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Editors Podium — Don and Elizabeth Perrin

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EDITORS PODIUM

Drs. Don and Elizabeth Perrin

In the past century, educators such as Edgar Dale and James D. Finn talked about communication media as “time binding” and “space binding.” Today the focus has moved to “interactive”, “digital”, and “Internet.”

Time Binding: Art, sculpture, photographs, documentary film and newsreels record experiences and events. Restoration processes and digital reconstruction have extended the lifespan of perishable media and enhanced the quality of replication. Media of historical and cultural value can be inexpensively reproduced in the form of books, pictures, films, television, and now computers. Recorded media bind us to the past, and theatrical producers enrich these offerings with docudramas and stories that recreate the past and present and extend it into the future.

Space Binding: Space binding media provide instantaneous communication of current events to large populations. The provincial nature of television stations is expanded by satellite and cable so that, when the occasion demands, the whole world can share the same communications at the same time. Television delivers blow-by-blow accounts of important events even as they are happening. We were there for the Kennedy assassination and were among the first to be engaged in the drama of TWA flight 800. We have watched and listened to the world’s leaders as they work out century old problems. The number of channels limits the variety of messages communicated. New technologies have expanded local TV to hundreds and potentially thousands of channels. The Internet further expands these options. In the process, a significant bandwidth has been made available for educational programming and distance learning.

Time Binding and Space Binding: When we broadcast recorded media, the medium is both time binding and space binding. As we explore King Tut’s tomb on film or television, we are linked to the past along with millions of other viewers, some viewing at the same time, others viewing at different times. Time-binding communications can be played back “on demand” by renting a video, by accessing it from a cable television company, or on the Internet. Motion pictures are now distributed to theatres via private Internet for simultaneous presentation. This makes the transport of thousands of heavy reels of film unnecessary.

Interactive Communication and the Internet: The telephone gave us two-way communication in the nineteenth century. The first installations used a party line – a public network with no privacy. Switched networks now enable millions of simultaneous conversations around the globe. Interactive video is a logical extension of the telephone for business and education. It is now a feature of the Internet and will be a standard telephone feature within a few years.

Digital Communications: Images and print are accurately transmitted and replicated in digital format. Degradation of quality in successive copies is essentially eliminated, except where copy protection is used. Modern communication media make information very accessible. The Internet is the ultimate medium in providing virtually infinite resources for the lowest cost per viewer and the lowest cost per hour.

An expensive computer is no longer a prerequisite for Internet access – there are a plethora of email devices, set-top boxes, and web-TV appliances to adapt older technology. New products combine these features - witness the TV with videocassette or DVD player and Internet connectivity; the office digital copy machine that is also a network printer, scanner, and fax; and the cell phone with Internet access. Is it difficult to project what will come next?

Computers are intrinsic to every communication medium and every medium is synergistically related to the computer. People are becoming computer dependent for their very survival. Human interface design makes the computer friendly so that almost any person can use it to access or communicate information with little or no prior training. This is indeed the information age.

The technology, training and cost issues of the past century have been largely resolved. Educators must now focus their energies on effective use of these technologies for affordable high-quality education and distance learning that is time-binding, space-binding, interactive and digital.

GLOBAL CONNECTIONS, EXPANDING PARTNERSHIPS AND NEW CHALLENGES

by Jacques Hallak

We are here for at least three reasons.

First, we are educators, aware of the potential for using technology to increase our intellectual and organizational reach, expand our networks and means of exchange with colleagues worldwide, and empower learners in ways that we are only recently coming to imagine, let alone to realize as everyday operating facts.

Second, we are managers, decision-makers, responsible leaders of our respective institutions and organizations. We need to make decisions on how rapidly to proceed with new possibilities, how much risk we can accept, how much we can invest. Most important, we need to know whether we know what we are doing, and whether what we are doing is likely to advance our goals as educators.

Third, we are participants in a changing world in which powerful forces are creating both new opportunities and new concerns. These are tectonic shifts, literally changing the ground under our feet and causing familiar landscapes to seem unstable, difficult to define – particularly around the edges. The changing information and technology environment is part of this process of change. The changing nature of education is also part of this process. Learning is moving beyond the schools and universities. We need to think about learning continuously over the life cycles and in ways that transcend the institutional controls and academic frames that have defined the learning processes for decades, if not centuries.

The notion of the nation-state as a distinct entity -- self-sufficient, self-defining and self-regulating -- is being challenged by new realities inviting new international, (regional, global) partnerships networks and exchanges – in all sectors. Borders, of any kind, are increasingly porous. Information is one of the most mobile commodities in the world. Increasingly the educated and skilled information workers also are mobile. Similarly, the university is no longer confined to its campus or shaped mainly by its own traditions, its academic community and faculty, its libraries and other stores of knowledge or by other tangible factors.

New identities are emerging, shaped by interactions, exchanges, networked learning and joint projects with others in virtual communities, over distance and over time. Increasingly, coursework is treated as a commodity. New education providers are emerging, unapologetic about their commitment to meeting

marketplace demands. Industry is bypassing traditional universities, meeting its own needs for specialized training or advanced education. These new realities raise fundamental questions of how best to set and maintain education standards in the international environment.

What do these trends mean for the "national university?" Indeed, what does this mean for public universities providing public goods? How can we both set standards of excellence and, at the same time Collaborate to ensure equitable opportunities to learn in information-rich, high performance environments in all parts of the world?

I begin with questions shaped by these three identities for three reasons:

First, it is very important that we keep our identity as educators and keep the goals of improving education capacities, supporting learning and learners, foremost in our discussion. There is a very real danger that technology will push education in directions that are undesirable and unsustainable, creating new generations of problems, misinformation and loss of rigorous pursuit of academic excellence. There also is a risk that the education process can become only or mainly a transmission belt for information – answers divorced from the questioning, reflection, teaching and learning processes. We must not lose the distinction between information and knowledge – or the wisdom that comes from sustained reflection.

This is a risk for educators, for learners and I think for the technology community itself. Most of us are old enough and experienced enough to remember the last several rounds of technology-based solutions to education problems, and many of us still have the storerooms of unused equipment to prove the point. My first challenge to this group is to state our education goals and requirements as clearly and publicly as possible -- and to commit ourselves to sustaining the discussion of what these goals should be.

Intense human interaction is needed to get the full benefit of the virtual connections. The long-term benefit of distance learning arrangements may lie as much in the exchanges among the participating faculties as it does in the numbers of participating students. The collaborative processes of exchange and joint development are key to academic progress. Further, one of the lessons of the Open Universities in the UK and elsewhere is that the virtual education works best, and the virtual learners persist longer, when there is human interaction with a tutor, other learners and others with expertise in the field. We need to keep these ‘human factor" lessons in mind, both to improve the learning and instructional outcomes and to support the institutional reforms, institutional partnerships and – ultimately – new relationships among communities and countries in the global environment.

Second, it is equally important that we educators become thoroughly informed on the potential of the new technologies to support education progress, and learn how to invest in and manage these potentials. These are major investments as well as essential parts of the institutional infrastructure, shaping societies as well as economies. In the excitement about ICTs and education, there are many new ventures for which there is more hope than experience. A second challenge is for all of us to monitor our experience with rigorous research and assessment, report it as fully and openly as possible, and seek means of building the lessons learned and the learning process into our institutions, organizations and professional knowledge base. At UNESCO we are adopting a strategy of "prudent acceleration." Perhaps the most prudent rule we can adopt is to be clear about where we are trying to go, before accelerating!

A third reason for beginning with some suggestions about our respective identities and professional perspectives is that the changes most of us view as positive -- as opening up unimagined opportunities, as shaping new professional challenges – are not positive for all people, and are not shared by all people.

