefits of implementing Tawasul were suggested to the College Administration in the following categories:

Quality Student Benefits

- Online support and timely feedback from college mentors and peers during work placement/teaching practice can ease a student's transition into the work place, reduce their sense of isolation and increase their confidence and developmental progression.
- Students often secure permanent employment within their work placement organizations on the strength of their performance during their work placement period. Receiving on-going coaching and mentoring during the work placement period will ensure that they perform at their optimum and create a lasting positive impression of themselves and hence the HCT.
- Students are empowered through the sharing of experiences to make more informed decisions about their program choice and future careers.
- Students apply critical thinking and problem solving skills in supporting their peers.
- Students practice their reading and writing skills in English.

- Students get experience of business technology when using the site, editing and uploading documents, video, image and audio files

Teaching Faculty Benefits

- The teacher can track progress of each student much more closely thus offering effective and timely support to many students simultaneously.
- Teachers have the ability to frequently compare daily activities of individual students with their work plans, allowing mentors to take a more informed and active role in liaising with student WP/TP supervisors.
- As mentors have continuous access to the progress of students, they can avoid employer relationship breakdowns and the build up of personal frustrations that might produce conflicts or damage the students' confidence and developmental progression in the placement.
- Work placement mentors can manage their workload and time more effectively by scheduling online and personal contact with their students as appropriate.
- Students can upload current information on their work placement to assist the teacher. For example, location maps, google maps links, the name and contact number of their mentor, working hours, department they are working in each week. All this information is delivered in a timely and effective manner which enhances the effectiveness of the mentor.
- Student work placement case study materials can be downloaded and used as resources for new students about to complete their work placement.
- Shared resources and teaching materials can be made available
- The system can be linked to live information feeds, such as a news feed.

HCT System Benefits

- More effective use of teaching faculty time. Sharjah Colleges catchment area includes the Emirates of Sharjah, Dubai, Ajman, and UAQ. During work placement students can be dispersed widely and travel time between appointments in the work place can be considerable. This does not make effective use of the highly trained teaching staff time so using a virtual mentoring channel offers considerable financial savings to the college.
- Tawasul is an internal networking application, which can have access controls applied to separate student groups. It is thus totally secure and unlike many of the public social networking sites or virtual worlds does not compromise the students' cultural values in any way.

STUDENT FEEDBACK

Feedback about Tawasul was collected from three sections of IT students in both men's and women's campuses by a survey upon completion of WE (n=51). The survey contained a number of Likert scale items designed to assess the student opinions towards Tawasul and some open ended questions for written comments about the application (see appendix A). In addition, focus group interviews held as part of the assessment for work experience included questions and discussion about using Tawasul. Comments from these interviews and also comments from mentors themselves about how students used the online tool were collected.

Overall, the survey results supported the use of Tawasul in a number of key areas, such as the one illustrated below.

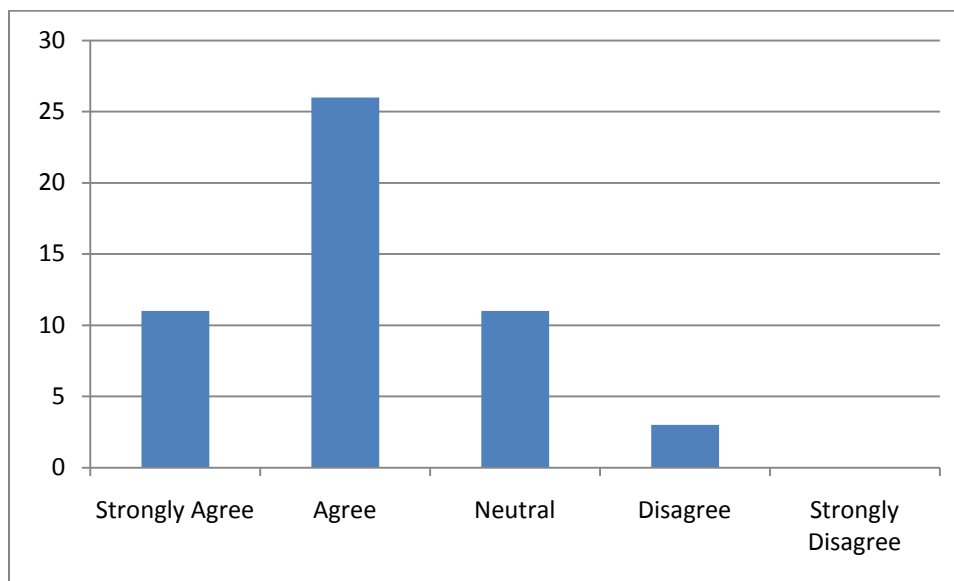


Figure Four: responses to “I like to write on websites like Tawasul

These responses indicate that the students liked web2.0 technology and many were familiar with it. Specifically regarding the Tawasul application, across both male and female campuses, 86 percent agreed or strongly agreed that the Tawasul tasks were clear and 86 percent agreed that they had received enough training with Tawasul. The students had little difficulty with accessing and being part of the virtual Tawasul community. Regarding why, 80 percent responded that Tawasul let them see what their friends were doing, and this is also reflected in the chart below.

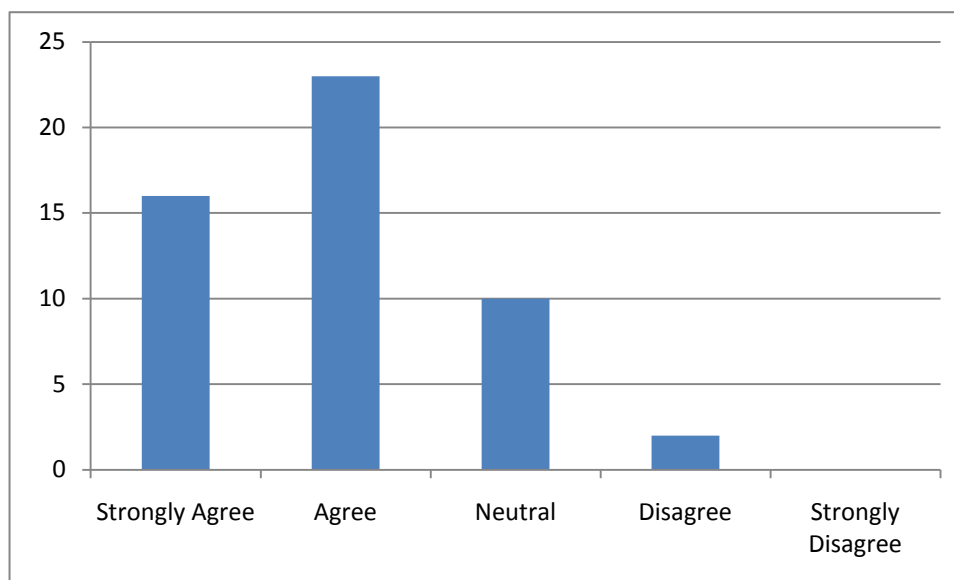


Figure Five: responses to “I liked reading other students comments and posts”

This indicates that the students liked Tawasul because they liked communicating with friends and liked to see what their friends, not just those on work experience, were writing about. This was supported by written comments in the survey and also oral comments made by students in the focus group interviews. Typical comments were that the students “liked seeing what friends did in their work” and that they “thought it was a good idea to contact friends and teachers”. Some students mentioned that they liked communicating with friends specifically not in the same IT class or program since the Tawasul site included all the college segregated by gender. The male students, in particular, commented that they wanted Tawasul to include more outsiders, including friends outside the college and also they wished to see an integrated rather than a segregated Tawasul site, although none of the female students mentioned this, possibly reflecting socio-cultural norms. Many of the male students also mentioned in the interviews that they preferred other social networking websites, such as Facebook or Hi5 to Tawasul and so compared Tawasul, an application that was set up specifically for work experience, with publically available social networking sites. Clearly it does not compete from these students’ perspective.

What is also of interest is the extent to which Tawasul was helpful, from the students’ point of view, for successfully completing and learning from work experience, not just as another way of communicating with friends and seeing what they were doing. The results from the survey about this were not so clear, as the following bar chart indicates:

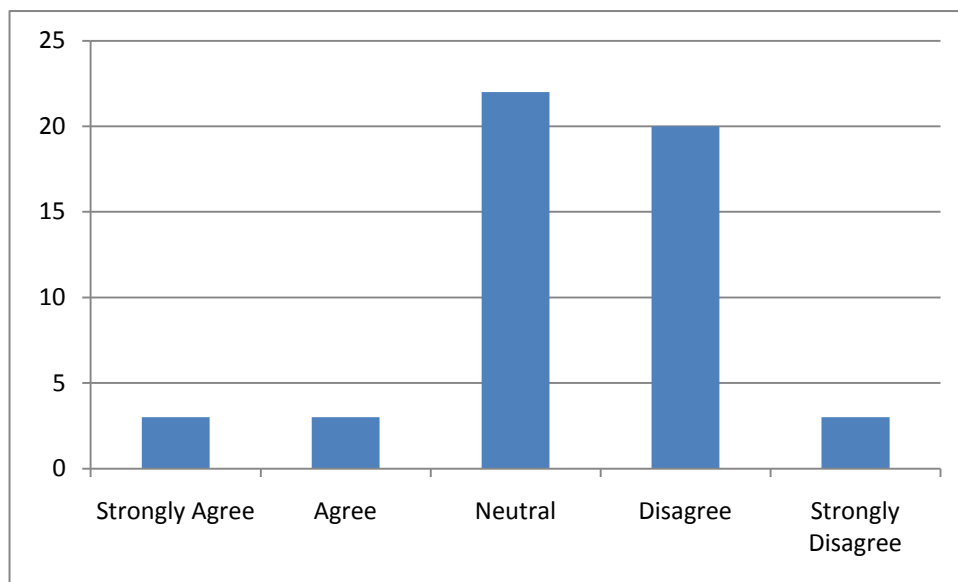


Figure Six: responses to “Tawasul did not help me with my work experience”

Although the number of students selecting disagree is encouraging support for the idea of using Tawasul for work experience, the number selecting neutral or agree is concerning. It seems that although the students found the assessed Tawasul posts and comments easy to follow, some did not see a link between what they were using Tawasul for and what they were learning on work experience. In the focus group interviews, many of the male students expressed this point. One student said, for instance, that “I had no time to do it. It’s unnecessary”. Another said that they prefer to “use mobile phones to keep in touch” and another asked, “why use it if we have Facebook?”. One blatantly said it was “a waste of time”. Very few of the female students mentioned this in the focus group interviews, however, which possibly points to a gender difference that warrants further exploration. Some of the female students did mention that they found the Tawasul interface confusing. This is further supported by the chart below.

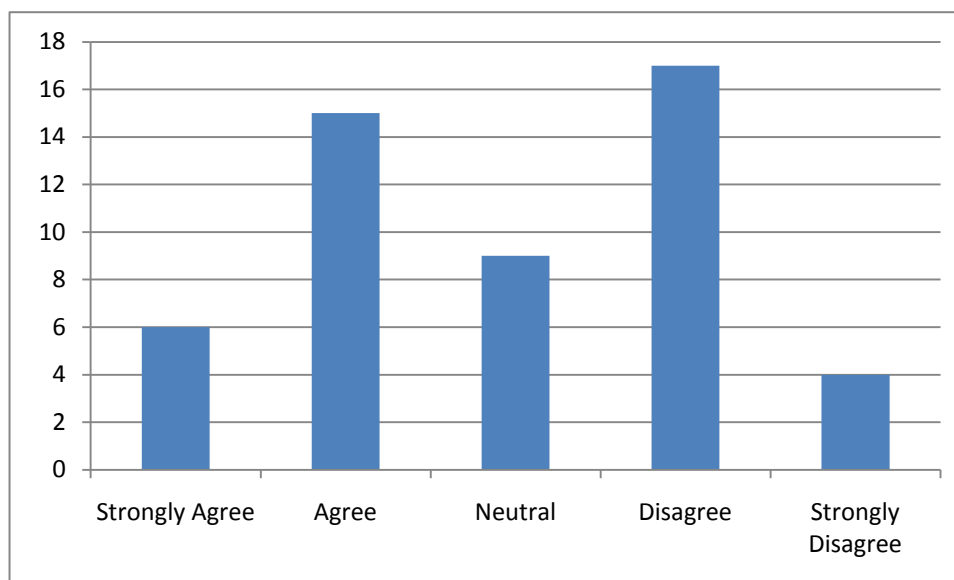


Figure Seven: responses to “It was difficult to know where to post messages in Tawasul”

From this chart, we can see that there were some misgivings about where to place posts and comments using Tawasul. The way Tawasul work is a bit convoluted with it being possible to post on a “wall” or in a blog. The “wall” posts were not recorded permanently but blogs were stored in a database, which made it possible to revisit them later. In addition to this confusion, users were able to set up communities inside their personal Tawasul pages that contained another wall and blog. Mentors were requested to set these up and then ask students that they were mentoring to join this community and post there rather than on the mentor’s home blog. These options led to some confusion by both students and mentors and needed to be taken into account when assessing what posts and comments the students had written.

REFLECTION

What did the students like most about using Tawasul? It is apparent that the aspect they liked the most was seeing what their friends were doing. They were motivated by the social aspects of the networking tool rather than using it just for academic reasons, that is, as just a requirement for WE. This is supported further by the finding that, even though they thought the WE tasks were clear, many were neutral concerning whether or not these tasks helped them with WE. Many of the male students in particular suggested easier alternatives such as Facebook and it is apparent that there are broad gender differences in perception of the web application that warrants further analysis given that Tawasul was segregated by gender. The Tawasul interface needs simplifying also, even though the assessed tasks were clear to follow, according to the survey results.

So, although the results reflect much of what the literature informs us about the validity of using a Web 2.0 social networking tool to improve communication via an online resource, there does not appear to be a strong associated link with meeting the academic goals associated with work experience. However, Tawasul is in an early stage of development at the Sharjah Colleges and we believe that the gains created by interest in what peers are doing in the virtual community offset a lower level of enthusiasm shown towards the WE orientated tasks. Simply put, it is better than the old way of doing it when many students felt isolated and cut off from their peers and mentors. As well as building the students' digital literacy skills by encouraging online written interaction, Tawasul worked to remove the sense of isolation, replacing it with an online virtual community.

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AFFILIATION AND ADDRESS INFORMATION

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DIGITAL PR EFFORTS IN THE LIBRARY

László Czeglédi

ABSTRACT

Digital literacy among others includes communicational literacy skills. As a result of the increasing prevalence of digital literacy traditional communication methods give way to on-line or digital communication with a special emphasis on integrated communication efforts. This type of communication efforts gaining a steadily increasing use by libraries are supported by several electronic devices including web 2 systems. The application of digital PR can strengthen the institution's position in its immediate and regional surroundings on a long run.

The Eszterházy Károly College launched an effective internal information network in order to inform the College community of actual developments, events, along with broadcasting edited programs. The iVision system coordinated by the Central Library is capable of accommodation to local special needs. The Digital Signage information distributing and content providing system is capable of pre-scheduled presentation of program units and the simultaneous broadcasting of various information at its respective end-points.

In addition to discussing the options of web integrated digital PR for the library, I will introduce the structure of the information system while briefly highlighting the respective hardware and software requirements, and the special, local options of network-based information and content provision.

KEYWORDS

digital literacy, digital PR, Digital Signage, academic library

DIGITAL ERUDITION, CULTURE AND LITERACY

The task denoted by the title of the present essay imposes the responsibility of the acquisition of digital literacy on service provider, librarian, and user alike. Consequently, a brief examination of the very concept and the related problems is necessary as a sound definition and implementation of digital PR rests on the clarification of the notions of digital literacy and communication as well.

While several definitions of the concept of digital literacy had been forwarded, it is hard to single out those with universal appeal or a comprehensive capability. Moreover, digital literacy has various subtypes representing diverse levels. We present a brief overview of the respective definitions below:

„Digital literacy represents a person’s ability to perform tasks effectively in a digital environment, with digital meaning information represented in numeric form and primarily for use by a computer. Literacy includes the ability to read and interpret media (text, sound, images), to reproduce data and images through digital manipulation, and to evaluate and apply new knowledge gained from digital environments.” (Jones-Kavalier, B. R., & Flannigan, S. L., 2006)

„Digital literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process.” (Martin, A., 2006)

„Digital literacy is the ability to locate, organize, understand, evaluate, and create information using digital technology. It involves a working knowledge of current high-technology, and an understanding of how it can be used. Digitally literate people can communicate and work more efficiently, especially with those who possess the same knowledge and skills. Certifications are available to determine if a person is digitally literate. Digital literacy encompasses computer hardware, software (particularly those used most frequently by businesses), the Internet, cell phones, PDAs, and other digital devices. A person using these skills to interact with society may be called a digital citizen.” (Wikipedia)

„... digital literacies, quite simply, involve the use of digital technologies for encoding and accessing texts by which we generate, communicate and negotiate meanings in socially recognisable ways.” (Lankshear, C., & Knobel, M., 2008)

The above selection demonstrates that the concept of digital literacy primarily entails the application of digital devices, activities performed in digital environments, the reading of materials presented on various media, and the relevant communication efforts facilitated by the latter. A closer look at this conceptual area reveals that digital literacy refers to a gradually developing skill continuum climaxing with the acquisition of digital erudition. I believe that making a distinction between the two concepts and the establishment of a conceptual hierarchy is necessary since digital literacy, erudition, and digital culture are not synonymous terms and imply different meanings for each age group. Consequently, the difference between the meanings of the respective concepts has not been fully clarified. I am convinced, that digital literacy is a part of digital erudition, thus the acquisition of the latter starts from the bottom, from the user level. Attaining digital literacy can lead to digital erudition in two ways, either via a professional route including exposure to the digital world at work or at professional forums, or through

such „everyday“ private and personal means as taking care of one’s business at banks, post offices, stores, or offices.

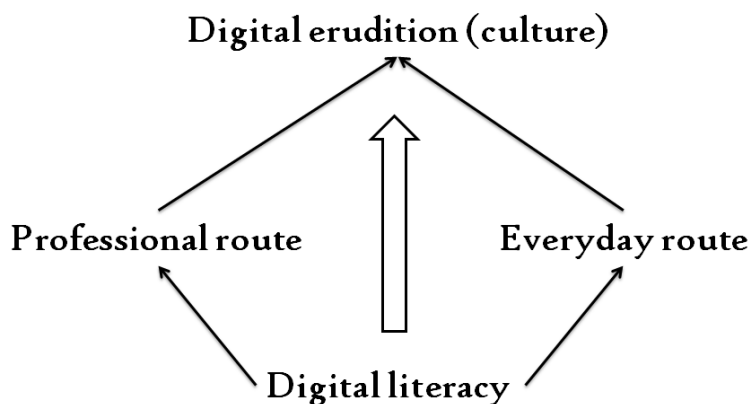


Figure 1. The acquisition of digital erudition

The acquisition of digital literacy, however, cannot be considered a simple process. Since it appears in a wide variety certain age groups are more predisposed to different types of digital literacy and some aptitudes can be more easily attained than others. This can also depend on the respective individual’s professional background, communication abilities, or on various personal factors and criteria. As I mentioned earlier digital literacy is composed of a wide assortment of components, some functioning on its own while others are either interdependent or supplementary. Thus the concept of digital erudition includes the following types of literacy:

- Computer literacy
- Information technology literacy
- Communication technology literacy
- Image-based or visual literacy
- Media literacy, etc.

INFORMATION TECHNOLOGY LITERACY – COMMUNICATION TECHNOLOGY LITERACY – DIGITAL PR

My essay primarily focuses on information technology literacy and communication technology literacy along with the combination of information technology literacy and the World Wide Web as a potential communication device.

As a result of the increasing prevalence of digital literacy traditional communication methods give way to on-line or digital communication with a special emphasis on integrated communication efforts. The actual integration of various communication devices entails diverse difficulties and it often amounts to no more than the presentation of the same creative material on different display surfaces. Integrated communication also implies that through exerting diverse impacts along with providing an equally variegated argumentation system assisting the respective decision-making process each media surface plays a different role in the life of the user thereby warranting the utilization of the widest range of relevant communication surfaces available.

Integrated communication, however, requires the fulfilment of two criteria, the compatibility of the respective devices and that of the contents broadcast on the particular media surfaces. At the same time the appearance format of contents have to be adapted to the relevant communication surfaces. (Incze, K., & Péntzes, A., 2006) This type of communication effort while being supported by several electronic devices including web 2 systems is gaining a steadily increasing use by libraries.

Nowadays the use of modern, state of the art equipment supporting communication and PR becomes more prevalent in libraries. Below we list the most frequently used means and methods:

- Traditional equipment
- E-mail
- Blogs
- Other on-line forums
- Electronic newsletters
- Video sharing portals
- RSS news channels, etc.

The implementation of new technologies gave rise to the so-called information allocation and content provision systems. These new devices facilitating the effective transmission of public service and personalized information have been introduced both in the public and higher education sphere along with the libraries of the respective institutions.

DIGITAL PR IN A LIBRARY ENVIRONMENT

The information allocation and content provision systems fulfilling a long standing objective of information and content providing institutions are new generation means of information transmission and PR efforts capable of forwarding information relevant to the general public or to a certain group of

people. The increasingly aggressive nature of commercial advertising and the declining role and narrowing options of the cultural, or, non-profit advertising in everyday life provide further justification. (At the same time we have to admit that there is no such thing as pure non-profit advertising as all commercial activity yields a certain profit not always expressible in financial terms) Consequently, even in such aspects as the application of the respective technologies it is absolutely necessary that educational institutions and libraries catch up with the business world.

While the increasing significance of the Internet in institutional communication can go a long way in shaping the reputation of the library, the potential provided by digital PR has not fully been realised in libraries of the higher education sphere. Yet, at the same time Internet-based public relation and communication efforts pertaining to a given institution have proven to be successful.

The application of digital PR can strengthen the institution's position in its immediate and regional surroundings on a long run. A library serving higher education purposes can perform two types of digital PR activities. External communication is directed towards the local or regional context, while its internal communication activities can be integrated into the institutional network as well (or it can integrate the communication features of the given institution). Furthermore, as a combination of the two approaches, the digital PR scheme integrated in the institutional network can be incorporated into the World Wide Web.

Consequently, the heretofore unprecedented expansion of personal space, the most important consequence of the application of web 2 in respective libraries, not only offers an excellent digital PR potential, but facilitates on-line connections between individuals and institutions or firms offering their services or products. Since a significant portion of users and consumers tend to be influenced by the opinion of other buyers during the respective decision-making process, all Internet-based communication devices have enjoyed heightening significance. While PR efforts have utilized on-line communication in an increasingly prevalent manner, in the Central European region traditional media as compared to Internet still dominates a substantial portion of the communication process. The latest entry in this field growing with a breathtaking pace is Digital Signage technology.

DIGITAL SIGNAGE

Digital Signage (DS) solutions have revolutionized both indoor and outdoor communication. By the use of digital technology text and images are sent to presentational devices located in faraway locations while their appearance is timed and their operation is monitored. The system is not comprised of

separate displays as in all cases a software-hardware complex facilitates the preparation and updating of data from a central location within the framework of a network structure. The respective information is presented via display devices including flat screen equipment, LCD monitors, and projectors connected to traditional machines or to such computers, which were modified for the respective objectives.

DS systems radically altering digitalised commercial communication employed in such areas of everyday life as education and health care have surpassed the boundaries of commercial advertising. Digital Signage provides a wealth of advantages as described below:

- Attention seizing advertising
- The simultaneous use of text, image, and motion picture
- Presentation of the respective information at distant end-points
- Real time advertisement and information provision
- Preparation, updating, or compiling data at a central location
- Controlled environment
- The advertisement reaches the relevant audience
- Profit-oriented options
- Cost-effective operation
- Dynamic operation
- The respective presentations can be timed, etc.

DS systems can be used in a wide variety of ways either for indoor or outdoor purposes. Indoor options for the use of Digital Signage include shopping centres, hyper and supermarkets, customer service locations, banks, post offices, lottery agents, pharmacies, hospitals, public and higher education institutions, petrol stations, mass transport, etc. Outdoor possibilities entail squares, buildings, busy intersections, open air events etc. The unlimited options of outdoor technology are demonstrated by the Podium project scheduled to be realised in Dubai. Accordingly, in an unprecedented manner a 2,000 square meter 33 stories high LED screen will be installed on a building wall (Meagher, S., 2008)

The options for the use of Digital Signage in educational institutions and libraries include the following:

- Welcome new students and visitors
- Improve communications
- On-air community bulletin boards
- Emergency broadcast systems
- Interactive kiosks
- School news
- Promote clubs and campus events
- Increase student participation in university activities
- Inform students of job fairs and recruiter visits
- Sports scores

- Homework assignments
- Notifying community of school closings
- Advertise new books, advice on finding books, opening times
- Conference news
- Entertain
- Increase revenue, etc.

DIGITAL SIGNAGE SYSTEMS AT THE ESZTERHÁZY KÁROLY COLLEGE

The Eszterházy Károly College launched an effective internal information network in order to inform the College community of actual developments, events, along with broadcasting edited programs. The iVision system coordinated by the Central Library is capable of accommodation to local special needs. The Digital Signage information distributing and content providing system is capable of pre-scheduled presentation of program units and of the simultaneous broadcasting of various information at its respective end-points.

The iVision system is basically a combination of various equipment and software facilitating the formation of large size and efficient information networks. The service is based on a modular on-line communication system comprised of the processing and updating (editing) centre, the transmission channel, the end-point equipment and the presentation instruments.

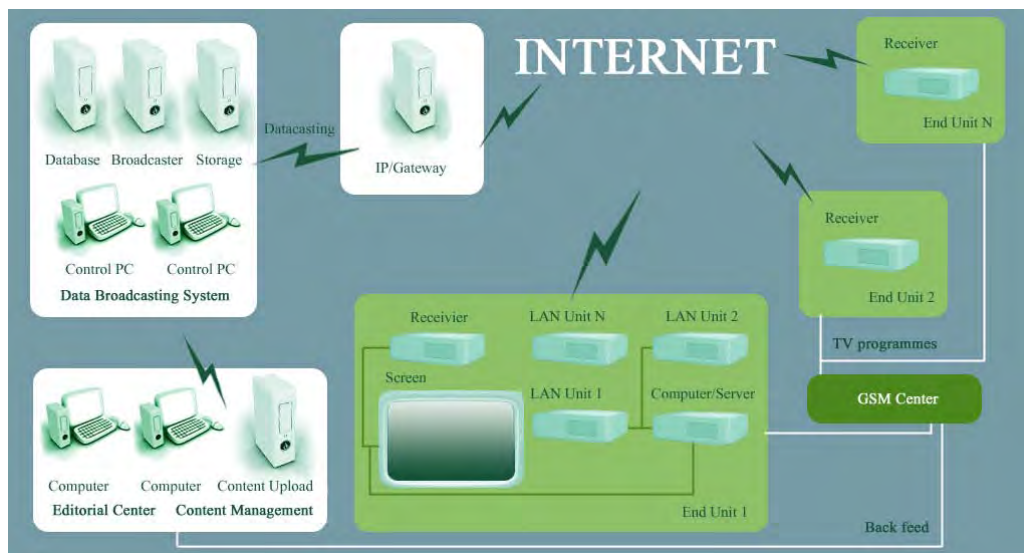


Figure 2. The iVision DS system

(realsign media – www.realsignmedia.com)
ICEM-CIME 2009 Conference.

The processing and updating or editing centre of the DS system is presently located in Budapest. This distant operation facility is responsible for the full-scale control, operation, and monitoring of the system in addition to housing the data base servers and the broadcasting system. The respective end-points are connected to varying transmission channels depending on the characteristics of the given location. Consequently, Internet-based communication can be complemented with satellite or mobile phone-facilitated data forwarding channels providing programs for the end points located at different sites of the country (post offices, shopping centres). At the respective end-points one or more industrial capacity computers control the screens. Furthermore, depending on the features of the given location one control point can be connected to several screens. Each control point has its own individual identification code facilitating on-demand grouping and categorization while the programs broadcast within a given category are identical.

The only educational institution functioning as an end-point in this system is the Eszterházy Károly College of Eger. The Digital Signage system of the Eszterházy Károly College includes six 52" diagonal width LCD Digital Colour TV screens installed in four different buildings. The programs presented on the respective displays are compiled and edited by the staff of the Central Library and the Lyceum TV. The size of the respective control display is identical to that of the TV screen.

The screen surface can be divided into numerous independently programmable sections. The screen sections are allocated in the course of the project planning discussions with the respective partners, and can be adjusted according to the changing demands arising during the use and operation of the iVision system. By the help of a processing and editing software the program components can be flexibly interchanged and are adaptable to the demands of the given site as well. In addition to film presentations, information can be displayed in textual (ticker-type) format with a freely chosen background.

In order to present the material in a slideshow or stream format the appropriate design facilitating the insertion of the picture box, video box, and text box options should be elaborated. On a given occasion the picture-video box can only display either still or moving images. The completed design will be allocated into the Designs list as a result of the saving process. By the help of a timing device, or a digital clock, we can regulate the respective presentation formats of the various designs while determining when should a slideshow or, a video be aired in the picture-video box.

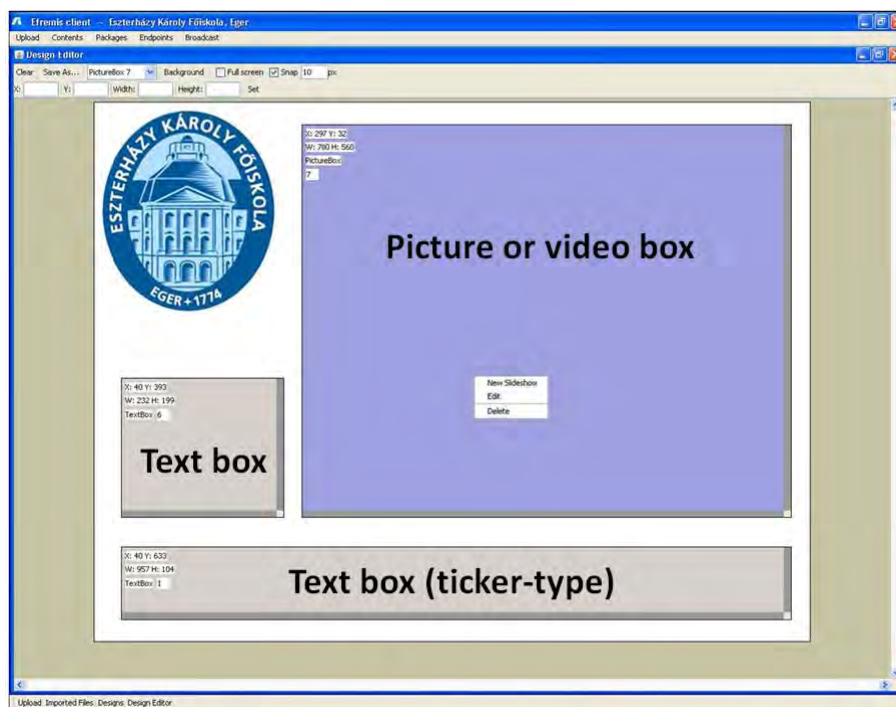


Figure 3. Design editor

In order to display the respective materials so-called packages have to be compiled from the images of the slide show and this package has to be sent to the respective end point on which the slide show will be displayed. The program, will then select the necessary items for the slide show.

In our institution the library staff defines and elaborates the appropriate designs. Accordingly, between 8.00-10.00 a picture box design and between 10.00-12.00 a video box design is used, while in the 12.00 - 20.00 interval a picture box design is applicable again. The changing of the design is automatic and the selection process can be re-programmed by the help of the timing device. The necessary packages are continuously prepared, and sent into the processing and updating centre via the system and following a feedback they are presented on a display device.

The capability of the end-points located in the College to broadcast previously agreed upon programmes prepared by other institutions via the editing centre is an especially important advantage of the system. Likewise, if assented earlier, the programmes prepared by the College can be presented in the systems of other institutions as well. Furthermore, the DS system is suitable for the airing of differing programs at each-end point thereby providing targeted information for the various faculties of the College.

IN CONCLUSION

While during the functioning of the system the processing and updating (editing) centre is provided continuous feedback thereby facilitating corrections or adjustments to the respective operation, the options allotted by this structure are far from being exhausted. Our primary goal is the increasing of the number of the displays especially of the outdoor communication type including the placement of such screens on building walls or on other locations in the city. This depends on our ability to develop appropriate program content and meeting such challenges posed by the technological development trends as providing a more open system, with personalized services for the respective user.

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APPLYING DIGITAL ARCHIVES IN UNDERGRADUATE'S INQUIRY LEARNING: EVALUATING THEIR EFFECTIVENESS

Lin Ching Chen & Yaw-Huei Chen

ABSTRACT

The purposes of this study were to evaluate the design of three digital archives integrated into undergraduates' inquiry learning, and to offer appropriate suggestions for designers of websites, so digital resources could be integrated into higher education more effectively. The case study was employed as a framework in this study. Thirty-four undergraduate students who took the general education courses in Taiwan would utilize the archives for the inquiry learning. Data were gathered through the methods of interviews, observation, and survey. The results show that the digital archives provide authoritative sources for inquiry; however, there are some weaknesses which need to be improved. Eight principles are proposed for the design of digital archives in undergraduates' inquiry learning.

KEYWORDS

digital archives, website evaluation, inquiry learning

INTRODUCTION

In light of the rapid advance in computer networking, electronic information becomes a valuable source for learning. Thus, there has been a strong move in many countries towards digitizing their cultural treasures and heritage, so these resources can be utilized effectively in the digital era. Since 1998 the National Science Council in Taiwan has also initiated several projects on preserving national cultural collections. Until now, more than 200 digital archives have been established (<http://digitalarchives.tw/>). These websites collect various rare resources in respect to cultural relics, visuals, documents, films, and sounds of Taiwan.

Furthermore, since 2000, the National Science Council in Taiwan has conducted several contests for integrating digital archives into curricula, so that elementary and secondary teachers can use these resources effectively in classrooms. However, most submitted lesson plans only perceive the digital resources as supplementary teaching materials instead of essential learning ones for student inquiry (Hwang, Shyu & Lin, 2005). Several teachers even complained that developing impressive teaching materials from digital archives takes too much of their time (Chiang, 2003). In other words, the concept of active and student-centered learning is still not successfully implemented in the classroom, though the Grade 1-9 Curriculum, launched by the Ministry of Education in Taiwan in 2004 has promoted ICEM-CIME 2009 Conference.

students' active exploration and information problem solving for so long. In fact, several studies found that due to the lack of information literacy for teachers and students, the precious digital archives could not be integrated successfully into the relevant curriculum (Chen, Yen & Chen, 2005; Chen, Horng, Li & Wu, 2007; Liu & Chou, 2005).

Information literacy is the ability to recognize, access, evaluate, use and create effectively information in its various formats (AASL & AECT, 1998). In light of the overwhelming flood of information that bombards students today, many research studies conclude that schools should integrate information literacy into the context of school curriculum, and educate students to be information literate people who can solve problems independently or make informed decisions in their real lives (Banta & Mzumara, 2007; Chen & Horng, 2005; Eisenberg, Lowe & Spitzer, 2004; Pappas & Tepe, 2002).

Thus, how can information literacy best be developed in students? Researchers found that information literacy instruction has been shown to be more effective when taught as an inquiry process combined with classroom contents (Andretta, 2005; Chen & Horng, 2005; Thompson & Henley, 2000). The characteristics of the inquiry learning include solving problems being an integral part of the process, use of technology as a tool for learning, and resources being expanded beyond the school (Harada & Yoshina, 2004; Lupton, 2004; Orlich, Harder, Callaham & Gibson, 2001). In other words, the most distinguishing difference between the inquiry-driven environment and conventional one is a profound shift from teacher-centered, textbook-directed teaching to student-centered, resourced-based learning. Thus, digital archives would play an important role in this type of learning approach.

If integrating digital resources into learning experiences is the overall vision for the digital archives, are they suitable for this mission? Prior studies found that the digital archives in Taiwan were more appropriate for college student use than primary and secondary ones, owing to the difficulty level of contents (Chen, Horng, Li & Wu, 2007; Wu & Hsu, 2005). Therefore, would these precious electronic resources be appropriately used in a higher education context for inquiry learning to enable undergraduates becoming critical thinkers? Many researchers recommend the quality of electronic resources should be evaluated in terms of their purpose, accuracy, authority, objectivity, currency, scope, presentation, and accessibility (Cooke, 2001; Harada & Yoshina, 2004; Kennedy, 1998). Cooke (2001) underlined that any assessment of purpose is inextricably linked to the other areas of evaluation, such as whether the intended purpose has been achieved, whether the intended subject areas are covered, and whether the information is appropriate for the intended audience.

On the whole, digital archives are precious tools for learning, but few studies until now investigate whether they are appropriate for being integrated into undergraduate's inquiry learning. If the

evaluation criteria can be used in a natural setting, we may in-depthly understand students' authentic reflections towards the digital archives.

Research purpose

The purpose of this study was to evaluate the design of three digital archives integrated into undergraduates' inquiry learning, in order to provide appropriate principles and suggestions for designers of websites, so digital resources can be integrated into higher education more effectively. Specific purposes related to the problem were:

1. To investigate the problems encountered by undergraduates when using the digital archives during the inquiry learning.
2. To find the design principles for the digital archives applied in undergraduate's inquiry learning.

METHODS

Research design

The case study (Lin, 2000; Merriam, 1998) was employed as a framework in this study to provide an in-depth description of digital archives use in a natural setting. Undergraduate students who took the general education courses would utilize the archives and other resources for the inquiry learning.

Research Site

The research was conducted at Ming University (a pseudonym), which was in southern part of Taiwan. There were 34 undergraduates taking the course, called Information Literacy & Learning. All of them have never used digital archives before. Students worked in groups of 3 to 4 with shared responsibility for inquiring various aspects of an interested topic. The total of nine groups participated in this study.

Research Process

The researchers designed many issues on the aspects of humanity and science for inquiry, then checked if there were suitable digital archives about these issues. Finally, seventeen topics were determined, such as poets, writers, insects, baseball, comics, etc. Students in groups selected an interesting topic for exploration. They could freely inquire these topics through the sources of books, journals, films, and, of course, digital archives. After analyzing and synthesizing the collected data, each group gave oral presentation to the class and their peers who could question the presenters. At last, students reflected

on the whole inquiring process and thought how to improve it. The whole inquiry learning lasted for a semester.

Data Collection

Data were gathered through the following three methods:

1. Interview: The students were regularly accepted our formal and informal interviews on their perceptions of and ideas about the digital archives they used.
2. Observation: When the students were interviewed formal or informally, the researchers would ask them from time to time to use the digital archives in front of us, in order to fully understand what they really mean. We would write down our observation in the notes.
3. Survey: The survey used in this study was designed based on Cooke (2001), Harada & Yoshina (2004), and Kennedy (1998). It contained both fixed-response type items and open-ended questions. In the first section, the students were asked to select their responses to statements along a four-point scale. The seven criteria employed in this survey were authority, accuracy, objectivity, readability, presentation, currency, and extension. As for the second part, there were two open-ended items designed to gather further data about students' opinions, reflections and suggestions to the digital archives they used (See Appendix).

Data Analysis

All data we first organized and coded based on the types of data (Table 1). Then these data were read and analyzed repeatedly by the researchers, so that salient themes and categories could be identified. Finally, the researchers rethought the connections of the categories and developed explanations of the bigger picture underpinning the study.

Table 1. Types and Description of Raw Data

Types	Description
1. G-ChangS1Int 010308	Researcher had an interview with student titled No.1 of Group Chang on 01/03/2008
2. Survey S2	A survey was written by a student titled No.2
3. ObserG-InsectS2 011208	Researcher observed a student titled No.2 of Group Insect using computers on 01/12/2008

RESEARCH RESULTS

Problems encounter by undergraduates when using the digital archives during the inquiry learning

The total of seven digital archives was used for student inquiry learning in this study. Owing to the limitation of paper length, only three of them were investigated. They were *Chinese Literature on the Internet*, *Contemporary Writers in Taiwan*, and *Bugs Recall*. Problems proposed by undergraduates about these digital archives were organized into two broad aspects of content and presentation.

1. Chinese Classical Literatures on the Internet (<http://cls.hs.yzu.edu.tw/>)

1.1 Content

This site is produced by Lu Fen-Ju, a well-known scholar in Chinese classics. Its main purpose is to digitize famous Chinese classical literatures and to provide easy access to people who are interested in literatures. It consists of five sections and there are different topics and functions under each section. The group 1 who investigated the outstanding poetess, Li Cing-Jh in Sung Dynasty, is interested in her life story, family backgrounds, marriage, and poems. Therefore, they used two subsections on this site; they were *Virtual Reality for Sung Poetry* (<http://cls.hs.yzu.edu.tw/CSP/index.html>) and *Instruction of Poetry Chanting* (http://cls.hs.yzu.edu.tw/CL_POEM/).

Students in Group 1 agreed that the coverage of collected poems written by the poetess was comprehensive; but there was neither interpretation nor analysis of the poetry in the two subsections (see Figure 1). This problem made students' inquiry more difficult because they could not grasp the thorough meaning of the poems (G-LiS8&S7Int 011508).

Figure 1 shows a screenshot of the 'Virtual Reality for Sung Poetry' subsection. The page displays a search result for a poem by Li Qingzhong. The interface includes a search bar, a list of search results, and a detailed view of a poem. The poem's title is '蝶戀花', and the author is '李清照'. The text of the poem is displayed in a traditional Chinese font. A callout box with an arrow points to the poem's text, stating: 'There is no specific column for interpretation and analysis of poems'.

Figure 1. Virtual Reality for Sung Poetry Subsection

However, the interpretation of the poems was actually located in another subsection of the site, titled *300 Sung Poetry* (<http://cls.hs.yzu.edu.tw/Tz300/Home.htm>) (see Figure 2). In other words, the databases behind these two subsections of the digital archives were not integrated entirely. If the databases could be incorporated and the interpretation column could be added to the subsection of *Virtual Reality for Sung*

Poems, this digital archive would be much easier for students searching and locating information.



Figure 2. 300 Sung Poems Subsection

On the other hand, the poetess's life story was the topic students in Group 1 would like to explore; however, they found there was little information about this subject, *"We couldn't find much information about her life on this website. It only has her short chronological biography. This information doesn't help us much. I can find the same information in any similar books or other sites."* (G-LiS7Int 011508) In view of the purpose of this site, however, its aim is to contain abundant digitized Chinese classics. Therefore, detailed biographical information about a writer might not be its priority. Taking into account of student's inquiry project, this digital archive perhaps can provide access to other suitable sources for students' needs. After all, the digital archive of *Chinese Classical Literatures on the Internet* is an authoritative gateway to Chinese classics available via the internet.

1.2 Presentation

The two subsections, *Virtual Reality for Sung Poetry* and *Instruction of Poetry Chanting*, are composed of various formats of information, such as text, sound, and graphics. A student commented, *"The opening screen is designed aesthetically and is clearly laid out."* (G-LiS8Int 011508) (see Figure 3) Nevertheless, when they looked for information there, they found, *"Every heading is so similar to each other. I don't know which one I should click on."* (G-LiS7Int 011508) In addition, students discovered that the information on the site was arranged under the headings of singers of the poems rather than poets or poetesses themselves (see Figure 4). This arrangement made student harder find needed information for their project, *"I don't care who sings these poems. They are maybe famous, but I think the poetess, Li Cing-Jh must be more famous than the singer."* (Survey S7) Therefore, as Cooke (2001) claims design issues too frequently enhance or compromise the usability of a resource. The presentation of headings should be self-evident and based on the user's habits; otherwise it would reduce students' willingness to use this digital archive.



The design of the opening page is aesthetic and clearly.

Figure 3. The Opening Page of “Virtual Reality for Sung Poetry”



The headings are arranged by singers of the poems.

Figure 4. The Confusing Headings of “Instruction of Poetry Chanting”

When we asking the Group 1 students why they did not use audio chant during the final presentation, they replied that they just could not find it (G-LiS7&S9Int 011508). Figure 5 was the screen providing the link to audio chants of the poems by Li Cing-Jh. However, the character was too small to be recognized and the icon used was not as usual. Thus, student S4 complained, “Why don’t they just put a trumpet as most websites do to let us find our way right away?” (G-LiS4Int 011508)



Figure 5. Screen for Audio Chants

2. Contemporary Writers in Taiwan (<http://lit.ncl.edu.tw/hypage.cgi?HYPAGE=home/index.htm>)

2.1 Content

This digital archive, created by Council for Cultural Affairs, collects information in various aspects of more than two-thousand contemporary writers in Taiwan. Regardless of biography, manuscripts, lists of works, reviews, famous phrases, and photographs are all covered on the site. In addition, it provides several access points for retrieving information, such as searching by writers, titles, phrases, and manuscripts. The Group 2 students who investigated the outstanding writer, Chang I-Ling, used this site for inquiring and reported, “*The organization of this site is good. The chronological table gives me clear ideas about Ms. Chang’s life experiences. The photos are realistic and plentiful; they catch my eyes right away.*” (G-ChangS2Int 010308)

On the other hand, although students could easily locate the famous phrases written by Chang I-Ling, they were listed out of the whole contexts (see Figure 6). Therefore, the student complained, “*I can’t tell why it is a famous phrase. I expect it will list the whole paragraph; or at least the page number, so I can trace it back.*” (G-ChangS1Int 010308)



Figure 6. The Searching Result of Famous Phrases

2.2 Presentation

The design of opening page of *Contemporary Writers in Taiwan* is aesthetically pleasing and well organized, so undergraduates tended to use it, “*I like its front page, and its contents also provide lots of needed information.*” (G-ChangS2Int 010308) (see Figure 7) In addition, the use of many photographs is another strength of this site. Both of images’ quantity and quality are awesome. However, students pointed out one problem that should be overcome, “*There is no explanatory text for each photo. If there is more description for the picture, for example, where and when did the photo been taken? That will be perfect for our inquiry.*” (Survey S2) (see Figure 8)



Figure 7. The Opening Page of *Contemporary Writers in Taiwan*



Figure 8. The Photograph Page of Chang I-Ling

3. *Bugs Recall* (<http://insect.cc.ntu.edu.tw/>)

3.1 Content

This site is created by Dr. Shih Cheng-Jen, a dedicated entomologist teaching in National Taiwan University. There are five main sections in the site: *Insect Classroom*, *Insect Thematic Exhibition*, *Insect Digital Videos*, *Children Learning Camp*, and *Instructional Materials for Teachers*. The Group 4 who ICEM-CIME 2009 Conference.

investigated social life of insects gained basic knowledge about insects from this site, e.g. a student commenting, "*The Insect Classroom teaches me a lot about insects. I have no idea about the terms of holometaboly and paurometabala, etc., but this website explained them clearly.*" (G-InsectS1Int 010508) However, other group members complained the information covered in this site was too general and lack of related references for further inquiring (Survey S20, S22). Furthermore, the titles of *Insect Classroom* and *Insect Thematic Exhibition* are so broad and general that it is hard to know their contents from the titles. The student S27 suggested that the design of title should have the functions to show the subtitles, when the user approach it with the mouse (Survey S27).

3.2 Presentation

There were multiple formats of information presented on the site, and the combination of printed text and graphics were commended by the students (Figure 9). The Insect Group No.2 student said, "The pictures and videos help me understand insects' ecology and characteristics a lot." (G-InsectS2Int 011208) In fact, while the researcher observed her using this site and found, "No.2 student is so excited and engaged when she watches the video about how a caterpillar becomes a butterfly. She keeps saying, 'It is so cool!'" (Obser G-InsectS2 011208) This situation just as what Clark & Mayer (2003) found that multimedia presentations encourage learners to engage in active learning by mentally representing the material in words and in pictures. Providing relevant graphics (including still pictures and animated films) to text is the strength of this site.

On the other hand, though the video is a powerful instructional tool, several videos provided in the *Insect Digital Videos* contain lots of vicious shots. For example, the shots of a cricket eating up a mantis's head scare several students, "It is so grouse. The video makes me very uncomfortable. It just continuously replays that moment." "That piece of film makes me sick. It is so real and there is no narration to explain what it is going on. I would rather watch the film on Discovery channel. The bugs are so cute." (G-InsectS20 & S25Int 010908) Thus, a warning sign should be shown beside the film to prepare students for watching the videos. In addition, how to keep the balance between the reality and aesthetics on video production is another issue for digital archives.



Figure 9. The display of *Bugs Recall*



Figure 10. Videos with bloody shots

Design principles for digital archives applied in undergraduate’s inquiry learning

As the above findings revealed, we can induce eight design principles for digital archives applied in undergraduate’s inquiry learning:

1. It has been difficult to give consideration to both breadth and depth at the same time.

Nevertheless, being electronic resources with authority in Taiwan, digital archives should go beyond the depth of coverage to provide access to other suitable information, in order to be a gateway for undergraduates to inquire the related topics.

2. If digital archives consist of many databases, the search mechanism should integrate all of them together, so that undergraduates can find information easily and efficiently. Features such as site map, contents list, index, or menu system would be more beneficial in helping students stay on the right track.
3. Quotations and famous phrases searched by students should be presented in the original contexts and with detailed reviews, in order to enhance undergraduates' further inquiring.
4. Every image or other forms of media should have good quality and be accompanied with clear explanatory text and source, so that undergraduates can easily determine if the information is suitable for their further inquiry.
5. Each screen should be clearly laid out, and the organization of contents should be logical and based on most undergraduates' thinking process.
6. The icons used should be consistent and self-evident, like using a trumpet to represent audio files, so that undergraduates would be easier to assimilate to their prior knowledge.
7. Undergraduates are used to imaged-based webpage design; therefore, use of more suitable pictures, photographs, etc would be an alternative strategy to make them use the digital archives more.
8. Although instructional videos are a valuable tool for learning, how to design a video based on the both principles of reality and aesthetics is an important issue which should be considered.

DISCUSSION & CONCLUSION

All of the undergraduates confirmed that digital archives provided them with precious information for inquiry learning, because the author and institution are well known for their knowledge and expertise in this area. However according to the Information Literacy Competency Standards for Higher Education, established by AERA (2000), our undergraduates' information literacy was still limited. They thought they could find all of the needed information for inquiry from only one source; thus the breadth of coverage of digital archives was criticized by them harshly. There are two methods to solve this problem. The first one is to provide more links in digital archives to other distinguishing websites or references to printed materials. Some descriptive information about each link included would enable students to select potentially relevant sites more easily. In such a way, this digital archive would become an authoritative entry to the inquiry learning of this topic. The second solving strategy is to provide undergraduates with more opportunities to integrate information literacy and digital archives into assignments in various disciplines (Avery, 2003; Chen, Horng, Li & Wu, 2007). Thus, their information literacy could be gradually and fully developed.

On the other hand, though Cooke (2001) declared that the presentation of information is generally secondary to its content, because we will use relevant information regardless of how it has been presented. However, the results of this study indicated that it was not exactly true. To undergraduates,

the presentation of information, especially the amount of pictorial information, may be their primary criterion to select a source. Thus, the site designers should take into account of this changing trend.

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Appendix: Webpage Evaluation Form

Topic: _____ Group Members: _____

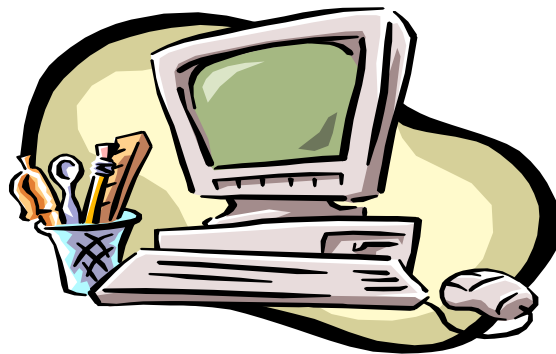
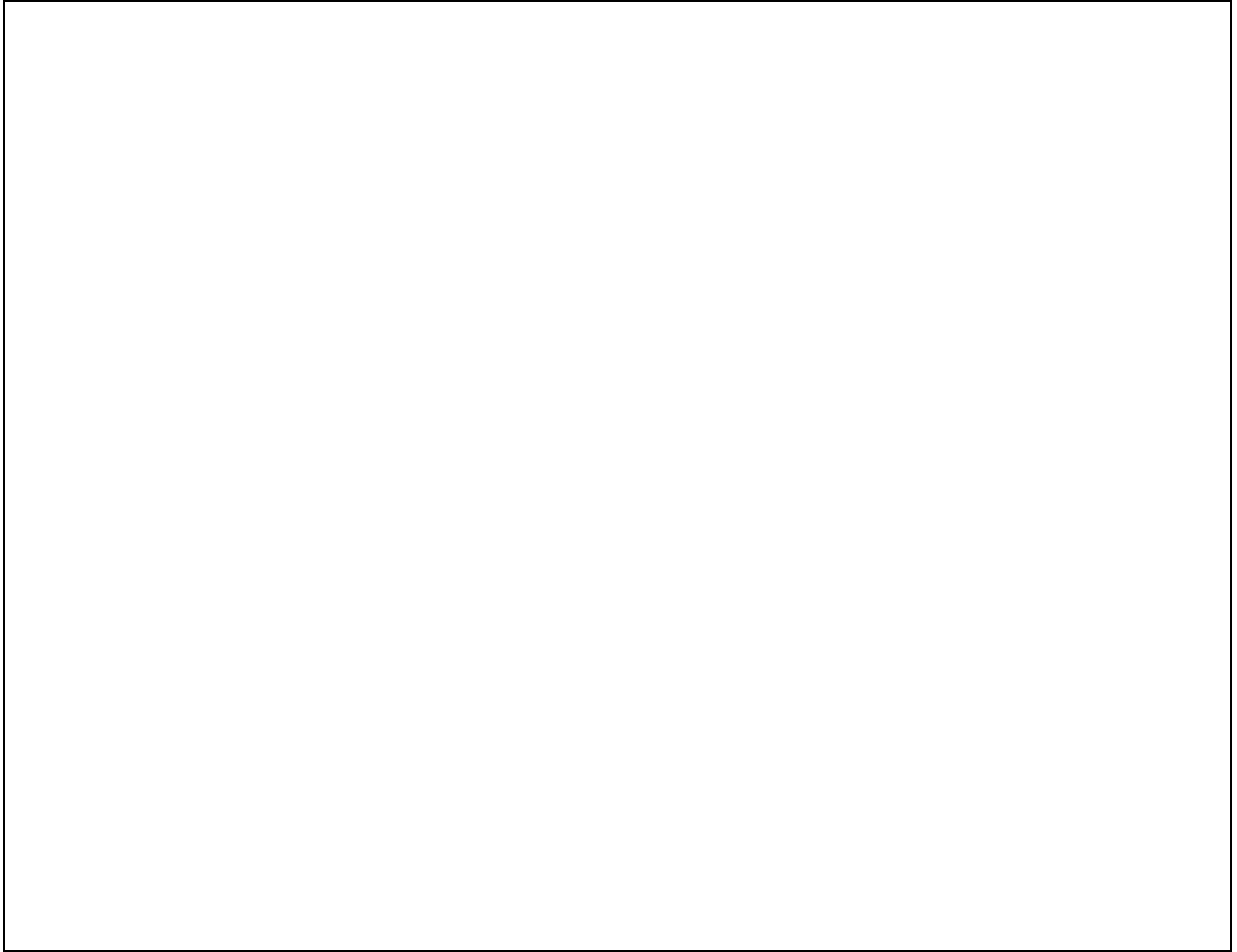
Website					
IP	http://				
Criteria	Items	Rate			
Authority	It is clear who or what company is sponsoring the page.	4	3	2	1
	There is a way of verifying the legitimacy of the page's sponsor.	4	3	2	1
	The author is qualified for writing on this topic.	4	3	2	1
Accuracy	The information is free of grammatical and spelling errors.	4	3	2	1
	The sources for any factual information are clearly listed.	4	3	2	1
	The page is logically presented and organized.	4	3	2	1
Objectivity	The informational content is clearly separated from opinion content.	4	3	2	1
	If there is advertising on the page, it is differentiated from the information content.	4	3	2	1
Readability	The information is pitched at an appropriate level.	4	3	2	1
	The graphics are logically presented in relation to the text.	4	3	2	1
Presentation	The site is stable and reliably accessible.	4	3	2	1
	The screens are clear and aesthetically pleasing.	4	3	2	1
	The qualities of texts, pictures, and video are good.	4	3	2	1
Currency	There is an indication of when the page was last updated.	4	3	2	1
Extension	There are links to further useful sources of information.	4	3	2	1

Instruction: 4 points=strongly agree, 3 points=agree, 2 points=disagree, 1 point=strongly disagree

After answering the above questions, what kind of help do you think this website gives you? Do you have any problems when you use this website? Finally, please write down your reflections and suggestions to this website.