This is more than a matter of basic equity and basic rights, though it certainly begins with the concern for equity and rights. It also affects whether the optimistic visions for the information societies can be realized -- for the use of ICTs to connect people, to support open societies and open debates, to enable individuals to transcend authoritarian structures and assert their human rights and basic dignity. Ultimately, it affects whether the communities of connected people will grow and prosper and become more widely and deeply connected.

Without access, we may have unconnected, alienated and excluded populations. Without education, and without a commitment to open societies and to increased political, social and economic participation, we also may see well-connected islands of people, isolated from larger communities, talking mainly with themselves, listening to their own echoes, distrustful of others.

We need to reflect on what happens when opportunity is not shared, when information is not available to all. Will distance education mainly enable those with some education to get more, or can it also be used to ensure that those with little or no education opportunity get some? What happens when leaders in some parts of the world are operating with very different facts? How do we reassure people that others will listen fairly to their points of view? How can we use technology to enable more people to participate in the academic and professional debates, social and economic decision-making, governance and technology choices that shape our collective futures? Without a commitment to equitable access to information and to education, we will have unacceptable levels of excluded, alienated people, and lose the human potential of these people and communities. Neither open markets nor democracies nor technologic and education progress can thrive for long in such conditions.

Some facts may be useful to illustrate the point:

Half of the adults in the world have never made a phone call! There are approximately 880 million illiterate adults, most of whom will never turn on a computer or read a help manual. At least 113 million children of school age are not currently enrolled in primary school, let alone expecting to continue their education at universities and specialized training institutions. The number of personal computers per 1,000 inhabitants ranges from fewer than one in Burkina Faso and 3 in Zimbabwe to 27 in South Africa, 38 in Chile, 172 in Singapore and 348 in Switzerland. The price of a computer represents on average 8 years of wages for a Bangladeshi, less than 1 month for an American. Approximately 55 % of Internet users are in Canada and the United States, 24 % in Europe, 17 % in Asia and the Pacific, 3 % in Latin America and 1 % in Africa. Worldwide, 1 person in 10 speaks English, yet 80 % of websites are in English. The 13 biggest world suppliers of access to the Internet are all Americans. It is estimated that 75 % of European and Asian connections go first to the United States, before being sent back to their region of origin

So, where do we begin? How do we invest? How do we work and learn together? I suggest we begin with the three identities suggested at the beginning. We are educators, looking for better ways to educate. We are managers, looking for better ways to support our education mission. We are people noticing that things are changing and that we need to learn how to work in new ways. Learning, managing and collaborating in the new information environment basically come back to the same tasks and questions:

What do we need to know? How are we going to get better information? How are we going to share the information with enough other people that we can begin to use it to make sense of things and chart new paths to new challenges?

The key to making sound education management decisions on the use of technology to support education is learning how to measure results and how to compare what we are measuring – across systems, across countries and for different sets of learners. Quality assurance, accreditation and certification systems, student records systems, indicators and reporting systems, processes for evaluation and assessment … are among the challenges for educators everywhere.

These are essential functions, whether managing a few schools and programs or managing huge systems across large states and whole nations, working collaboratively with others in larger networks. As we move toward distance education networks, and higher education partnerships across national boundaries, these functions take on a somewhat different character. The technical problems of comparative assessment and accreditation across state and provincial lines in federal systems (such as the United States, Canada, Brazil, Germany, Australia) are not significantly different from those faced across

international boundaries. However, it can be much more difficult to devise mechanisms for cooperation and collaboration that all parties can accept and work with over a sustained period.

There are political concerns about sovereignty and control, important differences in education policy and regulatory environments and in the ways education institutions are chartered and governed, as well as the realities of language, culture and geographic perspective.

In many contexts, the use of ICTs in education is limited more by telecommunications regulations and rate structures than by education policies and interests. This puts a practical limit on the ability of learners to utilize distance learning opportunities and the capacity of universities and training institutions to participate in virtual exchanges (joint research, teleconferencing, data exchange) in real time and with broadband connections. There has been some international discussion of ways to increase broadband connectivity, perhaps by putting available spectrum up for auction to universities, museums, libraries and research entities meeting agreed criteria. Proposals such as the Global Service Trust Fund are modeled on the United States e-rate initiatives, which combined economic incentives, subsidies and policy reforms to achieve low-cost connections for schools, libraries and other entities meeting public good criteria.

As in the United States, the e-rate innovations and other means of ensuring affordable access to education institutions depend critically on the willingness of governments to use regulatory means to ensure open access. Without some incentives and public leadership, the markets in most cases will not do it. The experience of the United States and of Canada holds a number of lessons for how to create affordable access. These lessons are not just technical or economic in nature. They include ways to balance national objectives of ensuring full access to information, communications and learning opportunities with the self interest(s) of the private sector competing to improve telecommunications and information infrastructure capacities.

Taking these three factors together – technical assessments, education policy and regulatory environments, communications policy environments – creates a complex set of choices that is difficult for any single country to address. Multiplying them exponentially by 20-50-150 times as additional countries join the enterprise – can be daunting indeed. Each nation, and each group of higher education institutions, needs to set and maintain standards. Each wishes to participate in new initiatives with additional partners and innovations, yet few wish to concede any part of their sovereignty and institutional identity. This can, and often does, lead mainly to failed agreements, partial agreements and pseudo-agreements that pretend to participate in virtual partnerships but in fact serve to protect national universities, preserve academic privilege and restrict the opportunities for professional movement.

This is the environment in which UNESCO tries to be of service, facilitating the exchanges among an increasing number of interested parties, working toward standards, benchmarks, indicators and processes by and through which institutions can collaborate as well as compete. Thus, my third challenge – my invitation – is to find better ways to collaborate internationally on the setting of standards, quality assurance and open monitoring of the increasingly complex and crowded environment for distance education and on-line learning.

N.B. The aim here should not be to control or to regulate. Rather, it should be to help countries, groups of countries or groups of higher education institutions, professional associations and specialized bodies to collaborate in the setting of standards, the development of mechanisms for assessment and accreditation, and the reporting of progress. In this regard, the self-referencing accrediting bodies in the U.S. may provide at least partial models for the emergence of similar accreditation bodies in the international environment.

Several mechanisms have been brought to my attention, each with some relevance to the international environment. In addition to the regional accrediting bodies and the related professional bodies:

- The Council for Higher Education Accreditation (CHEA) – which sets a high standard for the formation of accrediting bodies
- The Distance Education and Training Council (DETC) – an important mechanism for accrediting on-line coursework
- The Global Alliance for Transnational Education (GATE) – an important step toward a system for certification of programs in the international or transnational environment.
- The Council for Adult and Experiential Learning (CAEL) -- useful work in benchmarking the quality of coursework and training programs for the workplace.
- The National Council for Accreditation of Teacher Education (NCATE) – teachers and teaching continue to be key to education, and the development of standards aligned with the new education objectives and expectations is exceptionally important, in each country, and internationally.

There are many other mechanisms setting standards and providing accreditation and certification in specialized fields, including relevant examples from other regions. For example, the European Credit Transfer System, developed by the European Union, provides a way of comparing learning achievements and allocating "ECTS credits" to course units.

These and other mechanisms bear careful study for possible lessons applicable to assessment, certification and accreditation in the growing international higher education environment. It is important to note that they for the most part are

initiatives of the education and training communities themselves, which recognize the need for standards, for collaboration in the setting of the standards and for careful, rigorous monitoring and open reporting on conformance with the standards.

Education is a public good. This simple statement is central to UNESCO's mission, to national laws and international agreements concerning the right to education, and to the international commitments to reach EFA targets. Yet, the experience of using market mechanisms and self-referencing organizations to set and maintain standards for such an important public good is of great interest to other countries. I am aware that there are concerns about some of these mechanisms, particularly those that treat education coursework as a commodity. Educators in other countries need to hear these concerns, and to examine your experience. They can make up their own minds. I would like to explore ways by which UNESCO could help make this experience more accessible to other countries. .

UNESCO will continue to take an active part in the global debate about these issues. It will continue to analyze the educational, economic, technical, but also ethical dimensions of this debate. And it must facilitate an open and sustained dialogue between positions often separated by a gulf of ideology, self-interest, and mutual ignorance.

UNESCO should not itself intervene as a labeling and accreditation agency. But it can and should develop guidelines to help member states individually and collectively to determine the quality and appropriateness of education that is for sale. It is in the interest of all partners, including from the economic sector, to introduce coherence and transparency into this new, mushrooming market.

UNESCO will, in the first instance, examine the legal issues involved, look at the regulatory mechanisms in place and consult widely on what the main areas of need are for quality assurance, both for individuals and for governments. It will develop and test guidelines, and consider work on a declaration or recommendation that could form the basis of an international agreement in this area. The aim is not to control or regulate, but to find ways to provide information about quality, and to encourage the production of educational software that respects cultural specificity, diversity and those universal values on which UNESCO is founded.

Allow me to mention briefly a number of other areas of concern. These need to be talked about and addressed with care, but they do need to be addressed.

First, issues of intellectual property. To realize the economic potential of new publishing products such as educational CD-ROMs and other multi-media products that are easily exported and used everywhere in the world, exporters try to enforce copyright protection. The risk of this expansion of private, commercial

provision of learning opportunities is that it blurs the overall notion of education as "public goods". It also risks having educational and cultural products produced openly and collaboratively in one part of the world coming back as copyrighted products of international publishing.

Second, issues of quality control. As more and more educational software and entire courses of study become available electronically, originating from any location in the world - whether for free download or against payment -, the need for a fresh look at quality control for individuals and institutions to assess the academic merit of courses and programs becomes acute. There are very real problems of bad content, unethical providers and other abuses along with the potential of sharing information and creating equal access to shared learning spaces.

Third, a closely related issue is that of standardization of educational contents. There is a clear danger that the volume and accessibility of multimedia products from a few major producers serving dominant markets such as the United States will overwhelm local cultural values and perspectives. It is no accident that recent national cultural policy statements of countries such as Australia and Canada are directed at developing strong home-grown multimedia industries to help counteract such external influences. Such policies carry some risk of reducing access and stifling the creation of new materials. If we do not want to see such protectionism grow, we need to find better ways of working collaboratively through institutional partnerships, of supporting the local production of educational and cultural products, and of facilitating access for a wider range of producers.

A good start on this will be to ensure that the financial arrangements for distance education programs include provision for support of producers on both ends of the exchange, among all the networked institutions participating. We also need to think about the processes of developing materials for specific uses. The quality of education materials must include sufficient diversity to enable local educators to make good choices. And, the process of developing materials, aligning them with education goals, teacher training and learning contexts is central to the improvement of education at all levels. Even excellent materials sourced from elsewhere can be inappropriate if the effect is to short-circuit these local processes of consensus-building, team-building and iterative improvement

Let me close by thanking you for the opportunity to participate in this event and to help to put at least some of the questions out for discussion and some of the challenges out as invitations for collaboration and partnership.

I began my professional life many years ago as a teacher, a primary school teacher, and the lessons of that early experience have stayed with me all my life.

As we move forward to explore the possibilities of using technology to improve education, we need to keep a few things clearly in mind. First, our focus must continue to be on education, how to improve learning and how to assess what we are doing and share the lessons as widely as possible. Second, the education process is fundamentally about learning and teaching. Our first priority is to support the learners and the teachers, not the technology.

I thank you.

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Transforming Education:
Case Studies in Systems Thinking

By Kira S. King, Ph.D.
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Systems Thinking: The Key to Educational Redesign

As we approach the next millennium, rapid societal change has dramatically altered our educational needs—which in turn is challenging us to transform the structure and processes of our schools. The simplest explanation for the current need of educational change, is that we, as a society, have outgrown our schools. That is, the predominant educational system of today was created for the industrial age needs of sorting students into future factory workers and leaders, towards disseminating core knowledge, and towards building basic skills (Reigeluth, 1994). While this model was appropriate earlier in this century, with the advent of the information age, and now the beginning of the communication age (Thornburg, 1995) we are finding that it no longer meets our societal needs. In fact, it is limiting the ability of teachers and students to adapt to the 21st century.

As the amount of information increases exponentially, our educational system can no longer focus primarily on memorizing a core body of knowledge. There is no way any single individual can master all of the information available. Rather, our schools must help children become skillful manipulators, synthesizers and creators of knowledge. And since we are now entering an era of global communication and collaboration, we need professionals who can work on teams to solve complex problems. Society no longer relies primarily on factory workers, but on life long learners who can think critically, solve problems and work collaboratively. These are the skills of tomorrow's "knowledge workers" (Drucker, 1994). Since, industrial age schools were not designed with this goal in mind, we need entirely new concepts in learning and teaching—rather than more efficient industrial age schools.

Just understanding this need for redesign, however, does not provide us with the necessary skills to successfully create alternative schools. All too often, reform efforts fail because we lack the abilities required for systemic design; we cannot analyze the existing school model holistically and recreate it from the ground up. Instead, we often remain entrenched in our current notions of education and only tinker at the edges of schools— making minimal changes. With the grandest of ideals, designers often aim towards creating a new school that looks totally different from traditional education, only to find that the resulting system is very similar to a traditional classroom!

To avoid this trap of piecemeal change, we need to develop expertise in systems thinking which can help us determine how our schools will be designed

organizationally, how people will interact within the system, and how people and things will move in and out of the system. Unfortunately, systems thinking is a difficult skill to acquire; and it is not commonly taught. To remedy this deficiency, we will present SIGGS, a model that will enable readers to practice systems thinking while examining their current educational systems and while designing new schools and classrooms.

SIGGS, is an educational systems model created in 1966 by Maccia and Maccia through the synthesis of four different theories: Set, Information, di-Graph, and General Systems. Unfortunately, since SIGGS is written in highly complex mathematical language, it has received little attention since its creation. To make SIGGS more accessible, we will translate several SIGGS concepts into every day language by contrasting two alternative educational models—a modified Montessori classroom and the museum school—with our image of the traditional school model. As you follow along with our analysis of the different schools using SIGGS concepts, you will explore how students learned, teachers taught, and how objects, materials and people flowed into and out of these systems. This process will give you ideas on how you might redesign your own school or classroom. We will continue with a brief introduction to SIGGS, and to the two case studies we conducted on The Smithville Montessori School (pseudonym), and four museum schools.

SIGGS: Relevant Literature and Supplemental Resources

In several publications, Elizabeth Steiner Maccia and George S. Maccia (1976, 1975, 1966) presented their SIGGS Theory Model which they created by combining four different theories. From this model, they then developed a theory of education, consisting of 201 hypotheses, which are presented, in the 1966 manuscript. These hypotheses describe relationships among properties of educational systems. For example, one of the hypotheses is: If centralization in an educational system increases, then active dependence decreases. In order to understand this and other hypotheses, readers must first master up to 60 properties of systems that Maccia and Maccia describe (such as active dependence and compatibility).

Perhaps the simplest place to start, is Steiner's (1988) description of an "educational system." According to her work, educational systems are comprised of four components: teachers, students, content, and context. A teacher is defined as someone who guides or leads the learning of others. While we typically think of direct instruction, this also includes indirect guidance—such as teacher-created or selected learning materials or discovery centers. A student is defined as someone who intends to learn through guidance from a teacher; whereas a learner is someone who attempts to learn on his or her own. Content refers to what is actually learned; and context is the setting in which the content is mastered.