Help & Problems

Reflections & Suggestions



DISTANCE EDUCATION IN MOZAMBIQUE AND THE DIGITAL AGE

Maria José Loureiro & António Domingues Franque

ABSTRACT

The purpose of this communication is to describe the development of digital literacy in Mozambique presenting the experience of the Mozambique's National Institute of Distance Education.

The situation of the country will be contextualised in terms of literacy level, and the role of the "new" ICT in in conventional education and in the provision of distant education programs.

This communication and reflection will mainly look at the question of how new technologies are used in traditional teaching and also in distant learning and will address issues such as the difficulties and constraints experienced in its utilization. In reality a limited expansion of these practices is occurring but during last years a growth in the use of ICT is gaining momentum in Education.

Mozambique has to learn the experiences of good practices concerning the use of ICT in education from other countries, so that the country, even the most remote and disadvantaged regions, can benefit from advances in ICT.

KEYWORDS

Literacy, ICT, digital literacy, distant training, distant learning, constraints

INTRODUCTION

Since the beginning of the new millennium, distance education in Mozambique is playing a crucial role in the provision of education to those sectors of the society that otherwise would have stayed out of the school.

"The fast growing ratio of the population in Mozambique also stresses the urgency for the adoption of every conceivable solution to spread the opportunities for education all over the country" (Ramos and Tajú, 2009:3). And that is why Open and Distance Education is that opportunity of expanding access to education in Mozambique.

Open and distance learning in Mozambique goes back to the colonial time, when correspondence courses of practical nature were offered to those interested. After Mozambique attained independence in 1975 "... it was envisaged the introduction of Distance Education when the 3rd Congress of Frelimo asked the

government to set up a national correspondence institute with the aim of expanding access to education to the Mozambican citizens” (Miguel Buendia, 2008: 1).

But it is only in 1984 that the first distance education programme was launched. That programme was aimed at training under qualified primary school teachers and was implemented by the National Institute of Education Development through its distance education unit.

The success of the programme dictated the set up of a new institution in 1987 the Institute for Teacher Upgrading (IAP), which would be completely devoted to train primary teachers through distance education.

Thereafter, in August 2000, the Ministry of Education and Culture (MEC) established the Department of Distance Education (DDE) whose main role was to provide strategic and technical support to other directorates within the Ministry and assist them build their own understanding of the use of ODL and capacity to develop their own programmes as well as to promote and implement the policy on open and distance learning.

Recognising the important role of open and distance learning in increasing and expanding education access at all levels of education in general, and in particular the secondary education level, the Ministry of Education and Culture developed a Secondary Education by Distance Education (SEDE) pilot project. This project was managed both by the Directorate of Secondary Education and the Department of Distance Education. The target audience of SEDE is primarily school youths, mainly girls, and adults who having completed primary education face several constraints to proceed to secondary education. This is due to shortage of places in existing conventional secondary schools or merely because they do not exist.

After elections late 2004, a new development took place in the structure of the Ministry of Education and Culture. As a result a new ODL institution was set up earlier 2005, the Institute of Open and Distance Learning (IEDA), whose main role is to implement distance education programmes at all levels of the National System of Education (SNE) with the exception of higher education.

This has therefore dictated the extinction of the former Institute for Teacher Upgrading - IAP and Department of Distance Education - DDE.

The new IEDA is scaling up SEDE programme: from 250 students of the pilot phase in 2004 to 6000 students enrolled in this year - 2009.

The Pedagogical University (UP), a public university, has been offering training since 1990, using distance education, for in-service secondary school teachers teaching French. From 2003 UP has also been using distance education also for in service training of secondary school teachers teaching English and Physics.

The Banking sector has been since the 1994 using distance education to upgrade staff, both academically and professionally. From earlier 2000 the Catholic University has been running in-service training programmes for secondary school teachers in several fields of teaching using distance education.

More recently, public and private higher education institutions such as Universidade Eduardo Mondlane (Eduardo Mondlane University), Academia de Ciências Policiais (Police Academy) and Instituto Superior Politécnico e Universitário (Polytechnic Institute) are engaged in a number of open and distance education initiatives as part of the Government's Open and Distance Learning strategy.

Mozambique's Open and Distance Learning Policy/Strategy

In the light of the development of Open and Distance Learning (ODL) in the country, a ODL Policy and Strategy was developed and approved by the Ministers' Council in October 2001. The main goal of the ODL Policy and Strategy is to promote, guide and support the expansion of distance education in Mozambique in order to increase access to learning opportunities at all levels within the National Education System. As a result of that a National Institute of Distance Education (INED) was set up.

INED was formally created by a decree of the national Council of Ministers in October 2006 as "...a public institution empowered to coordinate and regulate distance education, including policies, regulations, strategies and implementation of a national system of distance education, to oversee the chain of provincial distance education centres, to create a system of accreditation of distance education institutions and programs" (Moore and Pereira, 2007).

On the other hand, the ODL Policy and Strategy states that

- The State plays a fundamental role in defining policies and strategies to implement and develop distance education;
- Distance education has the same status as conventional schooling;
- Distance education programmes should contribute to regional, social and gender equity and therefore implemented in the whole country;
- Coordination of the different institutional ODL initiatives with the ultimate goal of rationalizing resources in staff training, infrastructures, reproduction and distribution of materials avoiding in that way duplication and dispersion of resources;
- Articulate the formulation of distance education programmes at the different levels of education;
- The integration and articulation of distance education programmes of the different teaching institutions;
- The development of a network of support to ODL students (tutorial, supervision, library and other resources).

As part of the above mentioned Strategy, between 2003 and 2004, participants from several institutions were trained in ODL with the ultimate goal of starting programmes or upgrade those already in the field.

At the same time institutions were selected to develop ODL courses as Pilot Projects of INED such as: an online Business Management course at the Baccalaureate level developed and implemented by Eduardo Mondlane University through its Faculty of Economics assisted by its Centre for Distance Teaching (CEND) with the first intake of 75 students in July 2008. In 2009 a total of 400 students are enrolled in the programme and two in-service teacher training programs developed and implemented by the Pedagogical University assisted by its Centre of Open and Distance Teaching (CEAD).

These courses are for secondary school teachers of Physics and English and are already being implemented in the northern Province of Cabo Delgado and the central Province of Manica with about 250 students enrolled.

Finally a “bridging course” made of 5 modules aimed at preparing graduates from secondary education for entry into higher education.

This course was developed by a private University – A Politécnica – assisted by its Centre for Distance Education (ESA) and will be implemented by those institutions interested in preparing students to enter university.

The implementation of the “bridging course” will be done through agreements with INED; iv) the fourth pilot project is still being developed by the National Institute for Education Development in collaboration with the Institute of Open and Distance Learning (IEDA).

It is an upper secondary education course and will be implemented by IEDA in 2010.

These pilot projects are intended, on one hand, to develop ODL capacity in those institutions and, on the other, to enable INED to test its provincial network of resource centres as well as the Mozambique Distance Learning Network as part of the Government’s Open and Distance Learning Strategy.

Almost all ODL programmes that are being offered for some time now, including the INED pilot projects, are print based. The exception is the online Business Management course at the Baccalaureate level of Eduardo Mondlane University as an INED Pilot Project. The online practical side of this program has been developed in collaboration with the University of Aveiro in Portugal.



Figure 1: Home location of the students currently (March 2009) engaged in the Business

Management distance education programme of the University Eduardo Mondlane, Mozambique” (Ramos and Tajú, 2009:5)

If from one side the truth is that only 1% of the population in Mozambique (200.000) has access to internet, on the other hand this way of delivering distance education enables its rapid expansion throughout the country. Once the access to the internet is there those interested and with possibilities can enrol an online course without having to move close to the institution.

The Eduardo Mondlane online Business Management course although just a year old, has shown that going digital in Mozambique is possible and with time improvement will take place. This is for sure an example to follow even in conventional schools where learning is most of the time centred on the teacher leaving students confined to very little that he/her offers. Going digital gives the opportunity to students and teachers have more and get more knowledge.

Therefore, Mozambique has to invest more in digital in the field of education which will enable schools, teachers, students and the population in general to take advantage of the available knowledge in the world enabling a better education and live. Some progress has already been made by building distance education provincial resource centres as part of the mentioned ODL Strategy.

These resource centres are viewed as physical units, which will provide both academic and administrative support to ODL students. These resource centres are supposed to be shared among different providers of distance education in Mozambique. Due to the scantiness of resources (financial, material and human) shared utilization of these resource centres is part of the INED approach to reach wider audiences. The resource centres will start in four provinces, out of the ten, and gradually expanded to the remaining provinces.

The resource centres will essentially have a crucial role in supporting distance education students, students from conventional schools as well the public in general. Essentially the centres will:

- Provide counselling and orientation services to candidates and learners on Open and Distance Learning (ODL) methods;
- Guide candidates and learners on ODL courses;
- Offer physical space to ODL learners for face to face meetings with the respective tutor, work on their own or in groups;
- Offer the needed facilities and conditions for ODL learners to write exams;
- Provide library and other documentation services (traditional or digital library with links to other libraries for learners, tutors and the general public);
- Provide photocopying and printing services to ODL learners and general public;
- Provide access to Information and Communication Technology (ICT) to ODL learners and general public. For ODL learners, access to ICT will facilitate communication with the institution, tutors and other students;
- Provide ODL learners access to learning materials in print, audio, video, CDROM, DVD and other formats;
- Last but not least, the resource centres will also have an administrative role in terms of registration of ODL learners, tutorial arrangements and all other supportive aspects.

By now two resource centres have already been built by the National Institute of Distance Education (INED) and are being used.



Figure 2: Training of ODL providers in Wiki and Moodle – ODL Resource Center – Maputo City

CONCLUSION

Open and Distance Learning is a new development in Mozambique. Since its adoption in the 80's, considerable progress has been made. However, there is a need to consolidate what has so far been achieved in all domains. There is a need to strive for expansion of the actual programmes at all levels and assure that the quality of the programmes and other services offered are of higher standards. The newly created INED will therefore play a very important role to bring about the needed improvement and development which cannot be done without embracing the immense possibilities offered by our digital age.

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THE DIGITAL AGE: STUDENTS AND TEACHERS' PERSPECTIVES: A CASE STUDY IN PORTUGAL

Maria José Loureiro & António Moreira

ABSTRACT

In institutions connected with education, apart from teaching and learning activities, Information and Communication Technologies (ICT) also support a wide variety of other essential activities related with learning projects and training issues. This article focuses on the existing relationship between ICT students and teachers' perspectives in teaching and learning, and the derived benefits. The study is still at an initial stage and is, therefore, only presented here for purposes of dissemination.

However the first results obtained from questionnaires and interviews show that students complain about the PowerPoint use tendency in spite of considering ICT a very powerful tool for their own learning. Teachers consider that more specific training is need for them to be able to use, in a more effective way, all the potentialities and materials schools now possess, within the scope of the Portuguese Technological Education Plan (TEP). Considering that the country is becoming very well equipped with resources like Interactive white boards in all classrooms and 1 computer per student in primary and basic education, re-considering teaching models is required so that learning results correspond to the investment in ICT.

KEYWORDS

ICT, training, best practices, benefits, learning paradigms

INTRODUCTION

Information and Communication Technologies (ICT) occupy an unquestionable space in learning. In the schools the teachers are facing the challenging task to offer students the skills required by the information society (Oikarinen, Ruotsalainen, & Vikstedt, 2004). However, the equipment is not always used as much as it should be; a great number of teachers use ICT in the preparation of their activities and classes; ICT used in the classroom context are often limited to asking students to search the web for contents and/or information without any sound aims or correct search instructions and tasks to solve. There is a considerable number of teachers who are creative and daring but the examples and descriptions of good practices with ICT in schools are often rare or disperse. Additionally, these utilisations are often variable and report to very distinct situations, such as isolated experiences, research studies connected with career investment (Master and PhD courses), and implementation of limited-scope projects resulting from teachers' continuous education. In other words, there is a lack of appropriate tools and means which enable a correct and rigorous study of this issue (Costa, & Viseu, 2007; Matos, 2008).

On the other hand, even if relevant advantages of ICT are determined, it is not always simple to identify the literacy, new skills and paradigms that are involved in students' cognition and learning styles. It is, however, unquestionable that the technology is more or less optimized according to the number of times the material is used as well as the quality of its usage (Cho & Schunn, 2003; Facione, 1998; Loureiro, Loureiro, Moreira & Dias, 2006; McIsaac & Gunawardena, 1996; Moreira, 2007).

This article focuses on the relationship between ICT uses in teaching and learning and the connection derived thereof. These will be determined through a case study based on an interpretative methodology of results of data derived from questionnaires and interviews made to a school community. The background to these data is an international study with different objectives, led by Australia, Portugal being one of the European partners.

The study was developed in a school in the inner Northern area of the Aveiro district, Portugal. The school is situated in an urban area with rural influence, well-equipped and with strong traditions in ICT, and it has been linked to several pioneering projects in the usage of ICT within an educational and e-learning context.

WORK METHODOLOGY

In order to analyse the above-mentioned factors, the methodology used in the study was divided in several parts, some of which have already been concluded.

1. Selection, identification and characterization of the school – The school was chosen taking into account its geographic setting. It was important to choose a school that used ICT in order not to compromise the expected results. On the other hand, an urban school was not aimed at, considering it could, in itself, bias the results to a somewhat greater extent. Therefore, a school from the surroundings of Oliveira de Azeméis under the influence of the University of Aveiro Competence Centre ERTE/PTE was chosen.
2. First contacts with the Executive Council and schoolteachers – visit to the school. A meeting was held in January 2009 with several members of the school who would become the main informants for the questionnaire to be submitted to the school community.
3. Review of the questions to be made along with the interviews. The questions, which constitute the basis for the interviews to the school community, were analysed in detail.
4. Validation of the Portuguese version of the questionnaire. The local coordinating team translated all the questions in the model. In order to keep the internal coherence of the questions and the interpretive aspects they might produce, a professional translator back translated them to English. It was from the comparison and consensual compromise between both translations that the questions for the interviews were established.
5. After performing the interviews, the data will be analysed, treated and the final report elaborated.
6. The whole study will be translated into English later on, considering that, as mentioned before, Portugal is one of the partners in a study that mainly involves English speaking countries.

Collection and Analysis of Results

The study will be based on interviews to i) The Head of the Executive Council; ii) The ICT Coordinator; iii) Teachers of the ICT team; iv) Teachers who use ICT; v) Library Teacher; vi) Director of the Administrative Services; vii) Students.

Some of the questions to be asked to these interviewees are repeated, but many others are specific to each group of interviewees or individuals. The questions often have notes associated with them so that the interviewer is aided towards a more in-depth and precise response.

As an example, some generic and some specific questions are transcribed.

General Questions

- Could you outline your vision of ICT/ Education Technologies in students' learning please? Does this match the principal's or District Director's and others' views and the documented strategic directions of the school? (Educational project; activity plan).
- Could you describe how you see your role in supporting teaching and learning with ICT/ Education Technologies? (Personal vision).
- What would you say are the key value propositions concerning ICT/Education Technologies in teaching and learning that underpin the work of the school/district? Verified against the school's strategic planning documents. Is there a shared vision with others in the school/district?

Specific Questions

Library teacher(s)

- In what ways does your work relate to students' learning with ICT/ Education Technologies?
- Organisationally, how do you see this role working? E.g. with whom do you work? Who asks for your assistance? Who do you report to? (Alignment between teaching and learning and resources support).
- What sort of support do you provide? To whom?

Students

- Could you describe the subjects (if any) in which technologies are included in your studies?
- Are the ICT/Education Technologies necessary for you to be able to successfully complete your school work? Why is that?
- What are your preferred technologies? Why?
- What are your views of the quality of ICT/Education Technologies at [name of school]? Why do you say that?

- Do you have technologies (ICT/Education Technologies) at home? If so, what are they? How do you use them? Do you use them for school work?
- Can you remember studying without technologies? If so, what do you remember?
- Do you think technologies are helpful in your studies? Why do you say that?

At a later stage, and whenever necessary, information will be requested about other issues which may have come up during the interviews upon being transcribed and which allow for more detailed replies, with greater and more in-depth reflection.

Whenever emerging aspects occur from those considered by the questions and which lead to answers with a greater and more in-depth reflection, those aspects will be accounted for.

Drawing of conclusions

After treating the data, cross-checking them and the subsequent analyses of the results obtained from the questionnaires, conclusions will be drawn regarding the usage of ICT in this school, as well as the correlation between usage, frequency, and degree of satisfaction and optimization. At the end of the study, which is expected to be concluded at the end of the last quarter of the present year, we hope to obtain concrete data as well as detailed results on the usage of ICT within an educational context, in order to calculate the derived benefits as opposed to the corresponding investment in training. The present study may therefore serve as a support for more sustained management in terms of learning results for other schools or educational institutions.

RESULTS

As there is already data from the questionnaires and interviews, some preliminary results will be shown next, from the perspective of teachers, students, non-teaching staff and teachers with specific responsibilities in the school. Transcriptions are provided to support interpretations of the data analysed.

Teachers' replies to the questionnaire

The analysis of the questionnaires to teachers allow us to conclude that: i) All the teachers have used computers for more than 7 years (maximum time expected in the reply options); ii) Teachers are open to helping each other, although they do admit they receive more help than they give; iii) The majority of the teachers consider they have average skills as far as working with Information Systems; iv) Although they consider the school to be reasonably equipped (the greatest complaints refer to the network) they work on their personal computers; v) They consider the training they received to be of good quality; vi) They depend on the ICT team to help them with technical and pedagogical issues and they classify that support as excellent; vii) They consider computers/tools indispensable to perform their tasks.

If we compare these results to those verified a few years ago, we may conclude that, although a fully satisfactory use of ICT in education has not yet been verified, as far as the new learning paradigms and the whole of the school staff are concerned, there is an increase in the habits of usage of Information Systems.

Students' replies to the questionnaire

With regard to students' replies, i) The majority of the students do not spend much time working with the school computers; ii) They consider they have average computer skills; iii) They have used Information Systems for more than 5 years (45%) or more than 7 years (55%); iv) They resort to the teachers to solve technical issues (50%) and then to colleagues (33%). Only very few (8%) resort to the ICT team; v) For practical usage issues, they ask their colleagues (50%), teachers (42%) and the ICT team (8%) for help; vi) The quality of the computers at school is considered average or bad and the quality of the network is evaluated in the same manner, the main reason being that computers need to be restarted frequently.

Interviews

Regarding the interviews, there are some quite relevant aspects to be considered, of which we will only report the most relevant for the purpose of the present paper.

As to the students, they have different opinions about ICT in an educational context: some recognize the enormous importance technology has in consolidating learning:

“Teachers, at least in my classes and from what I can observe, resort to them [ICT] constantly in order to make the learning process easier and also to teach subjects by resorting to videos. For instance, in Biology, we use [them] a lot (...). I am going to speak more about the Sciences course, the one in relation to which I am more at ease. In the laboratory there are several technologies which we resort to frequently when we have lab activities and I think it is very well equipped from what I know.”

“This year I was again surprised with the technologies used at school, because within the scope of the subject “Área de Projecto” [Project Work] we are going to try to make preparations, following the embryonic development stages (...) There is going to be one day, which is the school day, in which we are going to present our projects to other classes.”

In these group interviews, one of the students said that ICT is an invaluable resource:

“What people need to do is know how to use it. Each person should be responsible for his/her own learning”.

Others, agreeing with Collis and Moonen, consider the use made of ICT in the classroom to be poor and far from the possibilities it offers. “In the long run people don't change. This means that the majority of teachers will do what they have done all along, which means using available textbooks or making handouts by cutting and pasting from other materials or now, making PowerPoints, often also by cutting

and pasting, only now it is electronic" (Collis & Moonen, 2005:48). The students complain mostly about the "PowerPoint tendency" which, from their point of view, even becomes tiring.

"I don't think that works done in PowerPoint are as captivating as we may think... (...) On the one hand, works are better organized, but I also think that they are more tiring, maybe because we need to be looking at them all the time and they have a lot of text."

There are other students who believe ICT lets them "fall easily into a lay back attitude because they know they have all the resources available". In other words, they become "addicted to a lay back attitude" and do not think as "deeply" about the learning topics as they should.

"This importance is a bit relative, because ICT let us fall easily into slackness. Because ICT relieves us a little bit from the pressure, because we know we have that resource at our disposal (...) and we end up doing that work in a less reflective way than required."

"We become a bit dependent on those technologies."

"Therefore we need to know how to use ICT to our benefit, because we have to remember that this is always to the benefit of the student."

There are actually students who, being aware of these constraints, study and only later use the computer to clarify doubts in specific sites or with the help of the teacher in the available Moodle subjects.

"I don't resort to technologies to study because I know that they will distract me a lot."

As to the teachers, there is also disagreement. Some consider that ICT has great potential and is a unique resource.

"Whenever possible, I try to develop search activities with the students in which they use computers, not only as a tool for me (for me to teach or for them to go there and do exercises), but also for them to be in groups or in pairs. (...) It is something which they really look for and enjoy doing and I have observed that in those lessons even the laziest students, who don't like to think as much as others, end up by being more attentive to what we are doing and they follow the activities with relative easiness."

"I am connected to my students, in a certain way, beyond school. From my point of view, this has been the most interesting resource in History. They can send me the works (...) for Moodle; I can stay in MSN explaining their doubts before the tests; I have a predetermined hour every day (from 9 to 10 p.m.) for chatting with my students at home, and this is what I consider to be the greatest value of all this technology. (...) Indeed, this interaction that I have been promoting (...) it was there that I observed the greatest conquest with my students."

"In relation to my subject, I don't think these are fundamental resources, that is, I think that in my subject there are still things that are not dependent from the computer, that is, reading,

writing, self-correction, hetero-correction, etc. However, I think it is a very productive resource because it solves some difficulties I have to face such as when they are related to time and space. I explain why: because there are materials, for instance, produced by me or by the students, which can be seen in the same space and at the same time by all and in less time, and situations of correction of work resorting specifically to the Moodle. (...) Students being able to access the work of others – I think this is very positive.”

There are others who think technology changes students into less creative and hardworking people, leading to lack of motivation due to the routine effect:

“They become copy/paste students”.

“Students are sick of PowerPoints in the classroom; they are sick of being bombarded with technology”

“They are already sick of the Internet at home; then we also have the other side of the coin, isn't it? It is the school, the Internet and computers. That they already have at home. They are already absorbed. Then we also fall into this problem; for them it is no longer a novelty, it stops being one.”

“It ends up being a routine, because it does not produce the intended effect (...)”.

Teachers are also aware of the dangers of the Internet and the acritical use of the information it can provide:

“The Internet is very rich, but it also has another side, which is the dark side, as I usually say. (...) There is a series of materials which need to be looked at with a very critical perspective and sometimes they [students] don't do that and therefore I think this needs to be worked on in the classroom, and me having the chance to do it is pretty good, so that they can work on this further at home.”

“They need to know how to read, interpret, to have the critical ability to filter the whole information. This is basic, and we, any teacher, need to provide them with those skills, right? These competences, knowing how to read and filter information.”

“(...) The question I pose myself is “But do they read well” what they watch on TV? The images... Do they know how to read them effectively? The problem is there, [which] critical, discursive, argumentative competences do they have? Are we indeed providing them with those competences?”

Besides the problem identified as the “copy-paste student” without interpretive, critical and argumentative skills, another strong constraint that was referred was the fact that the present educational system does not allow teachers time. The hours they spend with imposed bureaucratic tasks should, for the sake of teaching, be spent on specific training (to overcome the PowerPoint transmitting paradigm).

There is yet another fundamental issue that teachers have shown to be aware of. It is the need to identify difficulties and to be aware of new compulsory learning related to the skills and literacy mentioned above.

“Reading from the computer is not the same thing as reading a book and therefore even the underlying cognitive processes change a lot and therefore this is another learning one needs to undertake, and if one wants to focus on that, only on that, this is also a challenge for us teachers, right? We really have to think about this before resorting to such source of information, because it may pose new difficulties to the students.”

“Well, I think that they are not really aware. We are more [aware of it] because we didn’t go through this when we were their age. But they are not aware of the fact that that the screen is a world which is there (...)”

To determine the advantages and disadvantages of ICT, through field studies instead of consecutively testing programmes without knowing the results, is also an obligation of the responsible institutions.

“I think that there is a work of analysis of results which perhaps has not been done yet. That is, maybe only we can assess the immediate results, I don’t know if this has these potentialities in the medium and long term.”

“(...) There is a lack of strategic vision that should start from reflection and from the opinions of people involved in this area”.

Another very interesting point of view, having to do with aggregation tools, was given by an ICT teacher. There are several platforms, different subjects within the same platform, and the teacher becomes dispersed with so many access logins and passwords. If there were a place where the teachers’ work could be aggregated, they would not have to live in the “hell of platforms”.

“The problem with Moodle is the following: I have a Moodle for my subject, I am the one who does that, then I have a Moodle to administer for teacher training, and then I have the CRIE Moodle while ICT coordinator... then I have the Moodle of the Teacher Training Centre (...) Thus, I don’t know how many passwords I have (...) This is becoming a hell of platforms.”

A different perspective is the one presented by the Head of the Executive Council, since in his opinion there are serious gaps in the system, namely in relation to continuing professional development/*continuous teacher education and training*.

“I think that continuous teacher training should be completely different. It should have a much more formal character, and it should have a more rigorous assessment, because in truth we are first talking about financed teacher training (...) We have to fight seriously for it to be more rigorous. But on the other hand, people’s expectations, when they decide to do these training courses (...) is that it is not to be taken seriously, and I think that this is a terrible, terrible mistake.”

This rigour-lacking policy with regard to teacher education has negative consequences in short and medium terms, namely in relation to the usage that can be made at a national level of the countless resources schools will be equipped with in terms of materials and ICT, thanks to the technological education plan (TEP).

“With regards to a near future, with TEP, I think that there will be unique and exceptional conditions, and I doubt that schools will be able to take advantage of them, I really doubt it.”

“(…) I think that Portugal is going to be incomparably better than the majority of the European countries that I know of at this level. I think that this will be a unique opportunity for schools to grab and for them to really being able to put some innovations into practice.”

“Lack of teacher education. It is the insecurity that is shared by many people in relation to this technology (…) I think this is determining (…). The teams working in the field should take that leap and help colleagues take that leap too. (…) The earlier one catches the train, the better, because after that, people will grow feelings of insecurity and (…) more constrained regarding the use of those materials.”

During these interviews, a more assertive and critical point of view was given by the Director of the Administrative Services, who decisively states that “the balance between expenses and learning is negative. […] Too much is spent on ICT without re-considering the teaching models”.

This member of the non-teaching staff believes investment should be made on training for professional growth in order to develop multiple ICT competences and skills according to learning paradigms, in which ICT are a means and not an objective. There should be “an attitude against the existing *status quo*; an attitude of permanent challenge”.

CONCLUSION

We addressed the results of an ongoing case study on the existing relationship between ICT students and teachers’ perspectives in teaching and learning, and their derived benefits, difficulties and demands as to the teacher training needs they impose, along with the skills students should develop in ICT rich environments.

The results discussed in this paper show that students have mixed feelings and attitudes about ICT as they encounter them in their school: the PowerPoint presentations abuse by teachers as opposed to their praise of ICT as a very powerful tool for their own learning. On the other hand, teachers consider that more specific training is required for them to effectively use all the potential of the equipments schools now possess.

As referred by the Principal interviewed, Portugal will be amongst the first European countries to be fully equipped with state of the art ICT resources in primary and basic education. This however has to be complemented with a proactive and rigorous implementation of other actions that address the issue of teacher training before such equipment becomes obsolete.

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PROMOTING DIGITAL LITERACY THROUGH INSTRUCTION ON READING AND UNDERSTANDING MULTIPLES SOURCES OF INFORMATION

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ABSTRACT

The present study investigated the efficiency of a pedagogical intervention aimed at teaching students to interpret perspectives coming from different sources of information. Participants were 55 fourth and fifth graders from a French elementary school. They attended two sessions of reading practice in which they read short texts presenting controversial topics and answered questions using an online interactive system. In addition, the experimental group received comprehension instruction during the first session. Results show that instruction lead to superior performance in the second session, for both good and poor comprehenders. Students were very motivated by the activity and adapted easily to the instructional context. It is encouraging that this short intervention had significant learning effects, because teaching students to deal with multiple sources will be increasingly necessary in the context of online learning and digital literacy.