Using a systems approach, Frick (1993, 1991) has examined the kinds of relationships that can exist among these four components, such as, teacher-

student relationships, student-content relationships, teacher-content relationships, etc. Through this exercise, Frick portrays our image of industrial age schooling. For example, in teacher-student relationships, teachers of the typical industrial age school generally present information, assign readings, grade assignments, supervise student seatwork and answer student questions. For student-content relationships, students often find the subject matter to be disconnected from their lives, have a passive interaction with the subject, lack the opportunity to choose their own content; and consequently, they are often bored with the subject matter. In teacher-content relationships of industrial age schools, teachers often have little control over what content is to be covered, and are usually required to use district-mandated learning materials, such as textbooks. From this exercise, we can not only begin to see what has often occurred in industrial educational systems, but we can also envision how we might change those relationships.

In order to understand the hypothesis presented above (centralization in an educational system increases, then active dependence decreases), let's look at how teachers, students, administrators and other stakeholders inter-react with content. Generally speaking, most industrial age schools have a high degree of centralization, with decision making lying more in the hands of administrators, than with teachers, students or parents. According to SIGGS, if centralization is high, active dependence is low. Active dependence relates to whether or not people within the system have the power to impact influence others. Indeed, quite often, teachers, parents, students, and community members have little power to impact what content is taught, or the materials used to cover that content. Instead, they implement choices made by publishers, textbook adoption committees, administrators, and school boards. Therefore, it does follow that if centralization is high, active dependence is low.

Through using SIGGS concepts, educational designers can gain an understanding of how components of current schools systems are interacting with one another, and they can then re-design their systems. To explore more SIGGS concepts, point your browser to the Web site created by Frick and a group of researchers (1995-1999).

Methodology and Data Sources

The Smithville Montessori School

In 1993, a qualitative case study on the upper elementary classroom of the Smithville Montessori School (SMS) was conducted over a two-week period during which a team of researchers (Annelli, King, Lutz, Yi & Zhu, 1993) studied the classroom as a unique instructional system. Data collection methods included observation, interviews, and document analysis. All five researchers individually observed the classroom and studied class materials for a total of six visits. Interviews were conducted with the head teacher (Mr. Morrison), four graduates, one parent, and with the second author who was a former member of the Board of Directors with ten years of SMS involvement.

The Smithville Montessori School (SMS), was located in a small midwestern town, and was founded in 1968. It was accredited by the American Montessori Society in 1971, and was owned and operated by its students' parents. Since there was no principal, most of the day-to-day running of the school was carried out by the teachers and the school's sole administrative staff member who performed secretarial and office management duties.

In order to understand Mr. Morrison's classroom, a brief review of Montessori education will be presented. Even though Dr. Maria Montessori developed her philosophy nearly 100 years ago, her approach was uniquely modern and foresighted. In fact, the major components of Montessori education have been echoed and re-discovered in the work of Dewey, and in the recent constructivist movement (Bednar, Cunningham, Duffy & Perry, 1991; Bonk & Cunningham, 1998; Duffy, Lowyck & Jonassen, 1993).

The Montessori classroom is a community of learners with the following characteristics: freedom, structure, authenticity, and student ownership. First, children manage their own time, choose their own activities, and move freely about the classroom. However, they also must develop the maturity and independence needed to manage their time productively. Second, while Montessori classrooms appear to be chaotic, there is an underlying structure supporting the bustling activity. Third, real-world objects from the local environment are bought into the classroom, and are used by the children in the same way they are used in society. And finally, the Montessori learning community gives students ownership over their environment. They are responsible for managing their own time, for teaching each other, and for organizing and cleaning their classroom (Lillard, 1972; Wolf, 1975).

Following this belief in active learning, the Montessori classroom is a place of independence and responsibility. Accordingly, very little time is devoted to whole class instruction. Instead, teachers carefully design learning environments that contain centers of real-world activities that are uniquely suited to the children's interests and developmental abilities. Students are free to engage in work at the centers at will; however, they are required to finish the projects they start and to return all materials to their proper place afterwards. As the children develop, they become responsible for more tasks, such as completing assignments on time, leaving the room unsupervised and teaching their younger classmates. Thus, there is a dual emphasis on increasing levels of independence and responsibility.

The Museum School

During the past ten years, several museums and schools have collaboratively created a new educational system, the museum school. Since there is minimal research exploring their instructional practices and institutional design, the first author conducted a qualitative multi-case study on four museum schools (King, 1998). Each school was visited for approximately five days, and 32 participants were interviewed. Data collection methods consisted of interviews, observation,

document analysis, and a follow-up survey. Based on findings from these four cases, the museum school concept can be described as a school that is collaboratively designed and implemented through a partnership between a school district and at least one museum in order to implement museum learning that engages students in creating their own objects, exhibits or museums.

In these four schools, real-world objects and the exhibit development process were combined with constructivist and sociocultural curricula that embedded learning in long-term projects and apprenticeships. With the goal of situating learning in authentic contexts, children created their own knowledge through mentoring by museum professionals, by conducting research, and by developing their own exhibits. Each school implemented museum themes in which district-mandated learning goals were pursued through projects requiring students to research and create artifacts and exhibits. Throughout these eight week themes, students and teachers worked with museum educators on a daily or weekly basis, learning how to learn in a similar way that museum professionals learn while building their collections and developing exhibits. For example, at The Museum Magnet School, in St. Paul, first graders learned about science, math, and language arts while working with museum educators and teachers to create an exhibit on worms and recycling. At the Stuart-Hobson Middle School, eighth graders worked with museum professionals from the Smithsonian Institution—learning math, English, fine arts, and science—as they created an exhibit on Native Americans. At The New York City Museum School, seventh graders worked on social studies and English with their classroom and museum teachers by researching colonial America in the period rooms and portrait galleries of the Brooklyn Museum of Art.

Exploring Three Classrooms through the SIGGS Lens

Patterns of Interaction

In order to understand the teaching and learning process within our three models, we will first examine connections between teachers, students, and parents by studying the "affect relation" of "guiding the learning of..." To do this, we must draw one diagram for each system, as illustrated in Figure 1.

Figure 1: "Guiding the Learning of . . . " Digraphs

Xxxxxxxxxxxxxxxxxxx insert Transform Fig. 1 xxxxxxxxxxxxxxxxxxxxxxx

In traditional classrooms, connections tend to go from the teacher to the students; students seldom have connections to the teacher or between themselves with respect to "guiding the learning of." Thus, generally, the teacher is active in the instructional process, while students are passive recipients. The

lack of arrows from students to teachers indicates their passive role, and the fact that we don't think of students guiding their teachers' learning. We say there is a high degree of passive dependence, and that much of the time students are dependent upon the teacher's direction.

In the SMS and museum school classrooms we observed, however, we saw a variety of configurations. In Digraphs B and E, we can see more active dependence, as arrows flow both ways between a variety of individuals. Interactions with double arrows portray situations where children were given more control over their learning by teaching each other, and where museum educators and classroom teachers were guiding each others' learning as they collaboratively designed and implemented museum themes. Since students in both classrooms were more active in their own learning, many were motivated to pursue classroom activities even when teachers were not in the room. It is important to stress, however, that in all classrooms we observed times of whole class instruction, that resembled Digraph A.

Who Selects the Content?

Next, we will explore how content was selected in the three models, looking at levels of filtration controlling what materials were brought into the system. In industrial age schooling, our digraph (Figure 2) depicts a highly centralized process, demonstrating how little control many teachers have over the content, and how disconnected parents can be. Generally, it is publishers, textbook adoption committees, administrators, and school boards who determine which textbooks will be written and adopted; and it is usually the teacher’s role to implement those decisions. Quite often, there is an indirect relationship between publishers and textbook adoption committees, where the publishers filter their content in order to receive acceptance by the textbook adoption committees to accept their books. Typically, the states of California and Texas wield the most influence in content selection (Norman Overly, personal communication, September 11, 1998). Administrators and teachers can then only choose from textbooks that have already been filtered by the textbook adoption committees; they have little say in what was written in those textbooks.

Figure 2: "Selecting the Content" in the Industrial Age School

Xxxxxxxxxxxxxxxxxxxxxxx insert tranform Fig2 xxxxxxxxxxxxxxxxxxxxxxxxxx

In the SMS and museum school classrooms we observed (Figure 3), however, centralization and filtration were minimal, enabling teachers to choose from a diverse range of learning materials. Teachers empowered children and their parents to influence the content, giving students more control over their learning. For example, at SMS, content-decisions were made primarily by the teachers, not administrators. While Montessori teachers begin their careers with the

standard set of Montessori teaching/learning materials, they are expected to continually design other materials based on their students' needs and interests. In the Montessori classroom we observed, each student was required to conduct twelve research projects every quarter. At the beginning of each new quarter, the head teacher sent a note home, asking parents to describe topic areas that would intrigue their children. He then designed projects around those interests within reasonable limits regarding time and scope. Throughout the year, each student used reference books for their individual assignments; these books either came from the classroom library, the school library, or from the local public library which the entire class visited one day per week. Therefore, in this classroom, the teacher, parents, and students had significant influence over content selection.

In the four museum schools studied, teachers and partnering museum educators worked together with students and various subject matter experts (artists, builders, curators, exhibit developers) to create content and learning activities that interested the students, that met district-mandated learning goals, and that leveraged the museum's (and other informal learning centers') objects and exhibits. Once again, instead of focusing primarily on standard textbooks, content was now generated by teachers, students, and experts through a variety of resources, such as local informal learning institutions (museums, zoos, botanical gardens, history centers, etc.), traveling exhibits, the Internet, and local experts.

Figure 3: "Creating the Content . . ." for the SMS and Museum School Classrooms

Xxxxxxxxxxxxxxxxxxxxxxxxxxxx insert transform Fig3 xxxxxxxxxxxxxxxxxxxxxxx

Now that we have a landscape view of the three different school systems, we will zoom in closer for an analysis of how people and things move in and out of the classrooms.

Bringing People and Things into the System: Feedin (feed-in) and Filtration

The process of feedin involves bringing people and things into the system in two steps: toput and input. First, when things are made available to the system they become toput. Second, some or all of this toput is then brought into the system and becomes input. We measure feedin, and its sub-components, through levels of uncertainty or variation: how certain is it that your child will be enrolled into the school—will become input? To answer this question, we must consider filtration, which determines what items are made available to the system—to become toput. In public schools, since there is minimal regulation regarding admission, nearly all children who apply become toput, are eligible for admission. This results in a higher degree of variation within the input—in many different types of students regarding socio-economic status, ethnicity, achievement, etc. It is important to realize that when we state there is a high level of input, we are saying there is diversity among the student body, not that there are many students entering the school.

The concepts of feedin and regulation can also be applied to the acquisition of learning materials. In many traditional schools, filtration limits learning and instructional materials to standard textbooks, workbooks, and manipulatives. Teachers often experience this when principals, school boards, or state departments of education dictate what material will be covered. When a principal denies a teacher's request to implement a new curriculum, this is an instance of filtration. When all students in a class have the same learning materials, there is low input—which means there is little diversity.

Figure 4: Moving People and Things In and Out of the System

Xxxxxxxxxxxxxxxxxxxxxxxxx insert transform Fig4 xxxxxxxxxxxxxxxxxxxxxxxxx

In the SMS classroom we observed, there was higher input (greater diversity) than we typically see in traditional schools. This results from the fact that Mr. Morrison (the head teacher) was responsible for selecting learning materials and was not restricted to any district-mandated textbooks. Therefore, there was less filtration. The result was a greater diversity in learning materials—in higher levels of input. In fact, the only standard text he used was a math workbook.

Since the bulk of student work required the completion of research projects, most of the curriculum consisted of content specific reference books. Rather than using language arts textbooks, Mr. Morrison established an extensive classroom library of reference books. Additionally, the students used the school library; and weekly, the entire class visited the local library to select additional books for their research projects. Thus, there was weekly feedin (and feedout) of library books for each student.

In the museum schools observed, there also appeared to be higher levels of input, and greater diversity in learning materials. For example, museum educators were on-site on a weekly or daily basis, bringing new learning activities and resources—some even established offices within the schools. Also, at the Museum Magnet School of St. Paul traveling exhibits were brought into the school on a regular basis, and objects from the Science Museum of Minnesota were installed in the school atrium.

Therefore, learning material toput for both the SMS and museum school classrooms was greater than in the traditional school model. There was greater uncertainty of—or variation in—learning materials than is typically found in most industrial age classrooms.

Moving People and Things Out of the System: Feedout and Regulation

Feedout is the opposite process of feedin, representing the process of making components available to leave the system (fromput), and the subsequent release

of these components (output). Each year, high school seniors become fromput, and then become output as they graduate.

Just as feedin is monitored through filtration, feedout is monitored through regulation (Figure 4). When there is a high degree of regulation, there is less uncertainty or variation in the output. For example, if a school only allows students with a minimum GPA of 3.7 to graduate, then there is a high degree of regulation with little variation of the student body with regard to GPA.

Besides occurring on an annual basis, regulation happens daily. In Mr. Morrison's class, student performance was regulated daily through the use of something he called the 9-12 Card System. While students were free to manage their own time throughout much of the day, they were responsible for completing three units of work each day—one major (a paper, a poster, fifteen fact cards) and two minors (five fact cards, a weekly reader or a computer software program). When students were not engaged in small group or whole class activities, they were expected to work on their individual projects.

Upon entering the class in grade four, each student was given a tangerine punch card with rows of pluses and minuses. At the end of each day, students were eligible for dismissal only after having an exit interview with one of the teachers. If the child had completed the required major and two minors, the teacher punched three pluses; if not, she punched three minuses. At the end of each quarter, the punch cards were reviewed, children were moved up or down a color, and extra privileges were either awarded or rescinded. Privileges included the following: talking quietly with friends, visiting the library or outside deck unaccompanied, and conducting an independent field trip.

This system helped the teachers monitor each child's development of personal responsibility and time management. It reflected a type of regulation, where each day, students were only eligible for dismissal (can become fromput), after they had their exit interview. Afterwards, they become output—their parents took them home.

It also helped foster self-discipline. While researchers were observing Mr. Morrison's class, they did note off-task behavior. At times, children engaged in the quiet chatter of work: humming a song or talking to other students while working. At other times, this behavior escalated to such a level, that the students were not getting much work done. Teachers did not stop student chatter because children were free to manage their own time, even if it meant that they squandered time on off-task behavior. At the end of the day, however, the students were responsible for having done their work. If a child had not completed the one major and a minor, it was noted on the punch card. If the problem escalated, the student lost various privileges. For example, after failing to complete sufficient work, several students were no longer allowed to place their desks next to their fellow students; instead, they had to sit by themselves alongside the walls until they had demonstrated the ability to manage their time effectively. Therefore, through the use of regulation, this classroom had a strong structure presenting children with real-world choices and consequences.

Feedout was also different for the museum school classrooms. Student-created exhibits and objects were leaving the school and being installed at local museums. Additionally, students and teachers left the school on a regular basis to visit museums as alternative learning sites. For example, at the New York City Museum School, students and their teachers spent several hours two to three days each week at one museum.

If We Take Different Pathways, Do We Still Reach the Same Mountain Top?

Using a metaphor of mountain climbing, we will explore three SIGGS concepts—homomorphism, equifinality, and compatibility—that focus on both the process and outcomes of student learning. In industrial age schools, stakeholders typically feel that all students must complete the same activities if they are to acquire the desired skills; that is, all students must follow the same pathway to arrive at the mountain top.

It is this belief that leads to high levels of "homomorphism." Simply put, homomorphism analyzes the degree of similarity within an educational system, such as a classroom. For example, regarding the affect relation of "guiding the learning of (X)," homomorphism measures the degree to which students are all doing the same thing (X). In industrial age schools, homomorphism tends to be high; that is, quite often students are all working on the same activities with the same textbooks at the same time of day. For example, guiding the learning of geometry typically involves a teacher lecturing to students who follow along in their textbooks.