KEYWORDS

Digital literacy, comprehension instruction, multiple sources of information, argumentative texts

INTRODUCTION

Digital literacy is a broad concept that includes the ability to critically evaluate media content and learn from multiple sources of information (Arke & Primack, 2009; Goldman et al., in press). Such an ability is critical at all school levels. Students from elementary grades to college are using the Internet to find texts, images and multimedia materials to complete their school projects (De Vries, Van Der Meij, & Lazonder, 2007; Kuiper, Volman, & Terwel, 2007). In doing so, they encounter multiple sources of information and need to be able to critically evaluate sources' quality and credibility (Rieh, 2007). Dealing with multiple sources is an interesting, but also complex activity that requires a number of comprehension and documentary skills (Britt & Angliskas, 2002; Rouet, 2006). Research shows that many students lack such skills and struggle with comprehending different perspectives expressed in a Website (Brem et al., 2001).

In order to help students develop skills on the comprehension of multiple sources, researchers have created and tested a variety of instructional interventions. At the college and high-school level, there have been some successful attempts to train students to critically evaluate multiple sources of information (e.g., Britt & Angliskas, 2002). Sanchez & Wiley (2007) showed that training students to assess the reliability of Websites leads to more accurate reliability judgements, less misconceptions and

increased knowledge in various topics. Stadler & Bromme (2007, 2008) found that prompting students to use metacognitive strategies improves factual knowledge, memory for sources, and generates more arguments focused on Website authors. One limitation of these studies is that they have not been tested in real school settings, thus it is still unknown whether they can be successfully applied to classroom activities.

Interventions of this kind are rare at the elementary school level. Some researchers have implemented and tested information skills training programs, but they have focused on technical knowledge (Gerjets & Hellenthal-Schorr, 2007) or on how information is displayed (De Vries et al., 2007). One study assessed the impacts of teaching students to evaluate Websites and to use search strategies, but it obtained mixed results which could not be fully explained (Kuiper et al., 2007).

In the domain of text comprehension, several successful interventions have been developed to improve children's comprehension skills. Raphael and Wonnacott (1985) showed that teaching students to identify "sources of information" for answering different types of questions leads to increased comprehension performance. In their study, the term "sources of information" refers to one of three sources (explicit information in the text, implicit information in the text, and prior knowledge), not to different authors or texts. Shamir et al. (2009) found that comprehension instruction improves kindergarteners' word meaning skills when using an e-book to read narratives. Kendeou et al. (2008) argued that comprehension instruction pays off even at early stages of children's development. They showed that asking kindergarteners' to recall information and answer questions from aural and televised stories improves their comprehension skills and predicts latter reading comprehension. Recent reviews of the literature point to reciprocal teaching (Palincsar & Brown, 1984) as one of the most effective comprehension instructions (Biancarosa & Snow, 2006, NICHD, 2000, Spörer, Brunstein & Kieschke, 2009). Like the above mentioned interventions, most applications of reciprocal teaching use narratives or expository texts. These materials convey a story or information from a single source and do not require the integration of conflicting or controversial information from multiple sources.

One instruction that uses narrative texts, but takes points of view into account is the "character perspective charting" (Shanahan & Shanahan, 1997). In this example, students from 3rd to 5th grades are encouraged to identify characters in conflict and develop their respective points of view by answering questions in a chart. Anecdotal data suggests that this intervention is effective to improve comprehension skills but the authors do not present more rigorous data. Another strategy instruction that deals with the interpretation of a point of view is "questioning the author" (Beck, McKeown, Hamilton, & Kucan, 1997).

Given that multiple source comprehension instruction is still rare at the elementary school, but taking into account that successful interventions exist at other levels, the question remains opened of how school students deal with multiple sources and what kind of instruction might help them improve their comprehension and critical skills. In our study, we proposed a specific intervention that delivers instruction on the comprehension of multiple sources. An online system was used as supporting tool to present texts and questions, and provide feedback for students. The effects of instruction on students' comprehension performance were investigated in a quasi-experimental study.

The research questions and hypotheses included:

- How well do students' comprehend texts with multiple sources of information at the elementary school? We expected good comprehenders to outperform poor comprehenders when dealing with multiple sources.
- Does instruction on multiple sources improve students' comprehension of texts? Students in an instruction condition should outperform control students with no instruction. Moreover, instruction should benefit poor-comprehenders more than good-comprehenders.
- Is comprehension related to time spent reading the text? A positive correlation was expected between time spent reading the text before answering the questions and students' performance.

METHOD

Participants

Participants were 55 students from grades 4 and 5 of a French elementary school. They had a mean age of 10.2 years, and included 65% males and 35% females. The school is situated in a rural district, close to a larger urban area. It is not in an at-risk education zone.

Students had access to computers in their classrooms. Prior to the experiment, they had used these computers for classroom activities during at least 5 sessions of 30 minutes each. Some students also had access to a computer at home. In addition to this prior experience, they participated in a training session to learn how to use the online system called Lirelec that served as a support for the experiment (Goumi, Rouet & Maniez, 2007).

Participants were assigned to the experimental groups by creating matched pairs of students according to their comprehension level as measured by a standardized pre-test. The experimental group (N = 27) received instruction on text comprehension in the first session, whereas the control group (N = 28) received this instruction at the end of the second session.

Materials

Comprehension pre-test:

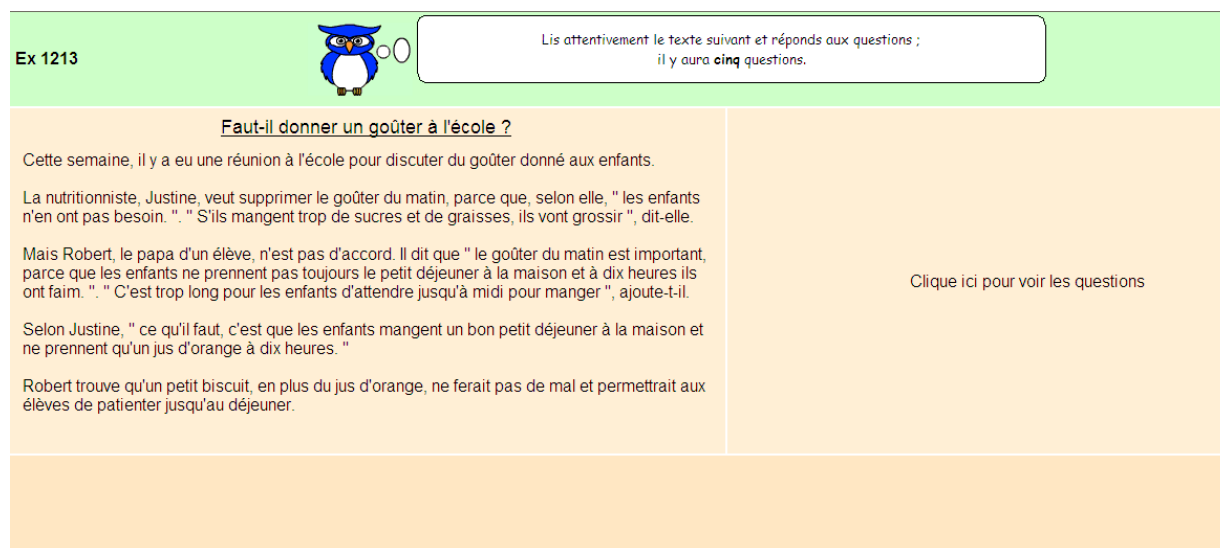
Four weeks prior to the experiment, all students completed a standardized reading comprehension test for the French language (Aubret & Blanchard, 1991). "Good" and "poor comprehenders" were identified on the basis of test scores. The test consists of 7 short narrative texts, each accompanied by 5-6 open-ended comprehension questions. About half of the questions are factual, the other half are inferential. All questions require short answers (one to three words). The texts and questions are presented in paper sheets and texts are available while answering the questions. The texts' and questions' level of complexity increases from first to seventh text. Texts are also adapted to each elementary school grade. Thus, the fourth graders completed sheets "b, c, d" of the standardized test, while fifth graders completed sheets "c, d, e".

Each correct answer in the test receives one point. Incorrect answers receive no points. The final score is the sum of all points obtained by the student. The individual scores can then be compared to a reference table of standardized means for each grade level. In our study, we used the median of each group (4th and 5th graders) to distinguish “good” and “poor” comprehenders because of the small sample size. The median was not very different from the cutting point used in the standardized table.

Comprehension scores ranged from 6 to 32 ($M = 22.2$, $sd = 7.2$) in grade 4, with a Median = 23. In grade 5, scores ranged from 10 to 36 ($M = 28.2$, $sd = 6.5$), with a Median = 30.

Texts:

Four short texts presenting a controversy between multiple sources of information were developed for the purposes of the study. Sources were represented by different characters in the text. Each text contained a title (2-5 words length) that summarized the topic of the story and a passage (131-203 words length) that presented a controversy between two or more characters. For instance, one text presented a debate between a nutritionist and a student’s parent during a school meeting. The topic was whether students’ should be given a morning snack at school. Texts were presented on screen (Figure 1).



The screenshot shows a digital interface for a reading comprehension task. At the top left, it is labeled 'Ex 1213'. To the right is a blue owl icon with a speech bubble. A white box contains the instruction: 'Lis attentivement le texte suivant et réponds aux questions ; il y aura cinq questions.' Below this, the text is presented in a light orange background. The title is 'Faut-il donner un goûter à l'école ?'. The text describes a meeting between a nutritionist (Justine) and a parent (Robert) discussing whether to give a snack at school. A link on the right says 'Clique ici pour voir les questions'.

Figure 1: Print screen of the interface used to present texts and questions in the study.

Characters in the text were identified by their name and/or a qualifier (professional affiliation, education level, socio-economic status, etc.). Each character’s opinion was presented in a separate paragraph, introduced by “Mr. X says that...” or “according to...” and followed by a statement under quotation marks. Three texts contained two characters and one text contained three characters. The opinions appeared alternately in the text. The passages ended by a characters’ opinion (two of the texts) or a sentence restating the questions raised by the controversy (the other two texts). No solution of the conflicts was offered directly in the texts, because the goal was to have students think of the controversy and form their own opinion based on what they read about each character’s opinion.

In addition to the four texts, a fifth text using the same rhetoric structure was developed for training purposes.

Questions:

Each text was accompanied by 3-5 multiple choice questions. Two exceptions are the first questions of two different texts, which asked students to underline a passage of the text that answered the question.

The first question focused on comprehension of the topic of the story. It aimed at verifying that students understand the theme of the controversy depicted in the text.

The second, third and fourth questions focused on source-content comprehension. Students were presented with a label "According to Mr. X..." and multiple-choices that did not reproduce the text literally but were rather paraphrases of what "Mr. X" had said. They aimed at verifying that students had understood what had been said and by whom in the text.

The fourth or fifth question (depending on the text) focused on linking sources and reasons for justifying an argument. Students were asked "in your opinion, who is right and why?", and they were provided with answers that combined the identity of characters with reasons that were more or less related to the specific question of the controversy. For instance, in one text about "should we let dogs inside the house?" possible answers were: (a) "the young girl, because she loves dogs", (b) "the veterinarian, because she has a lot of experience with dogs", (c) "the member of the animal protection society, because he protects animals", (d) "I do not know". The expected answer was "(b)", because the argument of experience is the most relevant when considering the risks of letting dogs inside one's house. Although we did define an expected answer for each question, the main goal with this type of question was to find out which characters and reasons students would choose and whether they would choose one (a "none" or "don't know" option was also provided).

Instruction:

The instruction consisted of conducting discussions in small groups, before and after students read each text. The general goal was to encourage students to identify the multiple characters presented in text, to understand their arguments and to take their perspectives into account when interpreting the texts. This instruction includes some of the elements present in "reciprocal teaching" (Palincsar & Brown, 1984), such as answering questions and making predictions, and in "character perspective charting" (Shanahan & Shanahan, 1997), such as identifying characters' goals and ways to solve problems.

First, the instructor presented the students with the lesson goals, i.e. to read short texts in which different people express their opinion on a subject matter. Then, she asked students about their behaviour concerning opinions from others ("do you take the advice from anyone, anytime?"). A discussion followed. As an example, students were asked whether they would trust their teacher or the experimenter on the question of having/not having class a specific day of the week. They were

encouraged to say why they would trust/not trust each of the sources and to identify the differences between them. The goal was to have students say “it depends” and to have them think of the reasons to accept/reject someone’s advice or opinion.

As a second step, the instructor asked students to read the training text and answer its questions. Students worked individually and silently for a couple of minutes.

After a reading-answering period, the instructor introduced a new discussion (third step). She asked the students to explain the topic of the controversy. Then, she asked how many characters were presented in the story, their names, their qualifications, their opinions about the topic and why they were in conflict. Students raised their hands as the instructor asked the questions and the instructor took care that all students have an opportunity to give an answer. Some students who did not raise their hands spontaneously were gently asked to answer one or two questions by the instructor. If they did not know or did not want to answer, the instructor shifted to other students. The goal of the discussion was that students correctly identify all the characters in the story and what they said.

The fourth step was asking students how they thought the conflict would be solved. They were also asked if they had lived a similar experience and if so what had happened. Finally, they were asked who they thought were right in the story and why.

The fifth step was concluding the discussion. No “right or wrong” answer was provided by the instructor. She emphasized that texts presenting different views about one topic are rather difficult to understand because people do not always agree. She reminded students of the importance of paying attention to “who said what” and taking into account different perspectives, concluding that in some cases it is difficult summarize ideas without making a reference to the sources of information.

Every step of the instruction was repeated after reading each text during the first session in the experimental group only. For practical reasons, in this study the instructor was one of the experimenters (the first author), who had co-conceived the texts, questions and instruction. In the long run, the perspective is to have teachers apply the same instruction to their students.

Procedures

The experiment was run in two sessions of 30 minutes each. Students worked in groups of eight, with one laptop computer per person. The sessions took place in a separate quiet room, close to the students’ regular classroom. Two experimenters were present in the room, but only one experimenter (the first author) provided the instruction. The presence of two experimenters in the room allowed for assisting students individually when needed (login and connexion problems, using the touchpad, etc.), controlling the discipline and timing (bringing students in and out, etc.). Computers were displayed around a table and all students could see each other and the experimenters. However, students were not allowed to look at each other’s screen.

Session 1 – Training:

In the first session, students were called in their classroom by one of the experimenters and brought into the experiment room. Upon arrival, they were instructed by the other experimenter to take a place, login into the system with the username and password previously assigned to them, and wait for further instructions. Once all students were connected, the experimenter began the instructions for the session. The texts appeared to the students as a list of links on the online interface. The experimenter told students which texts to select as a function of the session and group.

In the experimental condition, students were guided through the steps of the instruction described above. After a brief introduction (first step), they were told to read the training text and answer the questions individually (second step). The first students who finished the questions were told to revise the text and their answers while waiting for the others. After all students had completed the training assignment, a new discussion took place in the context of the experimental instruction (third through fifth steps). Then, students were instructed to read and answer the next text and questions, which were followed by the same discussion. Finally, students did the third text and questions plus discussion.

In the control condition, students were brought into the classroom and received the same initial login instructions as in the experimental condition. Then, they were told that the session goal was to complete exercises on text comprehension using the online system they already knew. Since there was no discussion, additional filler exercises (comprehension of expository or narrative texts) were provided in order to keep the same amount of time in each session. Presentation order of the texts was counterbalanced across sessions.

Session 2- Test:

In the second session, students in both conditions were told to read the remaining texts individually and to answer the questions. All students worked under test conditions. In the experimental group, students were provided with filler texts to be completed after they had finished the experimental texts. In the control group, students completed the experimental texts only and then received the experimental instruction in the last 10 minutes of the session. This was done in order to ensure that all students receive a minimum of common training by the end of the experiment.

At the end of the session, students were debriefed and returned to their classrooms.

Variables and data analysis

Two independent variables (IV) and two dependent variables (DV) were used in this study. The IV were comprehension level (good vs. poor) and experimental group (instruction vs. control). The DV were the scores obtained in each experimental session (score 1, score 2) and the time spent reading the text in each session (reading time 1, reading time 2).

Scores were obtained by first converting students' raw scores for each text into percentage scores. Then, the mean of the two texts in session 1 was calculated to obtain the first score. The same was done for session 2 to obtain the second score.

Time spent reading was recorded automatically by the online system. The system provides three different measures: time spent on the text, time spent on the questions, time spent on the correction. However, only the time spent on the text was analysed in this study. Time spent on the text corresponded to the number of seconds passed between the moment where the student clicks on a “read the text” link in the Web page and the time he/she clicks on a “see the questions” link. After clicking on the “see the questions” link, the student could still go back to the text and read it. However, students were instructed not to click on “see the questions” and to read the text attentively before answering the questions.

In order to test for statistical effects of the independent variables, a two-way ANOVA was conducted with Comprehension level and Group as between-subjects factors, and Session (“score 1” and “score 2”) as within-subjects factor.

RESULTS

Performance

Figure 1 depicts students’ mean performance scores. Good comprehenders had a mean of $M = 69.1\%$ ($sd = 19.6\%$) in session 1, and $M = 78.6\%$ ($sd = 18.8\%$) in session 2. Poor comprehenders had $M = 45.1\%$ ($sd = 17\%$) in session 1, and $M = 58.1\%$ ($sd = 24.4\%$) in session 2.

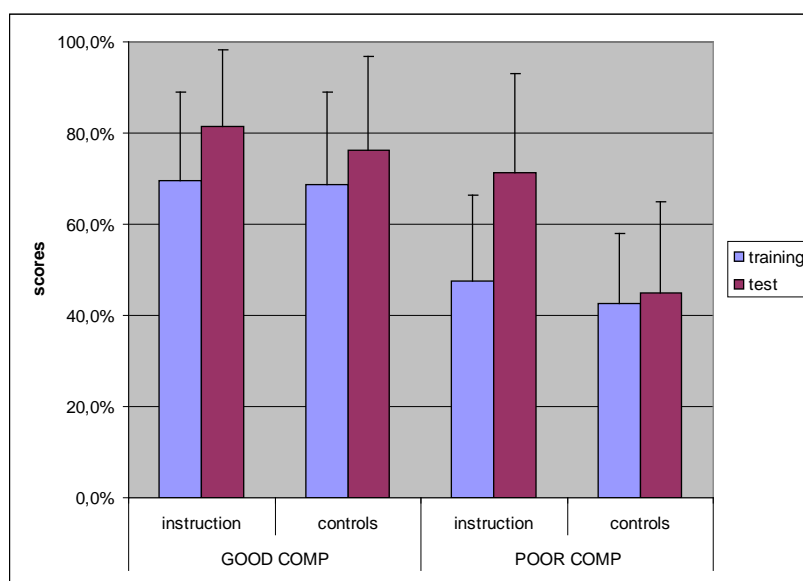


Figure 1: Students’ performance scores as a function of their comprehension level and experimental group.

A main effect of Session was found, although with a small effect size, $F(1, 54) = 17.2$, $p < .001$, partial $\eta^2 = .25$. Scores in session 2 were higher than in session 1. Furthermore, there was a significant

Session*Group interaction, $F(1,54) = 5.6$, $p < .02$, partial $\eta^2 = .10$. Students in the instruction group obtained higher scores compared to controls, particularly in session 2. Thus, the instruction had a direct effect on students' performance.

Contrary to our expectations, there was no significant triple interaction Session*Comprehension level*Group. Although poor comprehenders in the instruction group seem to increase more than other groups in performance, the superiority of the instruction for this particular group cannot be attested. Both good and poor comprehenders benefited from the instruction.

Reading time

Reading times varied greatly from just a couple seconds to several minutes. A significant correlation was found between time spent reading the text and scores in session 1, $r = .32$, $p < .02$. Also in session 2, the correlation between reading time and scores was significant, $r = .27$, $p < .05$.

The more students spent time reading the text, the higher their scores.

CONCLUSIONS

Reading and learning from multiple sources of information is becoming common practice even at the elementary school level. Most instructional programs on text comprehension at the elementary school use narrative and expository texts as a basis for student training. Students have relatively few opportunities to work with argumentative texts and multiple sources of information before they enter middle and high school (Goldman et al., in press). Dealing with multiple sources requires advanced comprehension skills, therefore training is needed to improve students' ability in critically learning from sources (Rouet, 2006).

Our study aimed at investigating the effects of an instructional program to teach 4th and 5th graders to interpret sources of information in argumentative texts. Students were encouraged to identify characters and their opinions in the text, to answer questions regarding "who said what" and "why and under which conditions" one source is more credible than another. Instruction took the form of a group discussion before and after reading the texts. We found that this instruction enhanced students' comprehension performance in a relatively short period of time (two sessions of 30 minutes each). The strategy of having students discuss the texts before and after reading, identify sources of information and link the sources with content helped them better understand controversies and characters' perspective in other argumentative texts.

Instruction was not significantly beneficial for poor comprehenders, contrary to our expectations. One explanation is that the observed differences between poor and good comprehenders did not reach significance because of the sample size or other factors linked to the design of the study. Poor comprehenders showed the highest increase with instruction when considering raw means. A ceiling effect might have occurred because texts might have been too easy for good comprehenders. These hypotheses should be investigated in a future study.

Reminding students to read the text attentively before answering the questions is an essential instruction, since in both sessions student's reading times and scores were significantly correlated.

Without that explicit instruction, many students would probably have scanned the texts without really reading them. Thus it is important to monitor students' activity during the session and release frequent reminders to help them regulate their reading pace.

The results of this study are encouraging because significant effects could be observed within a short period of time. With only two sessions (training + test) students showed progress in comprehending the perspectives of multiple sources in argumentative texts. Anecdotal data shows (a) that students adapt very easily to the instructional context because they are used to work in small groups (b) that they engage in lively discussions, especially when texts deal with subjects familiar or interesting to them. Thus, it is reasonable to think that this instruction can be easily implemented in elementary school classes, although other requirements exist in terms of teacher training and class organization. In the long run, the instruction could be adapted to the online system to allow for group discussions with automatic feedback from the system. This adaptation would require further development and observations in class, but the current system can already be used to archive texts and questions that can be used by the teacher in his regular class.

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Evaluation of Instructional Design using Bayesian Belief Networks

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Abstract

Contemporary methods of Instructional Design (ID) evaluation are fragmented in nature because the evaluation data is obtained from multiple sources (instructors, learners, instructional designers) independent of each other, thus yielding disconnected results. In addressing this issue on fragmented ID evaluation, we propose an integrated approach to instructional design evaluation, where we combine four types of data: a) data obtained computationally by parsing the course content, b) data collected as expert commentaries from instructional designers, c) course feedback data from students, and d) interaction data obtained by parsing learners' interactions with the content. These four types of data could be fed into a Bayesian Belief Network (BBN) that incorporates a causal framework for course-specific ID evaluation. The resultant BBN would respond to direct as well as causally inferred questions about the quality of the ID, even in the presence of sparse data. This paper describes our approach, shows a glimpse of the underlying Bayesian causal structure, and identifies a subset of potential questions concerning the quality of the ID corresponding to a course. While the proposed method is applicable to any type of course, most of our discussions would focus on the application of the proposed evaluation framework in the context of an online course.

Keywords:

Instructional Design, evaluation, Bayesian belief networks, learning objects, online learning

Terminology:

BBN – Bayesian Belief Networks

CAM – Conceptualized Attention Metadata

CLOE- Co-operative Learning Object Exchange

DAG - Directed Acyclic Graph

ID – Instructional Design

LO – Learning Objects

LOEI - Learning Object Evaluation Instrument

LOM – Learning Object Metadata

LOR – Learning Object Repository

LORI - Learning Object Review Instrument

LS - Learning Style

MERLOT – Multimedia Educational Resource for Learning and Online Teaching

MI-IDEM - Mixed-Initiative Instructional Design Evaluation Model

NPT – Node Probability Table

Introduction:

Instructional Design (ID) refers to the systematic and reflective process of translating principles of learning and instruction into plans for products such as instructional materials, activities, information resources, and assessment (Smith & Ragan, 2005). An evaluation of instructional design corresponds to evaluating instructional materials, activities, information resources, and assessment with respect to learning task, learning context, and learner preferences.

There are hundreds, if not thousands, of ID principles that result in a wide range of products. Some principles employ ‘generative strategies’ (Wittrock, 1974), where learners can construct their own meanings (for instance, goals, sequences of application of skills, self regulation, and transfer) by interacting with the instructional material. Generative strategies demand a high cognitive load from the learner. Also, generative strategies require careful design of the instructional context to sustain learning. Supplative strategies, as opposed to generative strategies, explicitly and specifically provide instructional guidelines, thus demanding a considerably lower level of cognitive load. Without careful supplative design, learners may become fully dependent on the instructional context rather than being an independent learner. When a particular ID principle is designed, developed, or deployed, evaluation mechanisms should also be designed alongside corresponding to each instructional strategy. If the instructional design employs a generative strategy of ‘read a book chapter’, a corresponding evaluation framework that, for instance, estimates the cognitive load, or assesses how well the student is able to transfer what has been learnt, needs to be designed as well. We propose a ‘holistic’ approach to the evaluation of instructional design by targeting every single ID strategy and the associated learning product employed in the instructional context.

It is a rather large and complex task to assess the quality of such a wide range of learning products. Designers and instructors typically evaluate the quality of their courses either formatively or summatively. Formative evaluation happens during the process of development of the learning products while summative evaluation happens after the learning products have been implemented into the instructional contexts.

(Nicol & Macfarlane-Dick, 2006) discuss ways in which formative evaluation results could be used to assess self-regulatory practices of learners. This is possible because formative results are mostly process-centric and can be closely tied with the individual learner. Literature identifies, based on the time at which evaluation happens, many types of formative evaluation, including, design reviews, expert reviews, learner validation, and ongoing evaluation (Smith & Ragan, 2005)¹.

¹ <http://classweb.gmu.edu/ndabbagh/Resources/IDKB/evaluation.htm>

Design reviews are conducted mostly by instructional designers at the completion of a design for an instructional product, but prior to implementation. Goal reviews, task analyses, learner analyses, and assessment specifications could be parts of a design review. Expert reviews, as the name indicates, are mostly carried out by instructors (e.g., teachers, tutors) after the learning product has been developed, but prior to the deployment of the same in instructional contexts. Learner validation depends on data collected from learners, and at times uses interpretations of learners themselves. It includes individual performance analysis, small group reviews, attitude data, field trials with sample students, and so on. Ongoing evaluation takes formative evaluation further into the deployment stage of instruction when instruction is actually imparted/executed.

Summative evaluations normally occur after the instruction has been implemented into the target contexts. The results of summative evaluation cater to decision makers in deciding the effectiveness of the instruction imparted/executed. For example, a decision on whether to continue problem-based learning (PBL) in 2nd year programming courses in an undergraduate degree could be influenced by summative data on the effectiveness of PBL in assisting students improve the quality of their code from, say, 70% to 90%.

Contemporary instructional design has witnessed many new inclusions, in terms of mode (from being behaviorist to cognitive to constructivist), scope of subject knowledge sources (from being lecture-centric to activity-centric), and from instructor oriented to more learner oriented. The challenges posed by these inclusions necessitate reusable digital resources, aka Learning Objects (LO), that can be shared among learning groups, that can observe and interpret learner interactions in the context of each resource, and that can also embed ID evaluation mechanisms.

Learning Objects range from images, live feeds, live or pre-recorded video or audio, blogs, and web delivered applications (Akpinar, 2008). It could be static as in a section of a text book or a web page, or as dynamic as in an interactive immersive 3D animation. It could address a single concept or a generic philosophy. It could target a single student or an entire classroom. It could cater to a single interaction (e.g., browsing) or a range of interactions (e.g., note taking, sharing, and indexing). Each Learning Object could also embed an evaluation component that determines the effectiveness of the associated ID strategy.

User perception of the very notion of Learning Object has been measured for faculty, as well as students has been measured resulting in a positive response from students of higher educational institutions, while faculty were aware of certain limitations in the implementation of this methodology in such institutions. While in high schools, teachers had relatively more promising responses than those of students (Kay & Knaack, 2008). However, without any measures for the quality of such objects, from a designer, as well as a learner point of view much of the effort used in their development can be considered as wasted failing to meet the intended ID strategy. Similarly, the lack of a standard specification framework of implementation – hindering usability among course designers and learners alike – presents one of the current challenges of implementation on a wider scale. In our viewpoint, a single course comprises of a set of Learning Objects; learner interactions corresponding to each Learning Object can be observed or estimated; ID strategies associated with each Learning Object could be

individually evaluated using a suite of mechanisms, whether formative or summative; and finally, a summary version of these individual evaluations could be combined in a Bayesian Belief Network to yield a comprehensive evaluation of the ID of the course in its entirety.

The contribution of this paper is a work under progress to describe a model to evaluate instructional design through measuring quality metrics of Learning Objects by means of Bayesian Belief Networks (BBN). We name this model as the Mixed-Initiative Instructional Design Evaluation Model or MI-IDEM for short. We believe this contribution will help in creating standard specifications for LOs that includes explicit representations for the underlying ID strategies and a suite of ID evaluation methods.

We describe a tool that has the ability to automate evaluation of part or all of the ID process of creating customized courses from user input, based on user profile, as well as LO metadata (objective data stored within the LOR containing information such as author, title, date of creation, keywords, size and type of file). It can also be used as a ranking and recommending tool in LO libraries in a manner similar to web searches and online stores.

Similar Work:

There have been some initiatives to measure quality of learning objects in recent research. Such interest can be reflected through different initiatives to facilitate and support the evaluation and exchange of learning objects through peer and anonymous reviews. Among such initiatives are the Co-operative Learning Object Exchange (CLOE)² - developed by seventeen Ontario colleges, the Digital Library Network for Engineering and Technology that uses an adapted version of the INSPEC taxonomy of scientific and technical literature³, MERLOT, which is a repository of educational resources rated on a five point scale⁴. All these are based on a common model that is based on the IEEE learning object metadata standard⁵. They lack enough opportunities of interactions among designers, and between designers and end users such as faculty and students (Nesbit & Li, 2005) .

Another instrument used for evaluation of resources is the Learning Object Review Instrument, (LORI), which, in its 1.5 version, is with nine dimensions, rated on a five point scale. The dimensions included measures for quality, compliance, learning goal alignment, adaptation, motivation, presentation, interaction usability, reusability, and accessibility. A web tool, eLera⁶ was developed to allow users evaluate online resources using LORI.

Although the previous tools have covered much of the quantitative metrics required to evaluate electronic resources from a technical point of view, they lack many other metrics that are important in the real world and related to the targeted users. From this awareness, the Learning Object Evaluation

² <http://net.educause.edu/ir/library/pdf/CSD3677.pdf>

³ <http://www.theiet.org/publishing/inspec/>

⁴ <http://www.merlot.org>

⁵ <http://ltsc.ieee.org/wg12/>

⁶ <http://www.elera.net>

Instrument (LOEI) was developed to examine school level content (Haughey & Muirhead, 2005). The later allows reviewers to measure each objective separately, rather than compare learning objects. Additionally, this tool provides a metric for the subset of the quality measures suggested by the Nielson while failing in the measurement of:

- Visibility of system status
- User control and freedom
- Recognition rather than recall
- Help and documentation

The presence of so many standards, with different users communities that will be using any of those standards, there is a need for those standards to co-exist. Thus, to fulfill such a requirement, a rating system should consider all the above standards when evaluating learning objects, returning a rating value that takes all the above standards into consideration, through statistical weightings. So far, research has been looking into measurements carried out using one of the above standards or their derived ones.

The above systems use manual rating collected as feedback from the LO user community. This is the biggest challenge since while manual rating can provide more meaningful information to the different classes of users, much of the feedback data with regard to LO libraries could be incomplete and missing. For example, only 10% of the total content of the MERLOT database has ever been rated (Ochoa & Duval, 2006). The second challenge is that like any data gathered from end users, it is highly subjective, requiring it to be profiled in a way or another, before making use of it in an contextual manner.

Literature has also focused on correlation between reusability and quality metrics and LO metadata. Cervera (Cervera, Lopez, Fernandez, & Sanchez-Alonso, 2007) used software engineering reusability metrics and correlates them with LO metadata. Their argument was that LOs can be considered as pieces of software geared towards human interaction. However, such an adapted approach could be questionable, since reusability from a purely object oriented approach differs widely from reusability in an educational context. Additionally, their research concentrates on reusability metrics, while ignoring other quality aspects as presented by the approaches described earlier. A more universal approach to quality should involve not only that of a product, but also the processes and the different actors involved in developing content. Such an approach was adopted by Cabezuelo (Cabezuelo & Beardo, 2004).

Another approach to measure the quality of Instructional Design is through learning style metrics, where learning styles (LS) are “the personal characteristics, which sometimes are not perceived or used consciously by the student and which form the basis for the processing and the understanding of the information” (Reid, 1995). Rojas uses an approach based on Honey and Alonso’s model for LS since they contain a definition for quality (Rojas & Defude, 2008). The interesting element of this study is that it takes the learners experience directly into consideration when measuring quality. Similarly, the approach to measure self-regulated learning processes described by (Ainley & Patrick, 2006) can be seen

as another way to measure ID effectiveness through tracking patterns of interaction with learning related activities.

While many forms of data gathering have been adapted for evaluating online courses – and hence instructional design - including student satisfaction, rating scales, and content analysis, (Gunawardena, Carabajal, & Lowe, 2001) showed that each of those methods had their own limitations and non provided a complete accurate model (Quilter & Weber, 2004). It was suggested that focus on tools to combine results from those different model was required to yield a more complete picture. Furthermore, research trends show that ID model validity have been focusing on five different approaches: expert review, usability documentation, component investigation, field evaluation and controlled testing (Tracey, 2009). While the first three present results from formative evaluations the last two present mixed components from formative, as well as summative evaluations. Such research also suggests the necessity to model ID based on frameworks using probabilistic approach that includes these different models.

(Morales, Garcia-Penlavo, & Barron, 2007) described an ID model to improve LO quality through a model that incorporated quality elements purely extracted from metadata. They proposed ID model based on an ontological model, classifying these quality elements in terms of the ID proposed. Earlier, (Reeves, et al., 2002) proposed the evaluation of instructional design through heuristics and usability. They described a protocol for the evaluation based on measures related to visibility, error handling and recovery, matching between system and real world, navigation, interactivity, media integration. The system they proposed makes no references to quality approaches such as interactivity among learners, models of self regulated learning, or critical thinking and provides only basic quality measures treating instructional design as a computer software problem.

Collaborative filtering can also be used for rating as well as recommending LOs to users. One approach is to use nearest neighbor Collaborative Filtering algorithms, specifically Slope One (Lemire, Boley, McGrath, & Ball, 2005). To improve efficiency in terms of memory usage inference rules are fed into a rule engine allowing users full control. In addition, such rules allow objective LO metadata to be included in the recommendations in addition to subjective predictions, allowing more accurate results. Another method uses a ranking system similar to that used in web searches (Ochoa & Duval, 2006). Instead of using link references to rank LO, the system uses Contextualized Attention Metadata (CAM) using metrics such as author corrected popularity rank, weighted popularity, rate of reuse and manual rank. Additionally, similarity metrics as well as recording fuzzy user profiles are proposed to group and profile users.

Proposed Solution

From the above sections we can clearly identify issues with the current methodologies to measure the quality of the ID and hence add value by linking several evaluation models into one statistical model.

First, there are different standards that use different metrics that are inherently incompatible, and different groups of users would require those standards to co-exist. Additionally, as stated earlier, each of those seem to provide an incomplete picture of the evaluation.

While metadata provides useful information regarding evaluation of instructional design on a micro level, much of the evaluation models fail to use that as a source of guidance, whether in the formative or summative evaluations. Metadata alone is also inadequate to measure the quality of IDs: it lacks the user prospective in a learner based environment.

BBN as a Proposed Solution

We propose that using Bayesian Belief Network (BBN) will be a suitable solution to calculate incomplete variables and generate the mappings discussed in the previous section. (BBN) has been used successfully earlier to measure quality of LOs using the manual rating (Han, 2004). Additionally, (BBN) has been used to predict software quality through activity-based quality models (Wagner, 2009), as well as in decision support systems (Lauría & Duchessi, 2006), and a tool to predict the attainment of IT benefits, given specific implementation characteristics and activities (Lauría, Eitel J.M.; Duchessi, Peter J., 2007).

(BBN) represents a powerful implementation of the Bayes' theorem of probability for a particular event (X) based on the probability that another event (Y) conditional upon it has occurred:

$$P(X|Y) = \frac{P(X)P(Y|X)}{P(Y)} \quad (1)$$

where $P(X|Y)$ is the conditional probability of X given Y, $P(Y|X)$ is the conditional probability of Y given X, $P(X)$ is the prior probability of X independent of Y, and $P(Y)$ is the prior probability of Y independent of X and acting as a normalization constant. The theorem can be expanded to include more than one probabilistic event conditioned by Y.

The presence of conditional independence assumptions yields BBN more efficient in terms of memory requirements than models based on full joint probability distributions and faster in terms of performance. Increasing the number of variables will lead to linear growth of conditional probability factors, removing redundancies along the path of the network.

The implementation uses the Hugin Algorithm⁷ which made it applicable to real world scenarios to answer (what if) problems by simulating different scenarios, confirming or rejecting uncertain beliefs through those scenarios. It uses a modeling representation through a Directed Acyclic Graph (DAG) with nodes representing dependent, as well as independent nodes, joined by the casual relationships among them. Each node or variable is linked to a node probability table (NPT) defining the relationships and dependencies of these nodes as well as their different probabilities if available. In most applications, the

⁷ <http://www.hugin.com>

variables are usually discrete with a fixed number of states. Figure 1 illustrates an example of DAG and NBT for a system of W, X, Y and Z variables with prior probabilities a_w, a_x, a_y and a_z respectively.

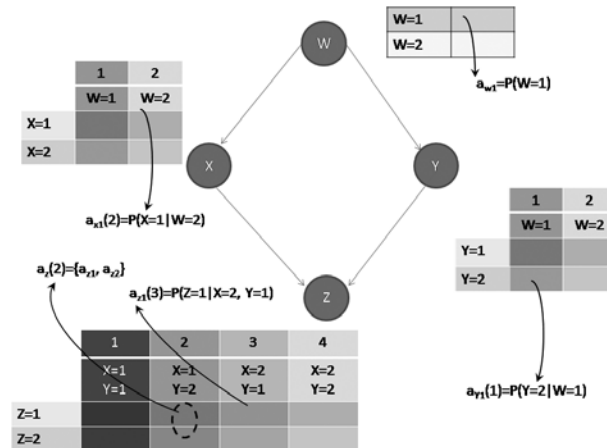


Figure 1: The DAG and node probability tables for a system of 4 events (W, X, Y, Z): event W is independent, while both events X and Y depend on W and Z depend on both X and Z .

For all our BBN implementations, we will be using Netica – an implementation from NORSYS⁸. Netica is a high performance commercial product that has been used widely in different fields of the industry. It implements BBN algorithm using many platforms including C, Java, VB, and C# and comes as an API, as well as a standalone application. The API uses tree data structs that is optimized for speed, and is interoperable, since all APIs use the same Bayesian network file formats as Netica Application making the implementation platform independent. It can also efficiently measure the degree to which findings at any node can influence the beliefs at another node, given the findings currently entered, and offers the flexibility that while removing nodes, it maintains the same join probability distribution. Finally, the learning algorithms allow learning probabilistic relations from case data, while being used for probabilistic inference and they can handle missing data and latent variables and hidden nodes. Those algorithms include counting, sequential updating, fractional updating, EM (expectation maximization), and gradient descent.

Implementation

Data selection and preparation:

We are aiming at utilizing data from four different resources:

⁸ <http://www.norsys.com>

- Data from content - obtained computationally by parsing the course.
- Data from experts - feedback from instructional designers on individual course design
- Data from students - feedback obtained during and at the end of course delivery
- Data from interactions - obtained computationally by parsing learner interactions

Content data can be obtained by parsing the Moodle course content for design elements such as types of learning objectives, types of interactions, length of content, appropriateness of audio/visual aids, segmenting and sequencing for learner pacing, and so on. We intend to capture data concerning as many of these design elements in a Bayesian Belief Network (BBN) and establish causal relationships between elements. The goal is to use the BBN to estimate the interplay between 'learner effort' and 'learner performance'. Most data can be useful for formative evaluation and provides some of the independent nodes in the BBN, while others can be summed up at the end of the course.

Data from experts can be obtained by asking expert instructional designers for their opinions about various design elements. Questions for expert data include data about learner styles that can be accommodated by the course design, audio-visual narration, elements that focus and split learner attention, relation between learning objectives and learning activities (reading, communicating, problem-solving), relation between learning activities and learning assessments, and so on. These give insights towards some formative evaluations with regard to the course.

Data from students can be obtained by asking learners for their opinions - formatively, as and when they are engaged in a learning activity, and summatively, as and when they complete an activity. Here, we plan to collect data about students' individual efforts (difficulty, time spent, concept maps, resources consulted), self-regulation (goals, strategies, correction mechanisms), co-regulation (groupwork, peer evaluation), competence mapping, and so on. Again, we plan to add these concepts and relations in the BBN and responses from individual students can be used to instantiate and validate the BBN.

Finally, Data for (4) is exclusively obtained by tracing what students do within specific online tools. For example, we now have the capacity to trace learner interactions within netica to figure out details of their software design capability, software development competence, software debugging ability, and software testing skills. We can also obtain time-stamped interactions of learners within Moodle.

Other

tools (e.g., writing tools) can be designed to help learners' writing skills. Reading tools (e.g., gStudy and nStudy) can be used to help boost learners' reading study skills. Discussion tools (e.g., Marginalia) can also be used to track learner's capacity to use threaded discussion forums. Once again, all these concepts can be added into the BBN as nodes and causal relations among these nodes can be established.

The Construction of the BBN

The first step is to establish multiple networks for each area within the different quality measures that we have identified earlier. Table 1 describes some of these elements that are extracted through xml parsers and later on cleaned. While some measures are rather straightforward, others require some data transformations in order to be used in the BBN.

1	Course Outline and Learning Objectives	Taxonomic level of learning objectives appropriate to the level of the course
		The learning objectives fit well and correspond to the assessments
		The learning objectives fit well and correspond to non-assessment activities
		Course outline matches the course content
2	Rewards	Rewards for individual performances in team activities
		Rewards for group performances in team activities
3	Support	Number of learning support avenues (including orientation, and online help) embedded in the course
4	Content	Estimated workload of students (in hours) matching the volume of course content
		Content length per page
		Content material and links are up-to-date
		How much of content is replicated from text or a webpage
		How much of content is written by the course developer(s)
5	Collaboration	Total number of teamwork/collaboration/communication tools used
		Estimated Frequency of use of each tool
6	Activities	Variety (student roles and perspectives) of activities used in the course
		Total number of activities used in the course
		Whether activities employed offer feedback to prepare learners for assessments
		Did the activities encourage critical thinking
7	Assessments	Each assessment has well defined criteria/rubric

	Number of assessments
	Did the assessments fit the objective
	Where the assessment material covered in the course

Table 1: Some elements from the extracted metadata

The basic skeleton of the BBN will be a three level net. The top node will include the basic methods used to extract the information (student surveys, expert feedback, tracing and metadata from the online course). The sub nodes below them represent each individual element and then finally, the evaluation for the area covered. Figure 2 presents an example for the BBN to calculate the effectiveness of the collaboration elements.

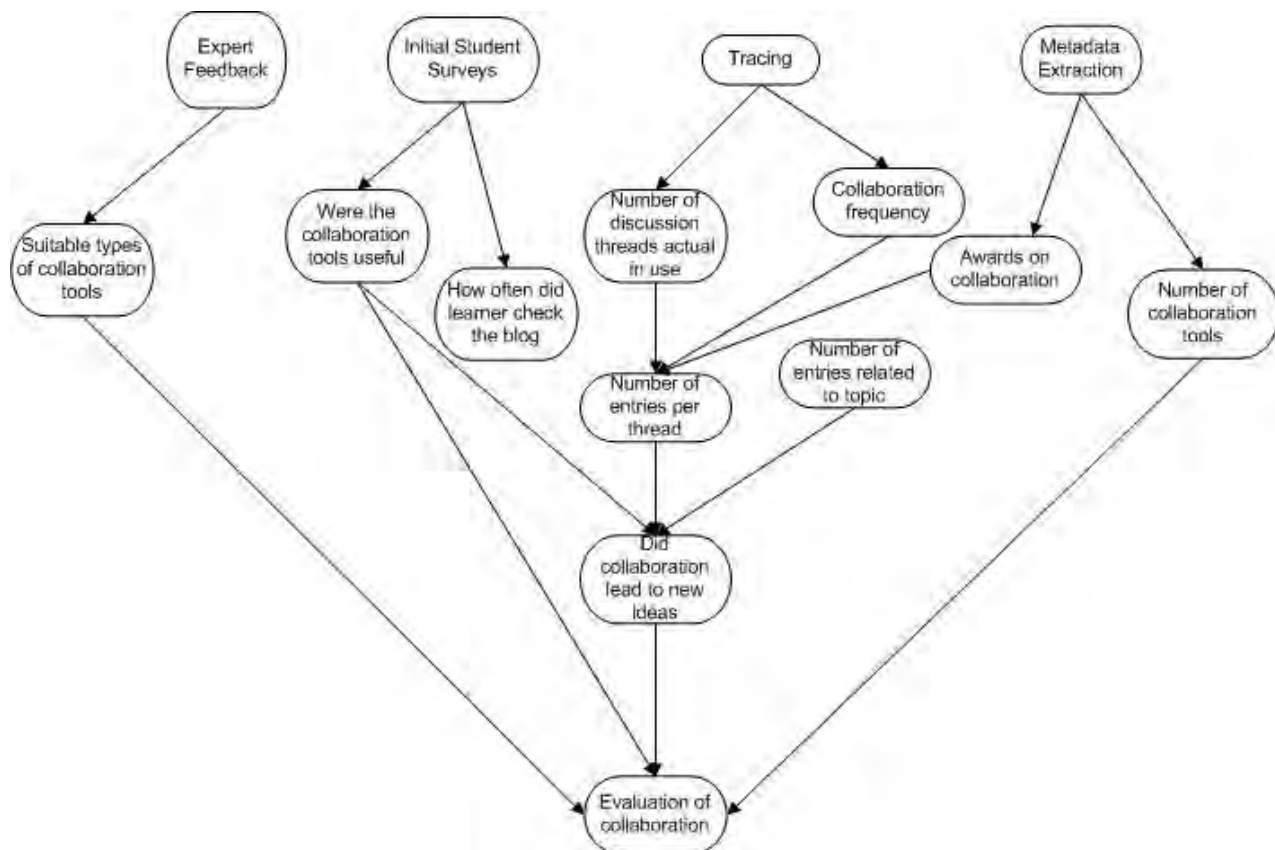


Figure 2: a collapsed BBN to measure the quality of collaboration within a course

The second BBN will be combining those different areas to calculate a final ID quality measure, based on all the individual calculation.

Another approach is to include all the different areas in one BBN. This would be more complicated for calculation. However, it would address elements that might be not be taken into account when separating the networks as per areas of interests.

One of the interesting things when using Bayesian Networks is that we may do our calculations with a minimum number of known variables. Such is our

Discussion

In this paper we presented a framework and mechanism to evaluate ID based on four sources of data using metadata extracted from the course, data traced to extract learner behavior, and data extracted from student as well as expert reviews. This framework combines different models to evaluate instruction design, giving instructional designers a clearer picture of the quality of the ID elements within their courses. Additionally, students can also review the network to check for progress of their work. The implementation of this framework will be executed in the coming 2 months, and results to be published afterwards.

(BBN) provides high performance and the size of the network does not grow exponentially as the size of our metadata grows since it based conditional independence constraints that limit the amount of computations required for probabilistic calculation. Additionally, it provides a good platform for answering (what if scenarios) that can be integrated to our project on a later stage.

Other (BBN) algorithms could also be useful in many other processes and calculations. The Markov chain can be used to validate the quality rating standard, while the Expectation Maximization is provides an automated mechanism to revise the BBN node probability distribution after a certain number of reviews.

Moving in opposite both directions along the Bayesian network allows us to validate our results while still being in the same environment. Additionally, this feature provides a good location to search for areas of improvement.

However, (BBN) is very sensitive towards both data completeness as well as the granular level of the datasets used as nodes: Incomplete datasets and higher granularity levels of data would yield less accurate calculations. On the other hand, larger amounts of data could cause some performance bottle necks with realistic datasets. Selection of data should be balanced to reduce the probability of such short comings. Additionally, one can use the sensitivity analysis as permitted by (BBN): if a Bayesian network becomes too large, one performs a sensitivity analysis of that network to discover which factors are the most important ones, allowing measurement efforts to be reduced significantly through focusing on the most influential variables.

Additional features can be added, such as variable weightings to particular variables (metadata elements) compared to other, depending on the person using the tool. For example, if the user wants to focus on content rather than ease of use, the rating should be flexible enough to allow this.

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DIGITAL LITERACY AND THE FUTURE SOCIETY: PREPARING TEACHERS FOR THE CLASSROOM 2.0

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ABSTRACT

We are witnessing the proliferation of information and communication technologies and the widespread use of internet in recent decades. Digital media are now important part of everyday life and students, parents and adults are using these technologies seamlessly in their work places, education and for leisure. Similar to reading, writing and arithmetic in the analog era, children growing up today are required to embrace digital literacy. Digital literacy is defined as the ability to understand and use information from various sources and more importantly to evaluate and integrate information in multiple formats that the computer and the internet can deliver. Educational planners recognize the importance of the new form of literacy and embedded in the teacher education program in preparing teachers for the future society. This paper describes the curriculum design and evaluation of the ICT for digital literacy course offered in the Bachelor of Education degree program at the Emirates College for Advanced Education.

KEYWORDS

Digital Literacy; Teacher Training; ICT; Digital Natives; Blog

INTRODUCTION

Much has been written about new media and digital literacy in the scholarly journals and the newspapers. Digital media are now important part of everyday life and students, parents and adults are using these technologies seamlessly in their work places, education and for leisure. Similar to reading, writing and arithmetic in the analog era, children growing up today are required to embrace digital literacy. Digital literacy is defined as the ability to understand and use information from various sources and more importantly to evaluate and integrate information in multiple formats that the computer and the internet can deliver (Gilster, 1997).

Educational planners recognize the importance of the new form of literacy and embedded in the teacher education program in preparing teachers for the future society (Yelland, 2006). This paper describes the curriculum design and evaluation of the ICT for digital literacy course offered in the Bachelor of Education degree program at the Emirates College for Advanced Education. The course examines the new technologies available both inside and outside of the classroom and explores its use and potential use for engaging students in their studies. Students examine current and emerging technologies and their relationship to pedagogical practices. Throughout the course students develop proficiency in the use and delivery of ICT in the teaching environment in conjunction with the Ministry of Education's new curriculum documents. The course evaluation reveals that students recognize the usefulness of digital technologies and becoming confident in using these technologies through practice. They express that the skills, knowledge and expertise gained from this course will be useful for their future teaching profession. The paper also suggests how the course can be improved in the future.

DIGITAL LITERACY

Digital literacy has some interesting differences from this scholarly sequence. To begin with the notion of a film, we find for a start that children already have fairly well established ‘intuitive’ readings of media! By the time they reach a school classroom they already know how to watch a movie. They know it has a beginning, middle and end, and their experience with TV tells them that they may have picked up on a story at many places within that continuum.

An infant reader has to be taught to recognise the beginning of a book, which way up to hold it, which direction to read the words and turn pages, the meaning of words, the functions of punctuation, and the relationship of pictures to text. Whereas the infant viewer already possesses a considerable sophistication with media, they know how to turn on a TV, play a video or DVD and even select chapters/parts within a DVD (with visual menus rather than text). They digest the programme of their own accord and bring a mixed legacy of education programs (Muppet show, etc) cartoons, documentaries, sitcoms.

With written literacy we must teach the techniques of calligraphy, how to hold the pen, to shape the letters, write with speed and legibility. Children may arrive at school with some knowledge of the alphabet and numbers and even be able to write some, but largely they arrive with bad habits and little coordination. Partly this is a matter of physical dexterity and maturation, and partly with poor or incorrect parental guidance. Starting position and stroke order of letters must sometimes be “unlearnt”. Even holding a pen in the hand correctly must be monitored and taught. A digital camera is not nearly as foreign. Children come to school with considerable familiarity with its use (Bulfin & North, 2007).

A considerable number of children will already have a sense of horizon, the pattern and familiarity of portrait or landscape framing, and using the horizon as a level. The necessity of stillness at the moment of capture may be in their awareness although with the increasingly more tolerant cameras even that may be a fading requirement. The school age child already has the “penmanship” of the camera at the beginning of school, while they still yet struggle to hold a pencil and write a single letter! What does this mean for literacy? It means that their story telling can begin immediately, for with a series of pictures presented in a slideshow they have their story. If we ask them to narrate the story with the pictures, either live or by recording over the slideshow they will have created a message for eternity. With simple programmes like MS Photostory3 the slideshow becomes a video with movement, dialogue and even music. Such a programme and its use is not beyond the scope of a new entrant 5 year old child.

The other tools of ICT that we may use for digital literacy in the early years are the sound recording feature on a computer to create “podcasts”, be they simple audio rendition of their stream of consciousness, retelling of their stories, plays, or self reflective utterances. All are simple to capture and edit. Video recording is also simple but the editing process is much more fraught with complications. Video may be edited by teachers in the early years and weaned on to middle year students later. Music production is also a more middle and senior level item when the desire is to move beyond the automatically computer generated modes (Burnett et al, 2006).

If our “digital native” children already have many of these digital skills, what is it that we are teaching? Too frequently in the current curriculum, the introduction of video and slideshow has been an end itself, that is, the teachers have shown how to make one and stopped. However, once we have taught our children how to hold a pen, form words and sentences, we know that literacy moves on to the deeper features of how to produce “good” prose, how to deal with sophisticated grammar, and elements of style. It is this development beyond the master skills of the program/device that is so lacking in the current ICT school environment. What is a good video, what are the rules and grammar, the styles and forms that we should be developing? How does a documentary differ from an interview, from a thriller, from an

instructional video? We need to understand both from a consumer and producer's point of view. Children need to be taught to become critical digesters of media so that they may also become polished producers (Marsh, 2006; Schiller & Tillet, 2004).

While it is argued that children already come to school with an understanding of how to read the visual material in their environment, it is only at a very simple and functional level, but nevertheless shows that they are beyond the stage that they come into the written literacy classroom. School must now take them forward and teach them the structure of communication, the subtleties of style, the nuances and double entendre, and increasingly the more complicated multi-stranded delivery of storylines. Visual literacy is evolving. One only has to look back at older films and TV programmes to see that the predominant linear thread and single plot line have almost completely disappeared in favour of multiple interlocking plots, crossed timelines and time shifts. The ability to handle such varied material has arisen through generational evolution of readings. We have become more sophisticated and complicated in our visual communication (Shaikh & Abbott, 2005; Spalter & van Dam, 2008).

Our students must learn the technology, not for their own use, but to be able to teach children how to use it appropriately. Often teachers learn new programs and think they are for themselves to use in a class (sage on the stage), failing to realise it is for their students to use.

COURSE DEVELOPMENT

The Digital literacy course at the Emirates College for Advanced Education is an introductory course in the ICT faculty for first year Bachelor of Education Students. The course was designed to introduce the student teacher to a wide range of digital tools for promoting literacy in the audio, visual and electronic realms. It was considered as an introduction which would be followed up in more depth in later courses of ICT during the 4 year B.Ed programme. After an initial skeleton course was developed based on the kinds of ICT currently being used in practicing classrooms (for example in Australia and New Zealand) a comparison was made with the emerging ADEC ICT Curriculum document. The curriculum document was analysed for content and delivery, and the Digital literacy course was mapped against it to determine the degree of coverage. This is to ensure that we were gearing our student teachers up with functionally appropriate material.

The course was written as a workbook, with supplementary video tutorials. It was delivered on SmartBoards with a guiding template Powerpoint for each lesson. The Powerpoints were modified slightly by each lecturer to suit their delivery style. Each week was divided into two sessions, a one hour "theoretical" session which was delivered in a classroom (in some cases in a lab) and a subsequent two hour "practical" session which was delivered in a computer lab. The students had their own laptops in both environments which they often preferred to use.

Delivery of the course was initially constrained by the lack of LMS or shared folder delivery system. This was resolved part way into the course by the creation of a mapped drive that students could access to download materials to their own computers (such as video tutorials).



Figure 1. Blog site showing group and individual students' web pages

Students were required to create a Delicious account of their own and they were allocated an individualised blog page hosted on Blogspot.com. The blog was to provide a vehicle for submitting material and for student to post a compulsory self reflective journal (see Figure 1). A portfolio of products was collected involving the production of a unique photo demonstrating superimposition; a Photostory video demonstrating a process (transactional writing equivalent); an audio podcast; a storyboard and a formal video interview.

COURSE EVALUATION

There are many factors contributed to the success of this course, these factors are obtained from the students' course evaluation and from students' feedback. Ongoing evaluation of the course allowed us to alter the delivery and content as was deemed appropriate. These changes were also written in to a course revision which culminated in a 2nd edition. The overall feedback of the "ICT for Digital Literacy" course was positive and it confirms its success. Students provided both positive feedback and recommendations to improve this course. Students' recommendations have been already taken into consideration while modifying the course and creating the new version of it to be taught in new semester.