In the SMS and museum school classrooms we observed, however, we saw lower levels of homomorphism, with greater diversity in learning activities. In Mr. Morrison's classroom, while there was some whole class instruction, much of the day consisted of unstructured time in which a variety of learning activities occurred: some students worked on their research papers individually, others consulted with a teacher, and a small group of students worked with the head teacher on a math lesson. Additionally, the instructional guidance by the teachers was often offered indirectly, through the learning materials they had acquired and developed for the students. At the Stuart-Hobson Middle Museum Magnet School, the first author saw low levels of homomorphism while students prepared their Native American exhibit opening. One third of the grade level was painting murals, another third was in the gymnasium building life-sized buildings (i.e., igloo, teepee, longhouse), and the remaining third was working—with little or no supervision—on exhibit artifacts, i.e. hand-drawn portraits of Native Americans, portraits frames, beaded works, etc.

Such low levels of homomorphism stem from a belief in "equifinality," which suggests that there are many different pathways leading to the same destination. Though students took different paths, they all climbed the same mountain top. For example, these museum school and SMS classrooms encouraged students to pursue unique avenues of research and inquiry. At SMS, each semester,

students conducted 12 individual research papers covering different content. At the museum schools, students covered basic learning goals through a variety of different museum themes, such as a Worm Exhibit, a Native American Unit, a Habitat Theme, a Colonial American Module. While the content changed, it was believed that children learned similar skills as they defined their research project, generated questions, gathered data and information, synthesized findings, and published their work through papers, exhibit openings, and presentations.

While not all children learned the same content; it was believed that they would all cover learning goals enabling them to pursue lifelong learning, critical thinking and problem solving. This approach is quite different from traditional elementary schools which generally require that all students complete the same or highly similar learning activities.

A final concept we will present, compatibility, deals with the mountain top destination you choose for your students. How compatible are the graduating students with the "negasystem?"—that which is not part of the system. When we examined the three educational models, we found that this issue was dependent upon how we defined the negasystem. For example, were we examining how compatible graduates were with the traditional school environments they typically entered? Or were we interested in how equipped these graduates were to be communication age lifelong learners? When pursuing the first question, our findings suggested mixed results. During interviews with participants from the SMS classroom, and from the four museum schools, we heard anecdotal evidence suggesting that the students performed well academically after graduation. However, four SMS graduates did express initial difficulty with their loss of control over their learning—when leaving the SMS elementary program and entering a traditional public middle school.

While graduates of these alternative educational models appeared to perform well in industrial age schooling, it is important to realize that the skills society wants are not those that are most typically required for academic excellence. As Honebin, Duffy and Fishman (1991) state, authentic activity for traditional schools tends to be test taking and paper writing, but authentic activity for the workplace involves thinking critically, solving problems, and working collaboratively. Therefore, we need to redesign our schools so that the primary focus is not on information acquisition, but on the process of learning, thinking and problem solving.

Both SMS and the museum school models we studied appeared to be highly compatible with the communication age workplace, by helping children become self sufficient learners capable of building their own knowledge. However, it is precisely these skills which appeared to cause SMS students initial difficulties upon acclimating to the public middle school. For example, the four graduates we interviewed found it most difficult to adjust to a learning environment in which they had little autonomy. After years of individual responsibility and control over their own learning, suddenly these students found themselves having to adapt to the "sage on the stage" model where the teachers were now primarily in control of the learning process. Why are we asking our children to give up the very skills

we want them to acquire? Additionally, as existing museum schools seek to evaluate their success, and new museum schools are creating assessment systems, they are struggling with an outdated system that uses standardized testing as the primary means for measuring success. Since standardized tests do not measure the higher order thinking skills typically needed in the communication age workplace, they are not appropriate tools to be used as sole measures of a school's compatibility with its negasystem. When considering compatibility, we are confronted with the necessity of redesigning every layer of our schools so that success in schools mirrors success in the workplace.

Educational Significance

Society is experiencing the most amount of change it has ever experienced in recorded history (Drucker, 1994). To navigate these choppy waters successfully, we must redesign many of our societal systems, not only to meet current needs, but also to shape the future we all envision. One of the most important systems we need to redesign is our schooling. While it is tempting to have others re-design our schools for us, this is not the optimal choice because only the stakeholders themselves can truly understand their own unique needs and goals.

However, we cannot effectively design our schools unless we have skills in systems thinking. SIGGS is a powerful conceptual model that enables designers to analyze existing schools and design alternative systems by exploring the way people and things interact. As you are designing your new school or classroom, begin by defining the learning mountain top. What types of learning goals are you setting for your students? How compatible will these graduates be with the schools they enter? How compatible will your graduates be with the future work place?

Next, picture the pathways your students will take up the mountain top. Will you have high levels of homomorphism? That is, will students be doing the same tasks to arrive at the desired skill levels? Or will your program espouse equifinality, encouraging students to chart unique learning pathways up the mountain top? Such an approach will encourage the development of distributed expertise—such as the Montessori system of education (Lillard, 1972)—in which students acquire knowledge in different areas; yet, all students will also be building common skills in lifelong learning, problem solving, inquiry and collaboration.

Once you have your basic goals and philosophies articulated, continue your design by drawing a digraph depicting an affect relation, such as "Guiding the learning of..." Ask yourself, "Who is guiding each other’s learning?" Is the teacher in primary control? Or are you creating knowledge building communities where teachers, students, and experts are guiding each others’ learning, as appropriate?

Next, think about how you will select content for your students. Will administrators and text book adoption committees be in primary control? Or will

teachers, students, parents, and subject matter experts be free to choose from a variety of materials? Also, determine how you want to manage the feedin/filtration and feedout/regulation processes. Who will influence how people and things move in and out of the system? Will parents, students and community members have access to the system?

Such disciplined inquiry of asking questions and drawing diagrams helps educational designers break out of their traditional notions of schooling and realize their dreams of creating something entirely new. Traditional industrial age school systems are no longer capable of preparing our children for the future. There is nothing more important than this goal of educating our children to become lifelong learners capable of working effectively in the communication age; and perhaps there is nothing more challenging, overwhelming, and exhilarating. Even though SIGGS is a difficult language to understand, it is an invaluable systems thinking tool that supports us in the redesign process.

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A MULTIPLE-CASE STUDY OF EXEMPLARY INTERNET COURSES

Keith B. Hopper and Stephen W. Harmon

Introduction

The theory base in distance learning is chaotic and confused (McIsaac & Gunawardena, 1996). This is the case in distance learning in general, and more so in the specific case of online teaching. The literature does not meaningfully guide the design and development of Internet courses (Brown & Wack, 1999; Schrum, 1998). With the recent rapid rise in the number of Internet-based courses, this lack of well developed theory is becoming even more critical. Mosaic, the first widely adopted Internet browser was introduced in 1993 (Wiggins, 1994) and thousands of online courses have since been developed and delivered in and for higher education.

The explosive growth of Internet-based teaching in the face of a paucity of relevant research highlights the need to examine the issue of what determines an excellent online course. There are Internet courses reputed to be of superior quality, but what can be said of these? We conducted a multiple-case study of exemplary Internet courses, guided by two initial research questions:

1. What are the elements and attributes of current exemplary Internet courses? Are there common construction, design, application, and interaction elements in Internet courses of excellence?
2. What is the role of learning theory, if any, in current exemplary Internet course development?

Methodology

A pilot study on a locally accessible online course was performed to develop and refine the computer-managed research database. The first phase in the formal study involved identifying exemplary Internet courses using the reputational case selection method of expert referral (LeCompte & Goetz, 1982). Instructional technology subject matter experts (SMEs) were queried by email for attributes of exemplary online courses. Their responses were compiled and integrated to create an exemplar profile used to screen course nominations.

Having created a screening profile to identify an exemplary Internet course, nominations for exemplars for study were solicited from professional listservs (instructional technology, distance learning, and education), organizations that have evaluated Internet courses for awards and recognition, professional colleagues, and authors of current literature on online teaching.

The setting for this study was higher education in the English speaking world. A cluster of five courses was selected from a nomination pool of about 70, and studied concurrently. This method resulted in a highly efficient and uninterrupted flow of data, with the responses of one developer filling the lag time of another. This study aimed to look beyond the predefined attributes qualifying the courses as exemplars, for deeper and unforeseen insights on excellent Internet courses. Five sources of data were included in the study: (1) documents, such as course syllabi and online course materials, (2) archival records, such as threaded discussion board records, (3) interviews conducted by email, in person, and by telephone, (4) direct observation, including the researcher's narrative log, journals of observations and reflections, and (5) artifacts such as student projects and papers. Data were analyzed and coded using qualitative research and case study conventions (Miles & Huberman, 1994; Stake, 1995; Yin, 1994). One course was dropped from the study, as major course elements were found to be incomplete. Data saturation was reached with the remaining four courses in the study.

The Courses

All four exemplars in the study used either WebCT or Blackboard, both online course platforms with a pronounced positivist orientation. That is to say the structure and tools provided in these programs seems designed to facilitate traditional instructivist pedagogies, and not as readily lend themselves to constructivist learning and instruction. The courses included in the study follow:

Course 1, titled Introduction to the Internet, was developed in the information sciences division of a large, urban community college in the Western U.S. This is the oldest course in the set (eleven cycles) and was co-developed and delivered by three information sciences staff members. Very popular (86 students), this course enrolls students both on and off campus. This course is an exemplar primarily due to its high state of refinement, and because the Internet is integral to the course content. This is a course about the Internet, delivered to college students, and it is itself nicely delivered via the Internet in a way that reveals and takes advantage of the WWW. Content expertise is the dominant quality in this course, although humor and teaching skill are also evident. The course was originally developed in HTML as a website and has now been adapted to WebCT.

Course 2, titled College Writing, was developed in the English department of a rural community college in the Northeastern U.S. Of the four exemplars in this study, this course at once makes the least visible, but possibly most effective use of technology. This is a course about writing, and technology is judiciously employed only if it supports this primary goal. More than any of the courses in this study, this course seems to fulfill Dede's (1990) prediction that "Eventually, distance learning may be the preferred delivery system for certain types of instruction . . ." (p. 252). Although technology performs no direct role in teaching students to write well, it provides an efficient and nearly seamless student-to-

teacher conduit for delivering documents for rapid evaluation and feedback. Technology also facilitates the delivery of modest volumes of declarative information, and provides a forum for discourse on writing. A major key to the success of this course is rapid, abundant feedback.

Course 3, titled Systematic Design of Technology-Based Instruction, was developed by the instructional technology department of an urban university in the Southwestern U.S. This is the most sophisticated and highly refined course of the set of online courses in this study, developed by a team of 11 who worked part-time on the project for several months. The entire course has a polished, commercial look and feel. A core course in a master's degree program, this course enjoyed cycles of formative and summative evaluation. The program where this course originated has developed a detailed and credible philosophical foundation for online course construction. This philosophy thoroughly addresses the shared theoretical foundations of the online faculty, supportive research, and detailed design standards. A recently completed and archived episode of the course with 28 students was studied. The online platform in this course is WebCT. This developer is particularly successful in precipitating meaningful, thoughtful, and sustained student-to-student interactions on the course threaded discussion board. The course is also distinguished by detailed, timely feedback and meticulous attention to detail.

Course 4, titled Electromyography and Biofeedback, was developed in the Physical Therapy department of an urban university in the Southeastern U.S. This course represents a variation from the dominant style of online course development and application in that it satisfies most criteria for an exemplary Internet course, but is not designed or intended for a true distance learning role. The Internet serves as the content delivery technology and as an efficient repository for course documents and supplementary materials. The course would require little modification to be employed as a pure distance course, but presently serves as an Internet-mediated, technology-infused departure from the traditional college lecture course paradigm. In this course, distance learning and other technologies are primarily intended to supplement and replace traditional classroom methods, rather than to make the course accessible to distant students. This course was selected to provide balance and contrast to the majority style of online courses in the study. This is an upper division core course in a master's degree physical therapy program. Except for a few mandatory classroom and laboratory sessions, regular attendance is not required. The dominant subjective feature of this course, and which pervades the course documents, instructional units, and conversation with the developer, is a powerful quality of content mastery. WebCT is the online platform used in this course. Of the four exemplars, this course incorporates the widest selection of technologies, and relies most heavily on laboriously constructed multimedia presentations.

Results

Analysis of the data generated by the four courses yielded several attributes shared by the exemplars. Emergent themes were upheld in the study if evidenced deeply, in multiple data sources, and broadly, in a majority of courses. The following five emergent themes were revealed and borne out by the study:

1. Abundant, rapid feedback; this is the singular, most striking and consistent feature found across all exemplars in the study. All four developers of these online courses recognize the critical importance of this aspect of teaching, and take aggressive, consistent steps to satisfy it. Feedback in these courses is characterized by detail and liberal application in a variety of ways (discussion board comments, email responses, verbal encouragement, formal comments on student and group papers and projects, and others), and especially in its timeliness.
2. Exemplary online teachers demonstrate the attributes recognized in effective classroom teaching. Related to the emergent theme of abundant, rapid feedback, all of these online courses reveal convincing evidence that they are developed and delivered by teachers who would be described in the traditional classroom environment as competent, highly skilled, and diligent. Underlying this general and subjective assessment can be found a wealth of practices, skills, and attitudes that are generally said to be seen in good teachers, and specifically noted in much of the literature on effective teaching (Angelo, 1993; Chickering & Gamson, 1987; Langlois & Zales, 1992). These developers, across the board, possess and employ a keen sense of humor. They convey a sense of excitement about their course content and a conviction that it is important. Their expectations are high and expressed clearly, and they have reached a level of manifest content expertise. They clearly care about the welfare of their students. They are confident, fair, friendly, good listeners (or readers), and again, are masters of effective feedback. Two of the four courses in this study are graduate level courses in professional master's degree programs. Knowles' (1980) theory of androgogy is therefore relevant, and these courses strongly evidence Knowles' fundamental assumptions about designing instruction for adults.
3. Learning by doing; all of these courses include elements, sometimes substantial, of assignments and exercises wherein the subject content is mastered and or evaluated by doing rather than, or more than, reading (or listening). However, considering the overall construction of all four exemplars, the "doing" portion of the courses, although substantial and supportive of the emergent theme of "learning by doing," is generally overshadowed by purely declarative material. Extracting the "doing" portion of most of these would leave much of what the student finds in these courses intact, but decidedly inferior.
4. Developers of exemplary online courses tend to perceive the absence of the traditional classroom's visual feedback and face-to-face interaction as

a substantial instructional challenge. This tends to support Dede's (1990) observation that, "The affective content of technology-mediated messages is muted compared to face-to-face interaction" (p. 259). The sense of uneasiness in the online teaching environment is expressed quietly, and often with a quality of sadness, that something human, but not essential to the instructional process, is missing. This perception is not about efficiency or effectiveness of instruction, or that students achieve objectives, but rather about an aspect of face-to-face teaching and learning that is tangential and unmeasured, but still important to most of these teachers.

5. Judicious selection of technologies; the developers of these exemplary courses are generally conservative and prudent in employing technologies in an instructional role. None of these courses include technology that would be considered exotic. In fact, the very best online courses in the study present an austere, almost Spartan quality. For example, the introductory writing course makes heavy instructional use of word processing applications and the ability to disseminate documents and written communications between students and instructor, and between students, almost instantly. It is difficult to overstate the facilitative role of technology in this type of course. The course is about writing, not technology, and the developer might have incorporated motion video, animated graphics, or gratuitous sounds, but these might well detract from the true mission of the course.