Firstly, this course provided many ICTs that will help K-5 future teachers to integrate them into the teaching and learning process. Teaching students different number of software and how to integrate them into classroom teaching was very beneficial. Students stressed that this course increased their knowledge and skills in terms of computer and other technologies use and integration.

"...this semester was amazing. I learned many things about some programs in the laptop. My knowledge and skills in ICT increased..."

Not only did the students achieve the importance of the ICT knowledge and skills but also the importance of integrating them into their classroom teaching.

"...I can use them in the Practicum course next semester. I can benefit from them and use new ways of teaching. The students will also be happy to use them...."

Secondly, the nature of the assignments in this course encouraged the social and collaborative work among the students. This course provided a social environment that helped students construct their own knowledge while interacting with their classmates.

“...also, I like when I worked with my classmates in social environment. I liked the cooperation with my friends in doing projects...”

Thirdly, most of the class time was hands on tasks that made their learning interesting and helped developing their creativity.

“...what I liked about it that each student get the chance to apply knowledge. Moreover, it stimulates student to use their imaginary thinking to do certain tasks...”

“...I felt interest when I was doing my work because the work it’s not routine that you feel boring when you do it but it was varied...”

“...I think this program help me in the future to learn the students and let them creative...”
 “Software we learned in this class will help our future students to be creative in creating products using these software”

Fourthly, students depended on themselves to learn different software embedded in this course under the teacher guide. They watched “how to” videos that explain these different software.

“What helped me the most to learn the programs is the tutorial videos, I liked the way the lessons are explained in the videos it was in details and step by step explanation.”

“...I think I like this method because I can come to it any time to see the steps in details. Also, it is because I am a visual learner...”

Finally, the help and support that the ICT faculty provided to students across the semester helped the students to gain lots of ICT knowledge and skills.

“...my instructor was in the class to help us if we face any problem and he was very available to help all the time”

Students recommended many significant recommendations. Some of them have been taken in consideration while developing “ICT for Digital Literacy” Version 2.0

The students needed fewer numbers of reflections they post every week. Students also needed more time for this course and their alibi for more hours is that everything that is related to teaching in the future will be done using computers.

“...I personally believe that this class should be more than 3 hours per week. That’s because later on in teaching everything will be by computers...”

The number of self reflections has been decreased but did not increase the course credit hours per week. Students recommended fewer numbers of software or more time for learning each software and this has been improved in version 2 by providing more space to learn each software in more depth.

CONCLUSION

Changes to the delivery of the course for the second edition, involved extending the audio podcast into a music production session to enable the creation of copyright free music material; extending and restructuring the video interview to explain the technique of single camera recording, and model that process better in class; reducing the internet content; making the distinction between Photostory and Powerpoint clearer in terms of appropriate use of technology; sidestepping the issue of students appearing in the video interview by setting the recorded interview talent to be co-opted staff members. In addition the grading rubric used for marking was re-written to make it clearer to students, and the coursebook was adapted to become more of a notebook that the students were expected to write in. The biggest change to the course has been the abandonment of the requirement for self-reflective comments which were found to be beyond the students. Instead the blog becomes a record of learning, and a submission area for a series of weekly assigned topics.

Digital literacy is vital for the UAE future teachers. Primary level teachers should be digitally literate to be able to prepare K-5 students. The “ICT for Digital Literacy” course proved its success of equipping K-5 teachers with the required knowledge and skills of using, integrating, implementing and teaching a wide range of ICT. Students’ recommendations for improving the course has been taken into consideration in the next round of course delivery.

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INCREASING EFFECTIVENESS IN ONLINE INTERACTIVE TEACHING AND LEARNING MATERIALS

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Abstract

The creation of non-linear online interactive teaching and learning materials is problematical for a variety of reasons, particularly in a second-language context. It is essential that such materials address learner needs and concerns, particularly in terms of a sense of cultural appropriateness, a reduced lexical set, content complexity, opportunities for revision, and resources and controls that enable learners to have the autonomy to structure and pace their learning.

This paper documents an approach that includes video demonstration, interactive scenario and simulation-based learning customized for a particular audience: Emirati women pursuing a Bachelor Degree in Applied Media Studies who are studying aspects of web development. While the teaching and learning materials developed in this project are particularly appropriate for delivery of technical aspects of software training to students of an ethnically homogenous oral culture, the model and techniques developed can be extrapolated to a wide variety of audiences to increase the effectiveness of teaching and learning materials for a broad range of topics.

Creating pedagogical materials: *quick, pleasant, and thorough*

Technology has always influenced the creation of teaching and learning materials. Two hundred years after the development of the printing press, J. A. Cominius's publication of *The Great Didactic* and *Orbis Sensualim Pictus* (*The World in Sensible Pictures*) (see Figure 1) in the 1600s, offered the first western illustrated textbooks (Capkova, 1970). These books recognized, in Small's words, that an idealized education "...might be expected to show three qualities ... it should be quick, pleasant, and thorough." (Small, 1990, np).

New technologies are inevitably compared to books, often in terms of speed of access. They add search mechanisms that make them *quick* to locate specific information as well as a wealth of related information; one can take advantage of the speed and convenience of the World Wide Web (WWW) to instantly look up information that would have, in previous times, required a trip to one's bookshelf, if not a public library.



Figure 1. From *Orbis Sensualim Pictus*

New technologies add media, such as audio and video, that make them *pleasant* by appealing to different senses and, by extension, offer more than one channel of learning. As The dual-channel assumption is that humans possess separate information presented material and auditorially presented material" (p. 46).

Cheon & Grant (2009) compared three interfaces, one textually based, one graphically based, and one metaphorically based. Although they found that there was no difference among users in terms of learning performance, cognitive load, or usability, they did find that a metaphorical interface increased learners' attention. On the other hand, while Dunleavy, Dede & Mitchell (2009) agreed that more interesting interfaces increase learner interest, they are concerned about the technical and cognitive overhead they impose on learners and which can, in some cases, be distractions.

New technologies also add interactivity, such as through computer-based simulations and, increasingly, by shifting the locus of control. Sims & Hedberg summarize shifts in locus of control as being between:

- Instructor and Learner
 - Linear and Hypermedia
 - Viewed and Constructed
 - Discrete and Integrated
 - Informative and Self-Paced
- (1995, p. 5-6)

In a traditional classroom, the locus of control rests with the teacher and the textbook, both in terms of dictating the timing and pace of learning, as well as the content and the approach to learning it. Presumably, a good teacher structures teaching and learning to ensure a *thorough* approach.

A computer-based learning platform can be *thorough* in different ways, particularly in terms of evaluating what an individual student knows and does not know through quizzes with feedback loops as well as computer-adaptive testing that analyzes a learner's answer to a particular question and chooses appropriate follow-up information sessions, tasks, and questions. In making this shift, new technologies (almost exclusively computer-based) offer opportunities for students to organize and pace their learning.

However, a new educational technology is never purely positive, or even neutral, in what it adds to the teaching and learning process. Bayne (2008), in discussing virtual learning environments, suggests that we need to be careful of the ways in which dealing with increasingly visual media impacts upon our approaches to learning and our ways of understanding the world. A simple example of this is the propensity for students to follow document hyperlinks and become lost in an ocean of data, only a small portion of which might be pertinent to the target topic they are attempting to grasp. Liang & Sedig (2009) are among a long list of those who are concerned with learners' navigation among non-linear resources.

Regardless, non-linearity is a key construct in the development of increased interactivity. Non-linear materials allow learners to learn what they want, when they want and, to do so in an order that makes sense to them. This is an anathema to traditional educational programs that are organized around a scope

and sequence, mandating not only what should be learned, but the order in which it should be learned, particularly when there is a structure based on a cognitive model such as Bloom's *Taxonomy of Educational Objectives* (Bloom, 1956; Anderson & Krathwohl, 2001). Sometimes such organization and structures may be construed as being artificial. For example, in a geography class, studying one country before another might simply be a matter of preference, without hierarchical justification. However, in other learning contexts, such as in a language classroom, it might be assumed that students would need to master certain grammatical structures before moving on to learn others.

Linear educational systems are largely a product of the book. Most books are meant to be read from front to back in a particular order following the author's intentions. Of course, there are exceptions, such as with certain reference books, but even these have navigation devices such as chapters, indexes, titles, and subheads which presume to organize the information in a particular way. Most of us have experienced the frustration of looking for a discrete item in an index and not finding it, often because a synonym is used in its place, or the topic is subsumed under a broader or narrower concept.

As mentioned above, non-linear programs have gotten around some of these constraints by including feedback loops that test students and then direct them to extensive resources and additional tasks that are likely to help them master any parts of the educational program in which they could not demonstrate expertise. In some cases, this may create additional problems:

Both the non-linear organization of many CALL learning materials and the tendency to include extensive background materials presents learner with the problem of defining their own scope and sequence. Essentially, learners must balance task completion with exploration. This balance is sometimes dictated by the constraints of the learning situation: learners faced with an important time-limited close-ended test question might be expected to minimize exploration while learners working on an open-ended project question for which they have a lot of time might tend to explore much more. (Beatty, 2010, np)

Heift (2008) is among those concerned with the consequences of learners structuring their own learning on computer-based platforms. She suggests the need for finer monitoring and feedback for students using non-linear programs to ensure they achieve measurable learning outcomes.

Non-linear learning and other forms of interactivity are not simply for making learning resources *quick*, *pleasant*, and *thorough*. They are often about searching for new ways to address learner difficulties with new ideas and the ways they may be assessed. They also often address real needs in ways that are not practical for traditional learning materials, such as books. A detailed example of this is contained in a tutorial development undertaken at Abu Dhabi Women's College (ADWC) in Abu Dhabi, one of 17 campuses of the United Arab Emirates' Higher Colleges of Technology.

Assessing learner needs

The rationale for courseware development was to offer tailored online instruction for a software program *Dreamweaver CS3*, by Adobe. The Adobe software is used in the design and creation of websites and is taught to Emirati women pursuing a Bachelor's Degree in Applied Media Studies who are studying aspects of web development. Through an on-going assessment of learner needs, the course instructor (Philip Toews) determined that the students' needs were not being met on a variety of levels:

- cultural appropriateness
- lexical complexity
- content complexity
- a lack of opportunities for revision
- a lack of resources and controls
- a lack of autonomy to structure and pace learning

After the development of online non-linear learning resources that include customized video demonstrations, interactive scenarios, and simulation-based learning, and a semester using and refining them, a structured interview survey was conducted to elicit anonymous feedback from the students' in terms of their attitudes toward the resources. The findings were anonymous and were used both to assess the current tutorial, for ongoing improvement of the teaching and learning software and to eventually create guidelines for the development of new tutorials. The survey questions are listed in Appendix A. The principal findings are noted in the following sections.

Cultural appropriateness

There are two levels of cultural appropriateness. The first level is concerned with language and imagery that the target audience might find offensive. For example, in an Islamic society, culturally inappropriate language would include referring to issues such as the mixed company of unmarried men and women and dating that that Westerners might find innocuous.

Similarly imagery of the exposed human body would also be deemed inappropriate. Figure 2, below, shows an example of culturally inappropriate training materials for *Adobe DreamWeaver CS3* from the *Adobe Classroom in a book* series, among the most popular training resources available on the market.

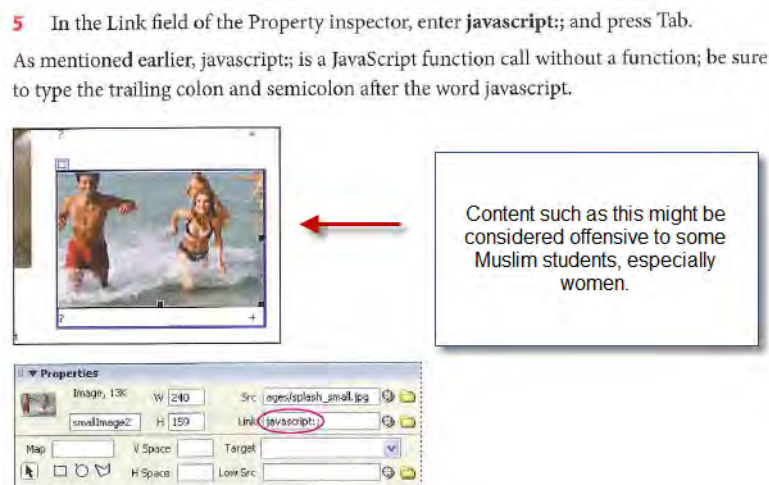


Figure 2. From *Dreamweaver CS3 Classroom in a Textbook*

In teacher-developed online tutorials, students can help identify any culturally inappropriate content of which their instructor is unaware. In this way, they become part of the process improving online learning materials.

A different area of cultural concern are those issues which are perhaps less tangible and more personal. For example, Emirati women used to a non-confrontational social system may encounter anxiety about operating in a non-native environment in which performance is aggressively assessed; they may have a style of work which might need to change in an international environment but which should be respected in their own environment, the United Arab Emirates. Also Emirati students may in some cases be shy about asking teachers, particularly male teachers, questions might benefit from additional learning opportunities provided in online learning environments that give the illusion of one on one instruction. A relaxed, almost conversational, style of presenting content tends to engage students and helps overcome some of the linguistic anxiety they may be experiencing.

Lexical complexity

In linguistic terms, while Arabic versions of the media creation tools such as *Dreamweaver* exist, the medium of instruction at ADWC, as well as the language of the students' eventual workplaces is most often English. Thus, learners face the dual hurdles of encountering English as a second as well as a specialized subset of technical English used in a computer design applications. There are countless third-party textbooks and, even in the best of them, the language is sometimes convoluted with complex sentences full of clauses:

4. Choose File > Save and press F12 (Windows) or Option+F12 (MacOS) to preview the page in your primary browser. Note that when your cursor hovers over the image, it changes to a hand which indicates a link; if you click the image, the browser will not be able to display the page, as the company, and its website, are fictional. Close your browser and return to Dreamweaver. (_____. 2008, p. 137)

Complex text, such as as above, needs to be carefully unpacked by second-language learners who need to understand discrete points and assemble them into comprehensible ideas. Any information which is superfluous should be omitted.

In other cases, a casual or humorous tone intended to make the technical aspects of a program less daunting, can have the opposite effect:

There's a lot to take into account with this independent little fella though, from the way links are created, to what they can link to, to the countless options you have in styling them (whilst remembering that some restraint is needed to keep them as user-friendly as possible), to the area of accessibility, which has particular importance when it comes to links. (Griffiths, 2009, p. 62)

The problems created by this 62-word sentence are similar to the complexity issues in the above example, with the added challenges of idiomatic expressions (take into account) and slang (little fella). Non-native speakers will often interpret this type of information incorrectly as it is as foreign as the language they are learning.

Customized materials can be custom fit to the language level as well as technical knowledge level of the students. For example, video demonstration lessons allow the instructor to create teachable moments for things like the HTML attributes for links, as seen in the following audio transcription of part of a video lesson:

Before I do anything I need to I need to select it. Now I go down to the properties bar. If you look down here you will see the link properties for that text. All you have to do is type in the web address or copy and paste it in from a web browser. In this case, I know the address:

<http://www.google.com>. You need to type in the full address, <http://> and all. If you don't get it right then the link will not work. Here's another trick. If you don't hit enter after you enter the link that link will not be locked down and saved as a link. Nothing will happen. So to prove this take a look at the text that is (Toews, 2008)

The explanation is not perfect and can certainly be subject to a process of continuous improvement that is so easy with digital media. For example, the discussion veers between the first and second person and could use more discourse markers beyond *before* and *now*. But it does include features of informal English that offer emphasis and make it friendly, such as *all you have to do...* and *here's another trick*. These qualities, combined with a variety of sentence types and lengths help to give it a reassuring conversational tone. A final editing of the script is shown in Appendix B.

Content complexity

Online tutorials using video are less time-consuming for learners than their print counterparts. For example, the above mentioned *DreamWeaver CS3 Classroom in a Book* (2008) requires ten pages of single-spaced text to explain an issue to do with help files. It would not be unreasonable to assume that students would require one hour to read a passage of such length—with questionable comprehension; students in the Arab world are sometimes referred as belonging to an oral culture (see Beatty, Hyland, Hyland, & Kelly, 2010) that does not place a high value on reading and therefore does not develop reading skills among young learners. So, it is likely the students will naturally prefer to see the same content covered in a six-minute demonstration video, as is done in this online tutorial. The content is difficult, but is made comprehensible through the speed at the explanations are spoken as well as traditional teacher gambits such as repetition and rephrasing.

An effort was made to simplify the content by using vocabulary and structures that were more likely to be familiar to the target learners. Key content and terms were amplified through emphasis and repetition.

Opportunities for revision

In interviews, learners identified the ability to do revision work at a place and time of their own choosing as a clear strength of this model of content delivery. They felt that they knew best when they needed to reinforce their previous learning and that being able to easily access specific content was very helpful to them.

Resources and controls

One of the greatest weaknesses of documentation provided with media creation software is the difficulty that new users have finding the topics they need to learn about. The problem is that they simply do not have sufficient technical vocabulary to ask the right questions. This problem of not knowing what to ask is compounded by the difficulty that second language learners have trouble using the standard indexing and search tools that accompany typical reference and training materials.

Placing the topic headings in an interactive table of contents organized by task categories (see Fig. 3) gets around these difficulties. Also, as seen in Fig. 4, students are able to call up the table of contents, scan the categories and then quickly see the specific video tutorials available for the task on which they wish to focus.

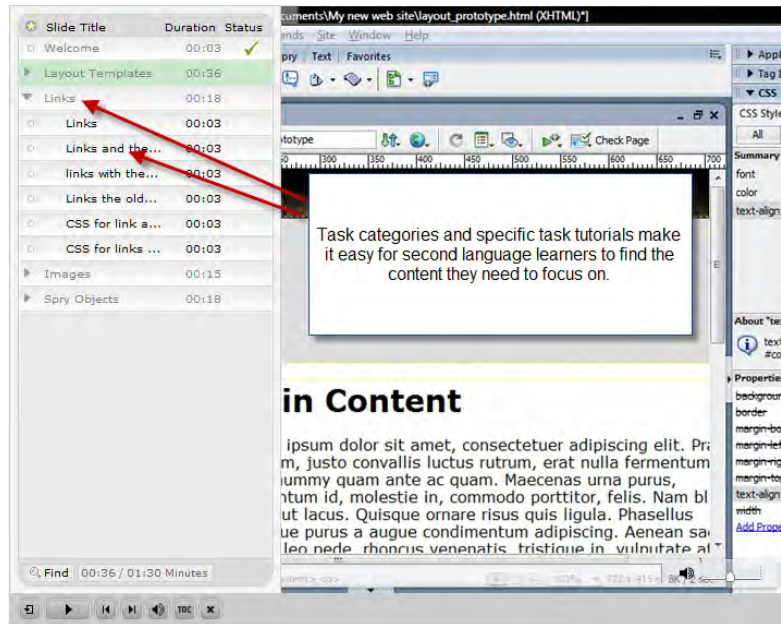


Figure 3. From <http://sptraining.hct.ac.ae/dreamweaver>

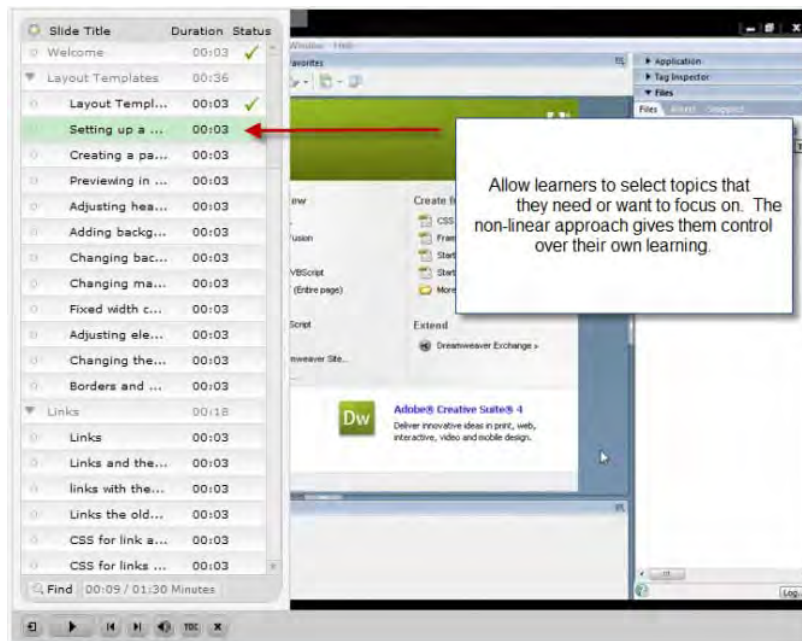


Figure 4. From <http://sptraining.hct.ac.ae/dreamweaver>

Students who were surveyed reported a sense of empowerment in being able control the timing of their learning, and not be dependent on the teacher. This is particularly an issue in a society where women are often highly dependent on the decisions made by others in their everyday lives.

Autonomy to structure and pace learning

ICEM-CIME 2009 Conference.

One of the greatest advantages identified by students interviewed about the learning materials was the ability to control the time, place, and pace of their own learning. Students were given the ability to access the video training materials from both inside and outside ADWC. This gave them opportunities to learn and revise when they chose and at a place of their choosing.

This is more than a simple convenience. Female students in the United Arab Emirates are often expected to be at home outside of school or business hours. Computer labs at ADWC are also almost fully booked during the nine to five school day, leaving little time available for students to access materials on campus in the labs where instruction initially takes place. Freedom to learn when they want is a form of respect that translates the trust of their instructors into a heightened sense of responsibility.

The playback controls (Figure 4) allowed students to start/pause/stop/advance the video as well as to control the volume. Students interviewed about the materials clearly identified this as a strong advantage of this approach to tutorial materials development.

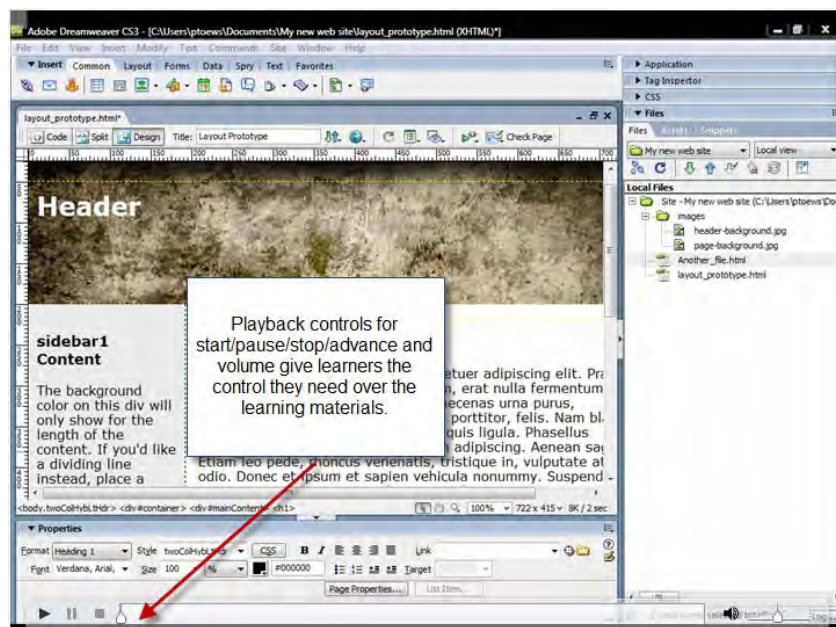


Figure 5. From <http://sptraining.hct.ac.ae/dreamweaver>

Conclusion

While the teaching and learning materials developed in this project are particularly appropriate for delivery of technical aspects of software training to students of an ethnically homogenous oral culture, the model and techniques developed can be extrapolated to a wide variety of audiences to increase the effectiveness of teaching and learning materials for a broad range of topics.

A strength of a project such as this is the natural and continuous feedback loop that can be used to refine the materials. This is in contrast to traditional learning materials such as books in which there is little hope for correction of errors or revision of information beyond a second edition or a list of corrections slipped in before the book leaves the publisher's warehouse. Moreover, learners become participants in the creation of learning materials, contributing not just suggestions, but often content as well.

But just as the current interactive interfaces used in many computer programs have provided new opportunities for tailoring to groups, it is likely that future directions will move toward tailoring for the individual (see Reategui et al., 2008). Of course, as the complexity of what a program has to offer increases, such as in 3D or multi-user virtual environments, many of the assumptions of this paper will need to be reconsidered (see Nelson & Erlandson, 2008).

Finally, although feedback supports the value of tailored materials such as these, they can be time consuming and technically challenging to create, particularly for a single individual. Individual teachers interested in creating interactive online tutorials should consider working in teams and inducting the learners themselves into the materials development process.

Appendix A

Survey Questions for Guided Interviews (Note: the questions were pitched in more conversational language)

Two sets of questions were used for the semi-structured interviews. Each set featured a set of questions organized with an ameliorative or pejorative slant. It was hoped that the contrast will together prompt a more centrist critique of the program free of the interviewer(s)' natural biases. Particularly attention was be paid to spontaneous comments that crossed over from the ameliorative or pejorative set, for example, saying something critical when asked to discuss benefits. Students were asked only one set of questions, either the ameliorative set or the pejorative set.

It was explained in advance that attendance was voluntary, that it would not affect their grades in any way, and that the information would be anonymous, with no record kept of who made any particular comment. Students were told that the interview would be recorded and the data would be used both to improve the program and to write a conference presentation and journal paper on how such software programs can be made. Students were told that the interview would take approximately 45 minutes.

Topic clarification: encourage examples	Ameliorative question set	Pejorative question set
Identify the program, which the students will already have been using:	What are the advantages of the program?	What are the disadvantages of the program?
Clarify the second-language context, Arabic speakers learning in English:	What about the program is helpful for English as a second-language learners?	What about the program is problematical for English as a second-language learners?
Address learner needs and concerns:	What needs and concerns does like program help you with?	What needs and concerns does like program not help you with?
Address cultural appropriateness:	What parts of the program are culturally appropriate for you learning web design?	What parts of the program are culturally inappropriate for you learning web design?
Address the lexical set:	What about the program makes it easy to understand the language that is used?	What about the program makes it difficult to understand the language that is used?

Address content complexity:	How simple is the content to understand?	How difficult is the content to understand?
Address opportunities for revision	What are the benefits of the opportunities for revision?	What are the problems with the opportunities for revision?
Address resources and controls that enable learners to have the autonomy	The program offers resources and controls. What benefits do these have?	The program offers resources and controls. What problems do these have?
Address how students can structure and pace their learning	The program lets you to structure and pace your own learning. How do these help you?	The program lets you to structure and pace your own learning. How do these cause problems for you?
Thank students and solicit any final comments:	Are there any other benefits of this program you would like to talk about?	Are there any other problems with this program you would like to talk about?
Thank the students again and ask them not to discuss the topic, questions, or answers until after the completion of all interviews. Offer to share the information garnered from the interviews to those interested students.		

Appendix B

A sample transcript illustrating the editing process.

Original text from transcription	Editing the text	Final text for re-recording
In this tutorial we will take a look at how to create links using the Property Panel in Dreamweaver. The first thing you need is some text that you want to create a link from, so I'll go into the design surface, type in a carriage return, and type some text. Before I do anything I need to I need to select it. Now I go down to the properties bar. If you look down here you will see the link properties for that	This tutorial we will take a look at shows you how to create links using the Property Panel in Dreamweaver. There are three steps. The first, thing you need is some text that you want to can create a link from, so I go into the Design Surface, type in a carriage return, press enter, and type some text. I type in "My First Link." Before I do anything I need to I need to The second step is to select it. Now I Third,	This tutorial shows you how to create links using the Property Panel in Dreamweaver. There are three steps. First, you need some text that you can create a link from, so go into the Design Surface, press enter, and type some text. I type in "My First Link." The second step is to select it. Third, go to the properties bar. Look and see the link properties for that text. Now, type in the target web

<p>text. All you have to do is type in the web address or copy and paste it in from a web browser.</p> <p>In this case, I know the address: http://www.google.com. You need to type in the full address, http:// and all. If you don't get it right then the link will not work. Here's another trick. If you don't hit enter after you enter the link that link will not be locked down and saved as a link. Nothing will happen. So to prove this take a look at the text that is selected, "My First Link" and in three, two, one, I hit enter and now you will notice that it is changed. It is underlined and, if I select outside it, it changes color. It is obviously now a link. So just a quick tip, if you want to make a link hit enter to lock it down. Notice if I click inside the link it is always set up and you can see what it is linked to right there.</p>	<p>go down to the properties bar. If you look down here you will Look and see the link properties for that text. All you have to do is Now, type in the target web address or copy and paste it in from a web browser.</p> <p>In this case, I know the use this address: http://www.google.com. You need Remember to type in the full address, including http:// and all. If you don't get it right then, the link will not work. Here's another trick Fourth, thing to remember. If you don't to press hit enter after you enter type the link. Otherwise, that the link will not be locked down and saved as a link. Nothing will happen. So to prove this take a As an example, look at the text that is selected, "My First Link". and in three, two, one, I hit Press enter. and Now you will notice that it is changed. It is underlined and, if I select outside it, it changes color. It is obviously now a link. So, Let's summarize. First, on the Design Surface, find or write text and press enter. Second, select it. Third, on the properties bar, write or paste the web address. Fourth, press enter. just a quick tip, if you want to make a link hit enter to lock it down. Notice if I click inside the link it is always set up and you can see what it is linked to right there.</p>	<p>address or copy and paste it in from a web browser.</p> <p>In this case, use this address: http://www.google.com. Remember to type in the full address, including http://. If you don't, the link will not work. Fourth, remember to press enter after you type the link. Otherwise, the link will not be locked down and saved as a link. Nothing will happen. As an example, look at the text that is selected, "My First Link". Press enter. Now you notice that it changes. It is underlined and, if you select outside it, it changes color. It is obviously now a link. So, Let's summarize. First, on the Design Surface, find or write text and press enter. Second, select it. Third, on the properties bar, write or paste the web address. Fourth, press enter. That's how to create links using the Property Panel in Dreamweaver.</p>
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WHAT WE CAN LEARN FROM VISUAL LITERACY STUDIES: A CHECKLIST AND MODEL FOR DEVELOPING DIGITAL LEARNING MATERIAL

Rudi W de Lange and Tsekelo P Moremoholo

ABSTRACT

The empirical work conducted by RL Pyke, early in the 20th century, and later work by Miles Tinker in the 1960's established legibility parameters for printed text. These parameters included graphic elements such as the type size, line space, line length, type style, cognitive and human factors such as the reader, the assessment process, the content and the complexity of the text. Although the graphic structure of digital text and the origination and delivery systems are different, the influence of the interrelated cognitive and human factors remains. Similarly, scholars such as Richard Mayer, Frances Dwyer, Joel Levin and Rune Pettersson determined parameters that affect learning when learners use visual-verbal learning material. Educators can design and develop digital learning material that is more effective if they apply the results of visual-verbo studies. Models and checklists based on these studies are helpful instruments in decision making during the design and development process of printed and digital learning material. Checklists and models developed from the broad field of visual literacy studies are particularly useful when assessing and planning instructional text that uses visual-verbo material. This paper proposes a model and a utility checklist, synthesized from mostly empirical visual literacy studies for the development of digital learning material.

KEYWORDS

Visual literacy, Learning material, Checklists.

INTRODUCTION

Scholars that published experimental work about visual-verbo instructional material in educational and psychology related journals provide valuable information for designers of instructional material. Although most of these studies were published several decades ago, the information is still applicable. These studies identified variables that contribute to improved reading, recall and comprehension of instructional text. The variables range from the graphic structure and layout of text, the content of the text, the student and visual elements that support the text. Extracting and listing some of these variables produce a list or a checklist against which learning material is measured. Rune Pettersson (1989) was one of the first to propose such a checklist as a rating scale. Such a checklist can be used as a tool to evaluate instructional material. It can provide an indication of the utility value of the learning material whether it is in print or digital format. The more "yes" answers that a particular piece of instructional material provide, the higher the relative utility value or usefulness of the material. The checklist proposed in this paper, based on visual-verbo studies, enables an instructional designer to measure the value of existing or planned learning material, whether in digital or in print format. The checklist is limited in that it does not address the technology available to designers of digital learning material but only focuses on generic variables borrowed from legibility studies and from the field of visual literacy research. The proposed model proposed is a simplified graphic depiction of those variables that contribute and do not contribute towards improved learning material.

The first section of this paper highlights some research results of legibility studies, followed by variables identified from visual literacy studies that affect learning. The next section presents the model and utility checklist as instruments in decision making when developing digital instructional material.

LEGIBILITY OF TEXT

The greater part of legibility studies involving print was conducted from the late 1940's to the early 1960's. These studies included, amongst others, comparative studies of roman typefaces, illumination, comprehension and legibility, different types of printing papers, and typographical factors. The trend of legibility studies shifted from basic research in the 1940's to applied research in the 1970's, involving learning disabled scholars, older readers and visual display units. Legibility research then moved towards the electronic media in the eighties and nineties. Some of the notable scholars that produced experimental papers and scholarly books during this period were Pyke (1926), North, and Jenkins, (1951), Tinker (1939, 1945, 1948, 1963), Zachrisson (1965), Poulton (1965) and Hartley (1987). The seminal book of Tinker in 1963, in particular set the graphic parameters for designing legible text. These parameters include items such as the length of a line of text, the spacing between the lines, the size of the letters, the color of the type and background, and the typeface. Although scholars determined in the 80's and 90's that different factors facilitate the reading of text on screens (De Bruijn, De Mul, and Van Oostendorp, 1992; Dillon, 1992; Juola, 1988; Matthews, 1989 and Scott Grabinger, 1993), print-based research results can inform instructional designers how to structure text in a digital medium (Hartley, 1987; De Lange and Collender 1995). The quality of digital delivery systems now approximates the quality of print-based text and it is therefore possible to apply some of the print-based research results to digital text. Text for digital learning material should conform to legibility principles in order to make it easier for students to scan, navigate and locate information and to read lengthy sections of informative text. These principles, applicable to instructional text, are given in the checklist later in this paper. The advantage of digital learning material is that a designer can imbed additional graphic cues to emphasize and to cross reference. Readers that do not use these cues might however experience these cues in the text as visually distracting.

VISUAL LITERACY STUDIES

Digital delivery systems make it comparatively easier to add visuals to instructional text. Visuals in this context include simple graphic devices such as color blocks and graphs, static (non-moving single images) and dynamic visuals (animated images). Studies revealed that static and dynamic visuals, under certain conditions, could facilitate the recall and comprehension of prose and instructional text. This facilitating effect is described in the cognitive-psychological literature as an interactive process between the text, the visuals, and the subject (Molitor, Ballstaedt and Mandl, 1989). Scholars have also indicated that visuals do not always facilitate learning, it can be distracting, and can interfere with the process of learning how to read. Good review papers and experimental studies on the non-facilitation and interference effect were published by Goldsmith (1984), Levie and Lentz (1982), Solman and Wu (1995), Rieber (2002), Carney and Levin (2002), Berends and Van Lieshout (2009), and Solman, Singh, and Kehoe (1992). Four conditions are required before visuals will promote the understanding of scientific text. The text must be explanative, it must present cause-and-effect systems, the tests must be sensitive enough to measure the subjects' understanding, the visuals must be explanative, and the learners must be inexperienced in the learning (Mayer, 1989; Mayer and Gallini, 1990). A similar list of conditions, compiled by Dwyer (1978) indicated that the effectiveness of a visual depends on the amount of realism in the pictures, the method of presentation, student characteristics, the level of the educational objective to be achieved, techniques used to focus attention on the visuals, and the tests used to assess the effectiveness of the visuals.

The variables that instructional designers of digital instructional material can consider are summarized under static visual elements, dynamic or animated visual elements, the instructional material and text content, and the learner characteristics.

Static visuals

Photographs, hand-drawn or computer generated images presented as static or dynamic images are multivariable pictorial stimuli. The facilitating effect of pictures is consistent across different studies and could be an indication of the robustness of this effect and have wide generalization possibilities. The general conclusion of all the major reviews and picture-text studies is that pictures must be text-relevant, clear, interpretable by the learner, and must not conflict with the text (Dwyer, 1978; Levin and Lesgold, 1978; Harring and Fry, 1979; Levie and Lentz, 1982; Levin, Anglin and Carney, 1987; Pettersson, 1993; Moore and Dwyer, 1994).

Realism

Researchers investigated the amount of realism and detail in pictures. There is consensus that realism is better than abstract or symbolic pictures. They concluded that the detail and the value of the amount of realism, in terms of facilitation, depend on the time and effort that the learner invests in studying the picture (Peeck, 1987; Dwyer, 1978 and 1994).

Cueing

Pictorial cueing is a field where scholars examine how to use pictures as cues in learning, and how to use graphic cues in pictures through labels and graphic items to improve information acquisition from pictures. Graphic cueing devices, such as arrows, color coding, lines and labels, might be necessary before the facilitating effect becomes noticeable (Levie and Lentz, 1982; Peeck, 1993 and 1994). Other cueing strategies, for example underlining, colored type, perceptual organizers and variations of a typeface, can also lead to increased learning. A combination of interrelated cueing in pictures and text can result in increased facilitation over non-cued material, whilst cueing only in pictures or only in text will not automatically facilitate comprehension or recall (Beck, 1984).

Labeling

Including labeled information with an illustration can improve the recall of the information that the illustration depicts (Mayer, 1989). Illustrations with descriptive and instructional labels can increase the recall and comprehension of text-picture material (Bernard, 1990). Pictures should have captions to guide the reader in understanding the image, because readers can interpret pictures in different ways (Pettersson, 1993).

Color

The selective use of color in pictures can help to direct attention to specific detail in a picture, and can increase retention and recall. Color can also act as a distracter by directing attention to the wrong part of a picture and by making the picture too complex (Dwyer, 1978; Lamberski and Dwyer, 1983; Peeck, 1987; Dwyer and Moore, 1995). There is consensus in the literature that color is preferable over monochrome pictures and that realistic color in pictures is better than unrealistic color.

Pictures that increase facilitation are closely related to the text and to the type of function that they perform in instructional text. The facilitation effect of explanative pictures is, for example, higher than the facilitation effect of representational pictures. Pictures that explain the working mechanism of a pump (Mayer, 1993) and pictures that depict structural relationships (Schallert, 1980) contribute to increased facilitation.

Dynamic visuals

Dynamic visuals are generally considered to be a subdivision of static visuals (Rieber, 2000). Due to the advent of the computers, it is now possible to change static cueing visuals into dynamic visuals. Dynamic arrows, dotted images or shading techniques now act as dual codes. Dynamic visuals such as animation are often realistic, because they portray a visible sequence of events in real time, or at least proportional to

real time. In this type of visualization, one state of the system is visible at a time, as it is in the real world (Hegarty, 2004). Dynamic visuals have the advantage over static visuals in that they are able to provide the learner with different perspectives of the instructional material, namely image, movement (ChanLin, 2000 and Rieber, 2000), and a direct visualization of changes that occur over time (Betrancourt and Chassot, 2008). ChanLin lists a number of areas for which dynamic visuals can be used. These are comprehension, memorization, attention-gaining strategies and emphasizing through a cuing strategy. Dynamic displays can also be used to represent more theoretical and abstract information, such as statistical concepts (Bodemer, Ploetzner, Feuerlein, and Spada, 2004), changes over time (Ainsworth and Van Labeke, 2004) and even computer algorithms (Narayanan and Hegarty, 2002).

Ainsworth and Van Labeke (2004) used the functional taxonomy of multiple dynamic representations to show the characteristics of dynamic representations in learning. According to them, there are three classes of dynamic visualization; (a) time persistent, (b) time implicit, and (c) time singular representations. These different types of dynamic visualizations are discussed in terms of their processing opportunities and constraints. Time-persistent representations show a series of values over the specific time. Time implicit representations on the other hand only show these values but does not show the specific times, while time-singular only displays a single point of time. Furthermore, they discovered that by combining different types of representations, learners can benefit from the complementary, constrain and constructive functions of these representations. However, they also urged caution with regard to the cognitive tasks associated with the content and the visual representations.

Lewalter's (2003) experiment suggests that dynamic visuals are conducive for communication of spatial aspects and dynamic processes as it allows a complete visualization of spatial constellations and dynamic processes, while with pictures, static indicators such as shading or arrows must be used to represent this information. Just as with static visuals, two principles are required before dynamic visual may facilitate learning (Tversky, Morrison and Betrancourt, 2002). This is the congruence principle (external visuals must be created / structured similarly with the internal), and the apprehension principle (graphics should be recognized and visualized correctly).

A paper by Hegarty (2004), states that dynamic visuals are ideal to depict processes that are visible in the actual world, such as a machine that is in motion. Dynamic visuals can also depict procedures that are hidden but are spatially distributed, for instance changes in temperature in a weather map (Lowe, 2003; Hegarty, 2004). Dynamic visuals can also display changes in space over time, incrementally or constantly (Ploetzner and Lowe, 2004). Learners can have some control over how these changes are presented to them if dynamic visual are designed to be interactive (Chan and Black, 2006). In order for a dynamic visual to fulfill its potential as a tool for learning, its function must not only be to be attractive but must also consist of the cognitive function that can be used to develop other important parts of learning such as comprehension, recall and problem-solving (Lowe, 2001).

Type of instructional material and text content

Learning material with high interest content, when compared to material with low interest content, can produce higher comprehension-recall scores for answers based on pictures and for answers based on text content (Beck, 1983). Text that is easy to remember can produce a ceiling effect when compared to the same text with pictures (Levin *et al.*, 1987). Text that is concrete (Moore and Skinner, 1985; Holmes, 1987) and text that generates spontaneous visual imagery in its readers does not require pictures to increase its educational effect (Levin *et al.*, 1987). Pictures are more likely to benefit a reader when the text is difficult to comprehend, for example an unfamiliar object or situation. The picture can help the reader to visualize the object or situation (Peeck, 1993). Text that contains spatial-relational information (Dwyer, 1978; Schallert, 1980; Levie and Lentz, 1982; Peeck, 1987) and cause-and-effect information,

for example the working of hydraulic brakes (Mayer, 1989 and 1993; Mayer and Gallini, 1990), benefit from the inclusion of pictures that depict these relationships and working conditions.

Learner characteristics

Numerous learner characteristics can have an influence on how a learner will react to and perform with picture-text learning material. The following characteristics can have an effect on the outcome of picture-text learning material:

Low prior knowledge

The facilitating effect of pictures becomes evident if subjects have low prior knowledge of the subject or of related subjects (Mayer and Gallini, 1990; Mayer, 1993). Subjects with low prior knowledge possess a relatively small amount of knowledge about the subject they are to study, when compared to subjects with high prior knowledge who possess a higher amount of knowledge about the subject. Text, for example, will not benefit from the inclusion of representational pictures if the learners find the subject matter easy or when they have no difficulty understanding the text. A high prior knowledge might induce a ceiling effect and the potential benefit of supporting pictures might not be evident.

Individual abilities

Individuals' reading, verbal and reasoning abilities affect how they utilize pictures (Peeck, 1987). Researchers found that subjects with a relatively lower reading ability appear to benefit more from illustrated text than good readers, and that poor readers make more use of illustrations than good readers (Levie and Lentz, 1982; Holmes, 1987; Peeck, 1987). Readers must have adequate word-recognition and word-decoding skills before pictures will show a facilitating effect (Levin *et al.*, 1987). There are also indications in the literature that students with low reasoning and low verbal abilities (Peeck, 1987) as well as less-skilled learners (Mayer, 1993), might benefit more from the presence of pictures in text than high-ability and highly skilled students. In contrast to Levie and Lentz (1982) and Peeck (1987), Waddill and McDaniel (1992) found that less-skilled comprehenders benefited selectively, whilst moderately to highly skilled comprehenders enhanced their recall when pictures were combined with text.

Visual literacy

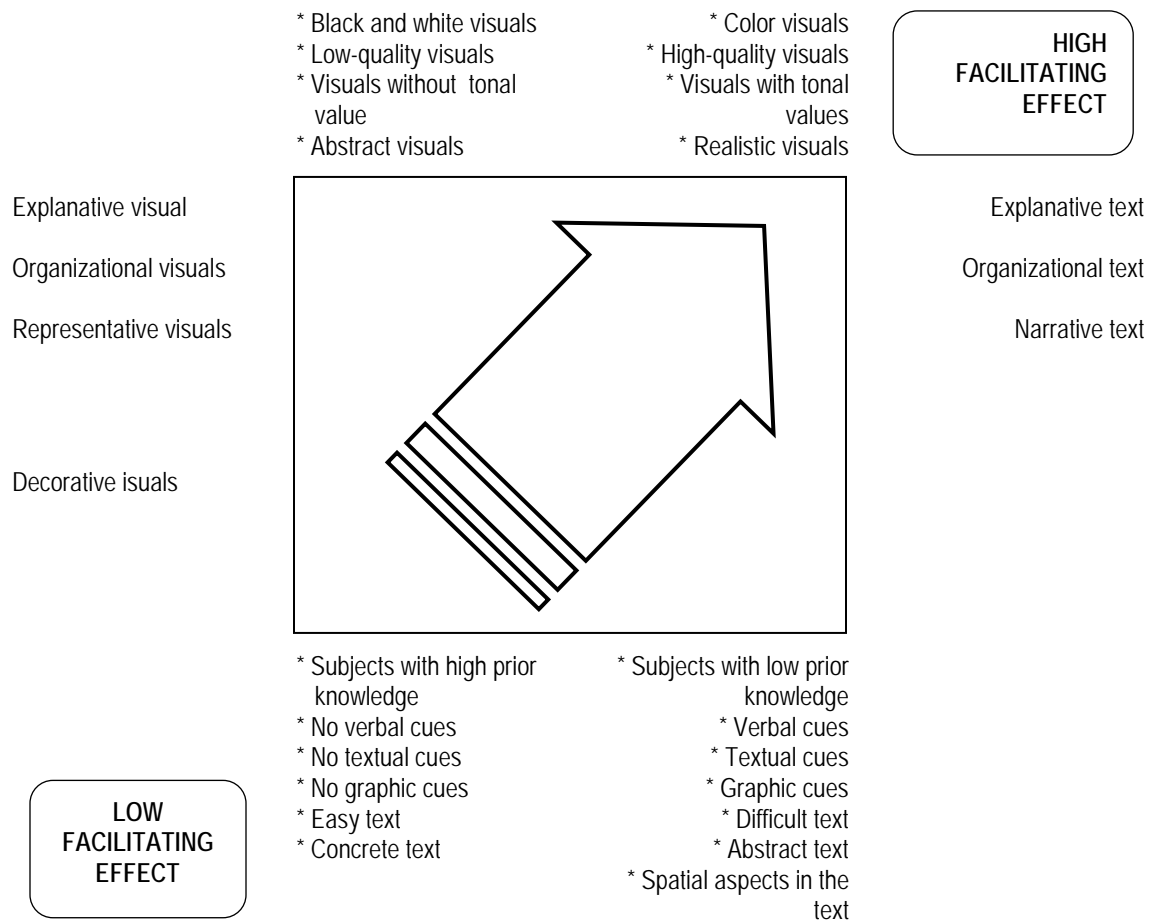
A learner's level of visual literacy, which is influenced by interrelated educational and socio-economic variables, is a factor that will determine if a learner can interpret a picture and understand the meaning of the picture (Goldsmith, 1986; Cripwell, 1989; Hugo and Skibbe, 1991; Peeck, 1993). The literature indicates that the effect of pictures can be increased if the learners' visual literacy is increased through training (Cripwell, 1989; Peeck, 1993) and incidental exposure to visual media.

Pictures that decorate any text will not assist in recall, comprehension or problem-solving skills. Pictures that relate to the text and repeat narrative text are most likely to produce a small facilitating effect. Explanative text, with explanative pictures, accompanied by labels and by text instructing the reader how to make use of the picture, will most probably show a much larger facilitating effect. It is, however, not possible to precisely quantify the values of these effects, due to the interrelatedness of the variables. An instructional designer might select the correct functional visual elements to support the text; there may be labels and cues, but a post-test might not show a facilitating effect if, for example, the learner has high prior knowledge of the material. An ideal situation would be when the text is explanative and contains spatial relationships. The text must not be too easy; it must present new information and must be of interest to the learner. The pictures accompanying the text must be realistic and must explain a procedure in the text or provide a picture analogy to aid the understanding of the text. Labels and graphic cues must compliment the picture. The learner must be visually literate, must have

adequate reading and comprehension abilities, and the teacher must specifically instruct the student to make use of the pictures.

THE MODEL

The preceding section indicated that that the visuals, the text, and the learner have an effect on the outcome of the learning process. Instructional designers must not only consider the use of visuals, but must also take cognizance of the content of the text and learner that will use the learning material. The model below depicts the direction and potential strength of the variables that play a role. The model, for example predicts that a realistic color visual (animated or static), that explains and illustrates text that explains a process such as the workings of an internal combustion engine, combined with appropriate graphic cues might show a facilitating effect if the learners have low prior knowledge of the subject. Easy text, in a narrative format and decorated with visuals that represent and repeat concrete information in the text will not necessarily assist a learner to recall or comprehend the text better. Representative visuals with easy and concrete narrative text might show a low facilitating effect, or no facilitating effect whatsoever.



* Dynamic aspects in the
text

Figure 1. A graphic model depicting the direction and potential strength of variable that play a role when visuals are combined with instructional text.

THE CHECKLIST

The checklist combines the rating scheme idea of Pettersson (1989) and the results of the aforementioned scholars. Instructional designers may use this list as an instrument in the planning of new digital learning material and evaluation of exiting digital learning material. The more “yes” answers the material under consideration provides, the higher the relative utility value, in terms of learning, the material will have.

1 2 3 4 5 6 7	Questions with regard to typography and legibility Is the type size similar to what is used in books, between 10 and 12 points in size? Is the typeface not decorative and familiar to the reader? Does the space between the approximate the spacing used in books? Are the letters dark, and on a light background? Are the graphic cues similar to what is used in newspapers and books? Is the layout simple in terms of columns, the placement of illustrations, lines, bars, and bullets? Is the line length less than two alphabets in length and net less than one?	<i>Yes/No</i>
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29	Questions with regard to the visuals and the syntax of the visuals Is the visual realistic? Is the visual presented in a clear style? Does the visual agree with the content of the text? Does the visual provide information that is central to the text? Are there graphic cues in the visual, namely arrows or lines, directing attention to a particular area of the text or visual? Is the visual in color? Does the color emphasize important parts of the visual? Are there tonal values in the visual? Does the visual have a caption (name)? Does the visual have a legend with more information than just a name? Is the legend instructive in nature? Is the legend easy to understand? Is the visual explanative in nature (does it explain a certain procedure)? Does the visual present an analogy of some form? If the function of the visual is to act as an advanced organizer? If the function of the picture is to repeat information that is presented in the text? Can the learner view the dynamic visual several times? Is animation broken into sequences? Is animation interactive? Or do learners have control over this animation? Is the student familiar with the notion of the animation? Is the animation format appropriate for the content (e.g., display, simulation)?	<i>Yes/No</i>
30	Questions with regard to the text and the learner Does the text hold high interest for the reader?	<i>Yes/No</i>

31	Is the text unfamiliar to the reader?	
32	Does the reader have low prior knowledge of the text?	
33	Does the reader have difficulty in understanding the text?	
34	Does the reader have the necessary reading skills to understand the text?	
35	Does the reader have the necessary visual literacy skills to interpret the visuals?	
36	Does the text instruct the reader to make use of the visuals?	
37	Does the text explain the visuals?	
38	If the text describes a dynamic process, is the visual in an animated format?	
39	Does the text contain spatial aspects and references to movement that require dynamic visuals?	
Questions with regard to the evaluation methods		Yes/No
40	Does the post-test focus on information that is presented in the text and which is reflected by the visuals?	
41	Do the post-test questions ask the subjects to provide an explanation or a concept, or to demonstrate problem-solving skills, when the text and visuals are explanative or when the visuals and text provide an analogy?	
42	Do the post-test questions ask the subjects to recall facts when the text and pictures provide factual information?	
43	Is the dynamic visual available when the subject must answer the questions?	
44	Is there a dynamic visual when the post-test focus on testing a procedure, spatial relationship or time related processes?	

CONCLUDING REMARKS

Digital media in an educational environment, as with printed media, is a carrier of information and instruction. The principles that affect students in a learning situation do not necessarily differ when they move from paper-based information and instructional media to an electronic carrier of information and instruction. Students are still governed by their own ability to decode the material, their pre-knowledge and experience of similar or related information, their mode of learning, the quality of the material in terms of readability, legibility, and graphic structure, and what they are expected to master, whether it be application of the instruction or a mere recall of facts. The advantages of digital media is however self-evident. These are primarily in the areas of delivery and cost, interaction and feedback, and the ability to use multimedia to enhance and explain difficult concepts and technical processes.

Dynamic visuals however, are not always easy to understand and may impose additional cognitive demands such as creating a mental representation of the dynamic content. A learner, when viewing a frame-by-frame animation or video, views one frame at a time, and once the animation or video has advanced beyond a given frame, the previous frame is no longer available to the viewer (Hegarty, 2004). This may pose additional demands on the student's working memory, especially in cases when information presented earlier in the animation that must be integrated with information that is presented later. In contrast, when viewing a static display, viewers can re-examine different parts of the display as much as they wish (Ainsworth and Van Labeke 2004). However, it can argued that the ability to introduce each step independently in animations reduces the clutter of static illustrations, of which all of the steps are shown at once (Stith, 2004).

Researchers working in the field of education and psychology have determined parameters that affect learning. Designers of educational digital media will enhance the effectiveness of their learning material if they apply these research results to their graphic structure, content and assessment processes. Measuring the effectiveness or improvement of enhanced learning material through experimental

procedure accurately might be difficult, due to extraneous independent variables and the Hawthorne effect. Time, cost and the sensitivity of the measuring instrument also affect such a measuring process. The proposed model provides a simplified graphic explanation of the factors that affect learning whilst the checklist provides an applied measuring instrument that can be used when developing digital learning material. This checklist however, is not an interval scale or a ratio measuring process, but rather an indicator on a nominal scale with ordinal properties. One should aim to obtain more “yes” than “no” answers when using the checklist during an evaluation or the development of educational digital material.

In order to develop our understanding of how dynamic visuals can best be used in a digital environment we need to know how students learn with dynamic visuals that are used in digital instructional material. Research could look at the interaction between digital instructional material, the learners’ ability and the internal mental models that learners bring to the situation.

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A SURVEY OF POPULAR SCIENCE MEDIA USAGE AMONG THE PUBLIC IN TAIWAN

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ABSTRACT

Popular science is greatly promoted these years in Taiwan. One way to communicate with people with popular science is using media such as books, radio, television and websites. This research was aimed at finding popular science media usage in Taiwan among the public by using online questionnaires. 331 copies of web questionnaires were completed, while 329 copies of them were valid. The results are shown as following: 1) Internet is the most popular media for the public when gaining popular science information; 2) the public's most favorite popular science topic is technology knowledge; 3) radio is rarely used for the public when learning popular science; and 4) popular science magazines and websites issued by official organizations such as government and foundations are less preferred by the public. To promote popular science, suggestions were made by the research: first, interesting popular science topics should be provided no matter what media are used; secondly, new media such as podcasts should be adopted; and finally, related organizations should take more advantages of websites.

KEYWORDS

Taiwanese Popular Science Communication, Media Usage

INTRODUCTION

Popular science is a term used to describe the interpretation of science for the public. It is greatly promoted these years, and therefore it increases people's awareness and knowledge of it. One way to communicate with people through popular science is using media such as books, radio, television and the Internet. This research was aimed at finding popular science media usage among the public by using online questionnaires.

COMMUNICATION OF POPULAR SCIENCE

Science developments promote the advancement of society and the innovation of technology. Public's knowledge on science and the degree of national science development can be seen as an advantage of a nation's competitiveness. American scientist Hively (1988) indicated that if people nowadays had little knowledge on science, their competitiveness would be lowered, even eliminated in competition. The meaning of popular science is using a variety of ways to let the public understand technologies and abilities that mankind acquired and put into practice. Weigold (2001) believes that popular science is a process of the communicator providing simplified science knowledge using various ways through media to the target audience. According to the announcement of article solicitation of the Popular Science Writing Award, held by the Taiwan National Science Council, "Science" refers to "natural science" or "technology". It should be conveyed in easy ways through various means to the

public (NSC, 2008). The target audience, aside from regular public domain, should include the communication of scientific knowledge between specialists in different fields. Funkhouser & Maccoby (1971) indicated: “Popular science is the knowledge of science conveyed to the public for the sake of education, training, etc.

Compared to other fields of knowledge, the abstruse technical terms and complicated concepts distances the public, thus science is also called “hard knowledge”. Through popularizing popular science, the distances between science and the public were shortened. This may allow the public to have basic knowledge of it. People nowadays are closely linked to media; therefore popularizing science through media is a convenient way. A survey shows that mass media are the main resource for the public to gain science knowledge (Treise & Weigold, 2002). Studies also show that the most common media is “popular science publications”. Comparing to other media, publications are portable and easy-preserving, thus increases the chance for readers to contact popular science (Fabbri, 2007). As content of popular science, Burkett (1974) indicated the literary aspect are those what make popular science publication so intriguing. In Taiwan, there are three forms of publications in popular science, first are short essays scattered on various print media and websites. The second kinds are popular science magazines and periodicals. They can be classified into civil and government publications. Civil publications are “Science Monthly”, “Newton”, “Popular Science”, and “Scientific America”. “Science Development” is an example for government publications. The third kind is “popular science books”, which discuss certain popular science topics in depth.

Lots of popular science short essays not only carry in print media, they are also being put on the internet. According to the observations of the researchers, the popular science websites in Taiwan currently can be roughly classified into two categories: websites of popular science publications and websites specifically to communicate science knowledge. Websites of popular science publications can be further categorized into commercial or non-profit. Commercial websites such as “Scientific American Website”, “National Geographic Website” were established by publishers, they often provide their magazine’s table of contents, abstracts or abridged content only. Non-profit websites were mostly affiliated under Taiwan Academic Network (TANet) such as “Science Study Monthly” and “Discovery monthly”. They are operated by government or foundations, completed articles are often provided. Both commercial and non-profit websites have same purposes of providing popular science knowledge and interactions with readers. Websites specifically to communicate science knowledge are non-profit based. They are created by private or government. Private popular science websites are maintained by volunteers. Their numbers are less. One of the larger scale website is “Sciscape”, the researcher found a number of civil popular science websites were listed in Sciscape, such as “TEENS”, “Natural Product Chemistry Website”, “Nano Science Website”, “Peregrine Blog”, “Science Circus” and “Knowledge Website”. Government popular science websites such as “Science Circus” by [National Science Council](#) and “Knowledge Website” by National Center for High-Performance Computing (NCHC) and [National Science Council](#).

Aside from publications and Internet, Television, Radio Broadcasts and Newspapers are also common media. Television had the function of presenting with sound and visual, and is common (Eveland et al., 2002). Popular science TV shows can be watched by lots of audiences in the same time, and can help the understanding of information among elders and lower-education people. In 1985, the Discovery Channel was established in Taiwan. It introduces science knowledge and technology in easy ways. After that, “Travel & Living” and “Animal Planet” were also being introduced into Taiwan; these shows arouse the interest in exploring popular science (Koolstra et al., 2006). Popular Science broadcast shows are mainly to convert science spirit and knowledge. The forms of communicating popular science in radio broadcasts, television and newspaper currently in Taiwan are “Educational science movies”,

“Science news report” and “Educational science programs”.

As mentioned above, it can be found that popular science brought about interests and contacts to the public by using various media. For the preference and the usage of popular science media, it should be studied further more.

RESEARCH METHODOLOGY

Internet surveys are good for collecting a large amount of data with few geographical and time restrictions (Wimmer & Dominick, 2006). This research utilized Internet survey among the Taiwanese public; a web questionnaire was developed which contains two parts, “Current status on the using of popular science media”, “”and “Demographics information”. The questionnaire were posted on my3Q.com (<http://www.my3q.com/home2/267/ariel0729/54177.phtml>), the website provides the questionnaire template, initial statistic on the questionnaire, subject’s IP list and dates when the questionnaire is being filled. Aside from the webpage mentioned above, the research also put the information of the questionnaire on various major BBS, the popular science forum, and the blog of Answerbox.net for asking people to answer the questionnaire.

The questionnaire was administered from 5/21/2009 to 8/17/2009, 331 copies of web questionnaires were completed. After retrieving the questionnaire, the researchers deleted 2 repeated IP questionnaires and retrieved 329 valid questionnaires.

RESULTS

The data is based on analysis of the 329 responses to the research which was collected by a Taiwanese web based survey from May 21, to August 17, 2009. Results of the research are shown as below.

Demographic Characteristics

When examining the data concerning respondents’ gender and age, it was found that 183 of the respondents (55.6%) were males while the remaining 146 (44.4%) were females. The sample ages is predominantly in the 20 up to 24(30.4%) years old range and are from Northern Taiwan (68.1%). Approximately two thirds of the sample major in law or business (see Table 1).

Table 1. Demographic Characteristics of Respondents (N=329)

Characteristics	n	(%)
Gender		
Male	183	55.6%
Female	146	44.4%
Age		
15-19 years-old	35	10.6%

20-24 years-old	100	30.4%
25-29 years-old	86	26.1%
30-34 years-old	72	21.9%
35-39 years-old	11	3.3%
40-44 years-old	11	3.3%
45 years-old and Above	14	4.3%
<hr/>		
Resident Area		
Northern Taiwan	224	68.1%
Central Taiwan	37	11.2%
Southern Taiwan	54	16.4%
Eastern Taiwan	8	2.4%
Other	6	1.8%
<hr/>		
Educational Level		
Junior high school	3	0.9%
High school	28	8.5%
Undergraduate school	219	66.6%
Graduate school and Above	79	24.0%
<hr/>		

Table 1. (Continued)

Characteristics	n	(%)
<hr/>		
Major		
Engineering	62	18.8%
Science	46	14.0%
Law/Business	76	23.1%
Social Humanities	69	21.0%
Agriculture/Medical Humanities	16	4.9%
Arts	28	8.5%

Other	32	9.7%
<hr/>		
Occupation		
Student	127	38.6%
Technician	65	19.8%
Civil Servant	66	20.1%
Sales	15	4.6%
Laborer	4	1.2%
Business Owner	20	6.1%
Housewife	3	0.9%
Retired	1	0.3%
Unemployed	23	7.0%
Other	5	1.5%

Popular science media usage

Table 2 shows that the Internet is the most (74.5%) used media while books are the least (0.6%). Most of the participants (91.8%) utilize frequently used media every day. Most (56.5%) respondents utilize the frequently used media “120 minutes or above” each time.

Table 2. Media Utilization of Respondents (N=329)

Item	n	(%)
Most frequently used media		
Television	6	20.7%
Radio	4	1.2%
Internet	2	74.5%
Newspaper	7	2.1%
<i>Magazine</i>	3	0.9%
Book	2	0.6%
Frequency of using above media		
Everyday	3	91.8%
Every Other Day	1	4.9%
Twice a Week	5	1.5%
Once a Week	3	0.9%
Less Than Once a Week	3	0.9%
Amount of time of using above media(minutes/each time)		
30	1	3.6%
31~60	5	16.7%
61~90	4	14.3%

91~120	2	8.8%
120+	1	56.5%

Most interested popular science topics

As indicated in Table 3, respondents are most interested in “Technology knowledge” (31.0%) while “Physics” took the least interest (0.9%).

Table 3. Most Interested Popular Science Topics of Respondents (N=329)

Item	n	(%)
Most favorite popular science topics		
Earth Sciences	17	5.2%
Life science	28	8.5%
Astronomy	31	9.4%
Chemistry	5	1.5%
Physics	3	0.9%
Marine Sciences	9	2.7%
Environmental Science	12	3.6%
Medical/Agriculture	29	8.8%
Mathematics	9	2.7%
Archaeology and Anthropology	19	5.8%
Engineering Technology	11	3.3%
Information and Communication	49	14.9%
Technology knowledge	102	31.0%
Other	5	1.5%

Popular science television program watching

An examination of the data pertaining to popular science television program watching, found that more respondents watched “educational popular science movie”, than “popular science news reports” (See table 4).

Table 4. Popular Science TV Program Watching (N=329)

Item	n	(%)
Never	119	36.2%

Favorite Popular Science TV Program		
Educational Popular Science movie	158	48.0%
Popular Science News Reports	52	15.8%

Popular science radio broadcast programs listening

As shows in Table 5, 86.9% of participants had never listened to any popular science radio broadcast programs. Those that had listened to the programs listened mostly to “popular science news” (7.3%).

Table 5. Popular science radio broadcast programs listening (N=329)

Item	n	(%)
Never	286	86.9%
Favorite Popular Science radio broadcast program		
Popular Science News	24	7.3%
Interview with Scientists	19	5.8%

Popular science website visits

In the 329 participants, 40.1% of them had never visited a popular science website. Those who had surfed the websites visit “popular science publication websites” the most (16.1%). The least (2.4%) visited websites were “Websites of foundations and associations” (see table 6).

Table 6. Popular Science Website Visits

Item	n	(%)
Never	132	40.1%
Favorite Popular Science website		
Government	12	3.6 %
Social Organizations	39	11.9%
Foundations	8	2.4%
Popular Science Periodicals	53	16.1%
Popular Science Knowledge Only	9	2.7%
Science Blog	25	7.6%
Science Forum	51	15.5%

Popular science newspaper article reading

As shows in Table 7, 35.9% of participants had never read any popular science newspaper articles. Those that had read popular science newspaper articles read “popular science news” mostly (49.8%).

Table 7. Newspaper Popular Science Reports Reading of Respondents (N=329)

Item	n	(%)
Never	118	35.9%
Favorite Popular Science Newspaper Article		
General Popular Science Reports	164	49.8%
Popular Science Columns	47	14.3%

Popular science periodicals reading

Table 8 shows that the most read popular science periodicals are “civil publications” (40.7%). The less read periodicals are “social education unit publications” (3.0%).

Table 8. Popular Science Periodical Reading of Respondents (N=329)

Item	n	(%)
Never	145	44.1%
Favorite Type of Popular Science periodical		
Civil	134	40.7%
Government	14	4.3%
Social Organization	10	3.0%
Foundation	26	7.9%

Popular science books reading

Table 9 shows that the most read popular science books are “biographies” (14.3%). The least read ones are “Chemistry” and “Physics” (1.5% each).

Table 9. Popular Science Book Reading of Respondents (N=329)

Item	n	(%)
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Never	83	25.2%
Favorite Type of Popular Science Book		
Life science	22	6.7%
Chemistry	5	1.5%
Physics	5	1.5%
Mathematics	12	3.6%
Earth Sciences	23	7.0%
Astronomy	21	6.4%
Animal	17	5.2%
Plant	6	1.8%
Nature/environmental protection	33	10.0%
Biographies	47	14.3%
Philosophy of Science	26	7.9%
Medical	19	5.8%
Technology knowledge	6	1.8%
Other	3	0.9%

CONCLUSION AND SUGGESTIONS

The research used mainly Internet questionnaires to survey the Taiwanese public of their acquirement of popular science information through media. The conclusion and suggestions are shown as below:

1).The most used media by the Taiwanese public is the Internet, which can be an efficient way to popularize popular science. The research shows that in all media, public used the Internet the most, followed by television. Books are the least used media (see table 2). The researchers advise that popular science related organizations can make good use of the Internet to popularize popular science.

2).Over half (86.9%) of the public had never listened to popular science radio programs. Using radio to acquire popular science knowledge is not common among the public. The researchers advise that popular science related organizations can use new media such as “Podcasts” to combine with conventional radio broadcasts, websites or blogs.

3).The research shows that nearly half (40.1%) of the public has never viewed popular science websites and nor has almost half (44.1%) of the public viewed any popular science periodicals. The researchers advise the media to raise the quality and quantity of popular science information to attract more attention toward popular science.

4). "Technology knowledge" is the popular science topic that the public is most interested in (see table 4). The researchers recommend that the media provide more information that the public is interested in. Making content that meets the audience's needs and interest is one of the main tasks while designing science education programs.

5). Governmental institutions and foundations' popular science websites and periodicals need further promoting. The research shows that the public views mostly "popular science periodical websites" (16.1%) and reads mostly "non-governmental published" popular science periodicals (40.7%), while viewing less governmental institution and foundations' popular science websites and periodicals. The researchers advise Taiwan government to enhance designing and promotion of popular science media to raise viewing frequency.

6). The public's most-read popular science books are "biographies" (14.3%). The researchers advise popular science publishers to publish according to the public's interest to raise their will toward reading popular science publications.

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ICEM 2009 Plenary Session:
Web 2.0 Technology and Digital Literacy

Keynote Speakers:

Dr. Marina Stock Mclsaac

Arizona State University

&

Dr. Chih-Hsiung Tu

Northern Arizona University

at

Abu Dhabi Women's College

Abu Dhabi, UAE

October 9, 2009

We would like to follow-up on the introduction to Web 2.0 technologies just presented to you by Dr. John Hedberg by giving you some specific examples of social networking technologies that can be used by teachers in the classroom. In this forum we will present our information, web links, and resources on a Wikieducator site that embodies that spirit of freely accessible and collaborative open education resources (OER).

Education is entering a new world of rapid communication and instant access to information. The new tools that students and teachers are using outside the classroom are shaping how they communicate and how they learn. Web 2.0 tools and open education resources (OER) have

changed the way people share and learn. Social networking and collaborative work-spaces allow teachers and students to create learning environments together.

This plenary session is based on the pre-conference workshops that we presented the past few days. The workshops are:

Bulding Online Academic Communities,

http://www.wikieducator.org/Building_Online_Academic_Communities

and

Developing Online Academic Collaboration.

http://www.wikieducator.org/Developing_Online_Academic_Collaboration

If you choose, you can use the links above to access workshop materials yourself and at your own pace. The goals of this workshop were for participants to:

- recognize new pedagogical models of social learning
- demonstrate basic understanding of selected Web 2.0 tools
- describe how they might use the tools in their teaching
- create igoogole, blog, twitter and delicious sites and explain their use in education.

Both workshops use igoogole as a platform upon which to build those social networking tools that you, as a student or teacher, might find useful in your work.

igoogle, is a google tool that creates a homepage or portal which can be personalized to include various social networking applications called “gadgets”. Applications like Twitter and Delicious can be assembled on an igoogle homepage to create a user’s own personal learning environment (PLE). With these applications, educators can stay in touch with colleagues, share research and practice-based information and collaborate with peers by integrating these tools into their teaching. In the workshop we give examples of igoogle set up with one teacher’s personal learning environment (PLE) and we demonstrate ways that this PLE uses Blogs, Wikis, Twitter, and Delicious for teaching.

Blogs are useful to educators in a variety of ways. Blogs can be logs of individual thoughts or class reflections on work being done. They can be diaries kept by students that describe their progress through a particular assignment or project. Edublogs are written and shared by communities of educators and can be valuable collaborative resources for teachers. Our workshops have some valuable blog links for educators and step-by-step directions to show you how to set up your own classroom blog.

Twitter is a short messaging or micro-blogging service that communicates an idea in 140 characters or less. It is a collaborative tool that allows educators and others to share links, references and ideas quickly. Teachers can select other educators within the same community to share ideas with and quickly see whether the “tweet” is something of interest. They can also easily send grades, notices and short messages to students by creating a class group. Students can collaborate with each other, submit answers to teachers quickly, and provide links to homework and active projects by using hashtags, for example “#ICEM2009.”

Wikis are collaborative online spaces that encourage people to work together. A class Wiki can consist of various groups of students working on different projects. As one person puts down an idea, another can modify it and add additional information. By working together in a Wiki space, a group project or paper begins to take shape, and if the students grant access to the instructor, he/she can monitor that progress and make suggestions. Shared resources and communal editing, can motivate students who might otherwise find working alone difficult. Links on the workshop website direct you to set up your own classroom Wiki, and give examples of award-winning classroom Wikis.

Delicious is an online social bookmarking tool that has great research and collaborative potential. By quickly “tagging” a link or reference as you read something of interest, you, the reader, can compile your own literature database in a variety of areas of interest. You can also find tags by others who have read and made notes on other materials with the same tag. Teachers can create class tags and provide resources to students, who can continue to add what they find to the class database. By collaborative linking and tagging, other users can find information related to these searches as well. Delicious has become a powerful search tool because of the collaborative efforts of many to tag, share and manage their bookmarks. The workshop materials contain links explaining how to set up your own Delicious account. They also have links to many exemplary uses of Delicious.

For complete ICEM2009 Workshop Resources see:

ICEM-CIME 2009 Conference.

<http://tinyurl.com/yhlegpe>

Author Biographical Information:

Biographical Information

Dr. Marina Stock Mclsaac

Dr. Marina Mclsaac is Professor Emerita at Arizona State University (USA) where she has taught and conducted research in Educational Technology for over 20 years. Her interests are in Distance Education technologies and the online use of educational and social networks, particularly Web 2.0 applications for teacher training and professional development.

Dr. Mclsaac is a recipient of four Fulbright Awards to Turkey and Portugal. She has given keynote addresses and workshops in Turkey, Italy, Germany, Cyprus, Taiwan, Hong Kong, Nigeria, and Portugal. The main focus of her work is directed toward intercultural issues as they relate to web-based teaching and learning.

Biographical Information

Dr. Chih-Hsiung Tu is an associate professor at Northern Arizona University, Flagstaff, AZ, and an educational/instructional technology consultant with experience in distance education, eLearning, technology training in teacher education, online learning community, learning organization, and knowledge management. His research interests are distance education, socio-cognitive learning, socio-cultural learning, online learning community, learning organization, social media, personal learning environments, and network learning environments.

Abu Dhabi Workshop, *How to design successful educational videos (Guidelines for pedagogic video design and production)*

Facilitator: Jack Koumi, Educational Media Production

Aim

To help staff and students consolidate skills in designing pedagogically effective videos.

Objectives

At the end of the Workshop, participants should

- be able to understand and implement video design principles for effective pedagogic narrative (Tables 1 and 2 below)

Table 1. A pedagogic framework of narrative screenwriting principles

Pedagogic screenwriting structure		Examples
Make them want to know	1. HOOK (capture attention and sustain interest)	Shock close-up of moist human brain. Narration: <i>This is a real human brain</i>
Tell them what you will do	2. SIGNPOST (information about what's coming)	Scene: four monkeys eating. Narration: <i>let's concentrate on social behaviour</i>
Do it, pedagogically	3. ENCOURAGE ATTENTIVE VIEWING (CONCENTRATION)	Presenter says: <i>helium in this balloon, carbon dioxide in this one. What will happen when I release the balloons?</i>
	4. ENABLE INDIVIDUAL CONSTRUCTION OF KNOWLEDGE	e.g. don't blanket shots with narration: leave slack for contemplation.
	5. SENSITIZE	e.g. timely occurrence of music
	6. ELUCIDATE	e.g. uncluttered, simplifying graphics
	7. REINFORCE	e.g. repetition from a different angle
Tell them what you have done	8. CONSOLIDATE / CONCLUDE	e.g. summarize key features, helping viewers to stand back from the story

MORE EXAMPLES of the pedagogic structure guidelines of Table 1 – see table 2 at the end for a summary.

1. HOOK (grab the viewers and hold onto them)

a. Capture Attention: delight, surprise, shock

The unexpected, whether negative (shock), neutral (surprise) or positive (delight) will *rouse* the viewer.

For example, the video starts with the shock close-up of a moist human brain, with the narration, *This is a real human brain (PAUSE 4 sec FOR CONTEMPLATION)*.

An example whereby you might surprise the viewer (in a chemistry video): the presenter releases a balloon filled with carbon dioxide, or a heavier gas, and it *drops like a stone*.

An example whereby you might *delight* the viewer, in a programme involving family life, is to show babies doing baby things, such as toddling then overbalancing onto their bottoms.

b. Sustain Interest: fascinate, entertain/amuse, appetise, create suspense

Having roused viewers through 1a, above, you have to *sustain* their interest – through bringing out the *fascination* of the topic, and/or *entertaining/amusing* them (humour is powerful), and/or *appetizing* them with a foretaste of interesting later items, and/or *creating suspense* (which stimulates them out of a receptive mode into one of active anticipation).

2. SIGNPOST

a. Chapter Heading

Telling viewers what comes next, as in, *Let's now concentrate on social behaviour*.

b. Focus signpost: what to look out for

This directs the learner's attention to particular aspects of the next item. For example, *As you watch the flight of the helicopter, concentrate on what happens when it tilts forward...*

Another example:

In the next clip, concentrate on the arms of the spinning skater

Both of these examples focus visual attention. Alternatively, it is often helpful to focus cognitive attention. For example

Instead of the teacher saying, *Let's work out the formula for the area of a circle*, The teacher says, *The area of a circle is πr^2 - let's see why*.

Thereby, viewers can keep comparing the current situation with the target solution.

3. FACILITATE ATTENTIVE VIEWING (CONCENTRATION)

a. Pose questions

- Most often, *question, pause, answer* (i.e. rhetorical questions).
- Special case: pose implicit visual questions by *partial animation* so that viewers have to imagine the *in-between* pictures.

- Explicit questions, with a visual device that informs viewers when the answer will be revealed. For example, *what are the reflective symmetries of this object?* – repeated as a printed caption – then a rotating clock-hand counts down to 10 seconds.
- For questions requiring lengthy deliberation, viewers can be invited to stop the video and re-start when ready, perhaps after referring to complementary print material.

b. Encourage prediction

- Inviting viewers to *guess what is coming next* keeps their minds active. For example, in a video about chemical elements, the teacher, holding two balloons, says, *This balloon contains helium, the other contains carbon dioxide. What's going to happen when I release the balloons, what do you think?* (PAUSES BEFORE RELEASING BALLOONS)
- Also, *implicit questions*, so that viewers will be tempted to predict the answers, such as: *we're going to investigate why, more and more these days, teenage boys lack self-esteem ...* (followed by a pause to encourage prediction)

4. ENABLE INDIVIDUAL CONSTRUCTION OF KNOWLEDGE

a. Concretize/activate existing knowledge

Use multiple analogies and metaphors in order to anchor into viewers' prior knowledge.

b. Do not obscure the geography

When recording in a new location that contains objects of interest, start with an *establishing* shot – a wide a shot that establishes the geography.

CAVEAT. The big-close-up is a must for informing and maintaining interest – and sometimes this should not be postponed just in order to start with an establishing shot. On the other hand, close-ups should not be too tight (allow some visual elbow-room).

c. Don't blinker, disclose the context (the conceptual geography)

- *old* in same shot with *new* for comparison. For example when one item in a mathematical equation is shown to change, retain the original unchanged equation in the same shot, for comparison. Similarly, show a close-up *from the start* of a chemical change (speeded up if necessary), rather than a 2-shot (presenter + object) and then a close-up later.
- If developing an argument line by line of text (or box by box of a flow-chart), don't always obscure the next line just because the commentary has not yet reached that point – show two lines (or three) from the start and highlight each as the commentary reaches it

d. Pause commentary for contemplation

As in Table 1b: do not blanket the shots with narration, leave slack for concentration

5. *SENSITISE (put viewers into a receptive frame of mind)*

a. *Appropriate style of Music – occurring sparingly*

The *style* of background music should be appropriate for the topic and learning task – and so should its *occurrence*: music over a whole video tends to tranquillise rather than sensitise.

Consider doing *without* music during narration and introduce it only when the narration stops for a while, thus inviting viewers to contemplate the scene and make their own interpretation.

b. *Signal Change of Topic*

A new topic can be signalled by a pause at the end of a topic followed by a change of shot and immediate new narration. This immediacy indicates that the topic has changed, then the narration *identifies* the new topic.

c. *Consistent style*

Maintaining a particular style, such as the colour of captions, facilitates intake of information, because the learners become accustomed (or de-sensitised) to the background information (colour) so can ignore it. Hence they are more sensitive to the *relevant* information.

d. *Conform to video grammar*

Do not cut from a shot in which the camera is zooming or moving. Movement (especially of the whole picture) requires extra mental processing. Hence the viewer's mind cannot settle down until the movement stops and the picture remains static for a second or so.

6. *ELUCIDATE (make the story clear)*

a. **Moderate intellectual depth/complexity**

- Long sentences, which normally contain conditional clauses, are difficult to understand. So convert every long sentence into two or more short ones.
- Pedagogic graphic design – clear, informative – using flow charts, concept maps, colour coding, shape coding, animation. And NOTE: clarity of text must take priority over beauty – fancy fonts and colours can be less legible

b. **Enhance Legibility / Audibility**

- Speak clearly (even experienced presenters are prone to gabble when being recorded)
- Framing: arrange objects/graphics to match screen ratio – excessive wasted space means wider shots and hence less legible shots.
- Ensure that all performers and props are in the right place, doing the right things, and that conditions are purposely restricted to exclude extraneous noises or intrusive objects or people.
- Direct the learner's attention to the relevant part of the screen or aspect of the picture – with commentary or superimposed graphics or highlighting or a presenter pointing

- To convey three-dimensionality, the best technique is to move the object or camera. Additionally, three-dimensionality can be enhanced by interposing the presenter's hand, sliding over the object. Appropriate key lighting is also necessary – to *sculpture* the object by creating differentiated light and shade and also shadows of protrusions

7. REINFORCE

a. Repetition (from a different angle)

Repetition for reinforcement can be repetition of words or of pictures. In either case, the repetition might be exact or, more usually, repetition of an idea from a different angle.

A second reason for repetition is not to reinforce but rather to compensate for inattention. Viewers' concentration may fade in and out during a video segment. Such lapses will occur at different times for different viewers. Hence, the need for occasional redundancy – repeat the ideas in different words, enlarge upon the idea.

b. Compare/Contrast

When two objects or concepts are compared for similarities between them, each concept is understood better through analogy with the second concept.

A similar effect can be achieved by doing the opposite – contrasting two concepts for their differences. This sharpens appreciation of the concept that is being contrasted, i.e. the viewer understands *what the concept is not*.

c. Synergy between words and pictures

- Choose the shot that best amplifies rather than merely *accompanies* the words. For example, a sequence in a foundry, with the commentary, *Safety is paramount when the heat is so fierce*. In this case, don't show a wide shot of the foundry – rather, show a *close-up* of a *potentially dangerous* activity – a worker pouring white-hot molten metal.
- Conversely, choose words that amplify the shot, e.g.
Do not say *this part of the object*
instead, say *the top left part of the object* or *the pointed part of the object*
- On some occasions, the pictures need to precede the words, e.g. when the pictures are mathematical expressions that are difficult to listen to unless they can be seen: for example, the corresponding formula needs to be seen during the commentary :
minus b, plus or minus the square root of, b-squared minus four ac, all over two a
- On other occasions, the words need to precede the pictures (to prepare the learners):
In the next clip, watch the arms of the spinning skater.

8. CONSOLIDATE/CONCLUDE

a. Recapitulate

For example, following the first half of a video about the brain, the presenter says (over appropriate shots of parts of a model of the brain)

We've looked at four parts of the brain, a part of the brain concerned with language, at the ventricles, at the visual system and at the sensory cortex

b. Summarize key features / consolidate

Summarizing is more extensive than recapitulating – it extends back and elaborates on the chapter by giving a précis of the key features. For example, following the recapitulation quoted above, the presenter summarizes, by saying

and in each case, as well as looking at their structure, we've looked at their function – what the parts of the brain actually do, the behaviour and the abilities and the sensations that they control

c. Chapter Ending

Name the chapter and say that it has finished (usually a single sentence). For example, in a video about the brain, at the end of a section (chapter) describing the natural cavities in the brain (the *ventricles*), the narrator says,

So that's the ventricles, now for the visual system.

The first half of the sentence is the *chapter ending* – it names the chapter (*the ventricles*) and announces that it has ended (*So that's*). Thereby the viewer *closes the book* on that topic and knows which book has been closed.

Table 2. Outline of above section; as subcategories of Table 1b.

<p>1. HOOK</p> <ul style="list-style-type: none"> a Shock / surprise / delight b Fascinate, entertain/amuse, appetise, create suspense 	<p>5. SENSITISE</p> <ul style="list-style-type: none"> a Music Style/Occurrence by Design b Signal Change of Topic c Consistent style d Conform to video grammar
<p>2. SIGNPOST</p> <ul style="list-style-type: none"> a Chapter Heading: what's next? b Focus: what to look out for 	<p>6. ELUCIDATE</p> <ul style="list-style-type: none"> a Moderate intellectual depth/complexity b Enhance Legibility / Audibility
<p>3. FACILITATE ATTENTIVE VIEWING</p> <ul style="list-style-type: none"> a Pose questions b Encourage prediction 	<p>7. REINFORCE</p> <ul style="list-style-type: none"> a Repetition (with a different angle) b Compare / Contrast c Synergy between words and pictures
<p>4. ENABLE CONSTRUCTIVE LEARNING</p> <ul style="list-style-type: none"> a Concretise / Activate existing knowledge b Do not obscure the geography c Do not blinker, disclose the context d Pause commentary for contemplation 	<p>8. CONSOLIDATE/ CONCLUDE</p> <ul style="list-style-type: none"> a Recapitulate b Consolidate / Summarise key features c Chapter Ending

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