This study concludes that satisfaction of these attributes is necessary and sufficient to develop an online course of quality comparable to these courses identified as exemplars of Internet teaching.

Other findings of the study revealed in composite course developer survey responses include the following:

1. WebCT is the dominant platform for these courses, as well as the majority of courses nominated for the study. This study revealed no important technological advantage of one commercial online development platform over another. This study did not address the pedagogical influence of online course management tools (Firdyiwek, 1999).
2. Course capacity varied markedly across the four exemplars, and this tended to be determined for administrative reasons to be the same as on-campus courses. This is in keeping with recent literature on student capacity in online courses (Harmon & Jones, 1999; Porter, 1997).
3. All of the exemplars address incoming technical skills, although not rigorously. None of the courses verifies student mastery of technical skills. The matter of incoming technical skills was identified by one developer as a likely cause of high attrition.
4. These developers report that successful online students tend to have time management skills, solid incoming technical skills, and tend to be older.

5. There is general agreement in these developers that attrition in their online courses is somewhat greater than in their classroom courses, although none quantified this information.
6. These developers report little difference in online instructional style, compared to classroom style, as perceived by their students (revealed in student comments and course evaluations).
7. Reported email volume ranged from 20 to 75 messages per week. Only one of the developers posts a formal policy on instructor responses to student email messages.
8. Online course challenges reported by these developers included development time (the dominant challenge) as well as technology hurdles, and the tedium in codifying the course knowledge-base. The low bandwidth issue of the current Internet is perceived to be a major hindrance to more aggressive technology integration in online courses.
9. All of the developers believe that efficacy of their online courses is comparable to their traditional courses. Both advantages of disadvantages of online teaching are noted by most of the developers.
10. All of these courses developers, save one, classify themselves primarily as early adopters in the Rogers' (1995) innovation classification ranking. (The single exception readily admits to being an innovator.) In all cases, there is objective evidence that all developers in this study might well be classified as innovators.
11. Responses were mixed regarding the importance of a face-to-face element in an online course. One course developer declares that this is unnecessary and a second considers a face-to-face component "helpful to some students." The other two developers emphatically disagree, stating, "I cannot imagine a course without face-to-face interaction" and "face-to-face is always best." Other relevant comments include a lament that, "there is nothing like a human voice" and an observation that textual substitutes such as "emoticons…do not measure up in communicating nuances and inflection."
12. All of the developers in the study report a willingness to develop another online course.
13. These developers agree that student workload in their online courses is exactly the same or very similar to the classroom versions of the same courses (if they exist).

An expectation that exemplary online courses would employ a strongly constructivist underlying philosophy was not supported by this study. All of the developers of these exemplary courses tend to fall nearest the positivist pole of the positivist-pragmatist-interpretivist continuum. The set of learning theories that can be identified in these courses is best described as eclectic. These courses strongly support Cahoon's (1998) observation that online teachers are learning to teach on the WWW as they go along. While some of the exemplars could be

seen as fitting Willis's (1995) characterization of "adding a bit of constructivist seasoning to the behavioral ID stew" (p. 9), others elevated student-to-student interaction using online tools to become a dominant instructional strategy. All four courses include elements of the active learning described by Bostock (1997), the situated learning described by Choi and Hannafin (1995), and even the events of instruction described by Gagne (1985) [only one course employs Gagne's principles systematically and intentionally]. There is strong evidence that learning is taking place in these exemplary courses, based on the quality of discourse, and the quality and improvement in student performance in writing and other projects.

Perhaps the most pronounced and consistent link to learning theory found across these courses is Dede's (1990) broad prescription that distance courses should create a shared environment, support interaction, and facilitate collective as well as individual learning. All of the developers of exemplary courses conducted entirely online in this study make substantial use of interactive online tools such as synchronous chatroom, threaded discussion board, instructor-student and student-student email, and course listservs to achieve precisely these goals. The majority of these exemplars, at least to some extent, objectify Dede's early, think piece description of technology-mediated interactive learning (TMIL). However, only one of these developers cites Dede as an influence on course development and management, and it is not clear if evidence of these principles arises from intentional design, or simply because the developer(s) chose to use the available toolkit.

Limitations

This study addressed the modest question of the nature of best teaching on the Internet at this (early) point in online course development. This study does not purport to answer the more important but formidable question of how to best teach on the Internet. This study was restricted to higher education, intentionally excluding Internet courses developed by nontraditional (virtual) institutions, and online courses for the corporate world. Another limitation of the study is that SMEs contributing exemplary case selection criteria were drawn only from the field of instructional technology. Although the exemplary online courses included tend to be of a highly declarative, positivist nature, it is recognized that the screening profile may tend to exclude courses with a more strongly constructivist approach. It is also recognized that at this very early point in online course experimentation, highly declarative courses, closely resembling traditional classroom courses, are likely to have been developed first, and there may not yet have been time for exemplary constructivist courses to appear.

Conclusion

The quality of these courses was found to be largely attributable to teaching skills and practices, rather than to application of technologies. Developers of exemplary online courses employ a variety of technologies, rarely exotic, but

consistently demonstrate a limited, shared foundation of fundamental teaching skills, attributes, and attitudes. These courses are not defined by technology but by teaching. These exemplary courses are designed and implemented in a way that exploits the best qualities of effective instruction while maximizing the interactive potential in current online course tools. On the whole, these courses are not made exemplary by technical acumen or by mastery of exotic new instructional strategies--they are successful in large measure because their developers possessed or developed the fundamental attitudes, practices and skills of good teachers everywhere. The technology mastered in these online courses, although not seamless or without substantial demands, was not a barrier for these developers. The courses in this study reveal that these online tools are capable of managing a variety of course topics and instructional approaches. The primary implication of this study is that this study strongly suggests that successful classroom teachers contemplating online course development are likely to be better prepared for the challenge than they may suspect.

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India's slum kids latch onto IT

by Nirmal Ghosh

A FEW meters from the boundary wall of the head office of IT training institute NIIT in New Delhi, there is a slum.

While NIIT has become a household word in IT circles in more than two-dozen countries, the slum is a constant reminder that in the country that is in many ways powering the information revolution, there is a huge gap between the virtual and the real worlds.

As an experiment, NIIT's cognitive engineering researchers last year made a hole in the wall near the slum and installed a powerful computer connected permanently to the Internet there.

The computer was available for anyone to use.

The result was extraordinary. The slum children, many of whom had had no primary education, went over to check out the computer. There was no instructor on call; they were left to themselves.

Within five hours, one of them, Rajender, eight, had managed to find a Disney site. Within days, a group of children, aged five and 17, had figured out how to download Hindi-film hits, Disney movie-clips and cricket trivia.

Not all used the Internet. One little girl used graphics software to help her father, a tailor, figure out the design and color scheme of a skirt he was working on. Most of the children played games.

The children also developed their own language for working on the computer because there was nobody to explain the terminology to them.

They named the cursor *nci sui, mtr* or needle, because of its sharp arrow shape, and they call websites “channels".

The hourglass is called *a nci damru, mtr* the hour-glass shaped drum that the Hindu god Shiva plays.

When it appears, the children know the computer is working on something.

Noted Dr. Sugata Mitra, head of research at MIT: "In most of our classes here at NIIT, we spend time teaching people the terminology and such. With these children, that seems irrelevant."

MIT engineers withdrew the keyboard after it proved unable to stand the harsh use, and replaced it with a crude but sturdy joystick-like apparatus.

To date, the slum children have created more than 1,000 folders.

THE POWER OF TECHNOLOGY

In the hot summer afternoons, the sun falls on the screen and the computer is kept covered and locked; in the long evenings, it is opened and the children flock to it.

Sanjay, 13, told The Straits Times that most of them played games or checked newspapers online.

Kithang, eight, peering into the screen and jiggling the joystick, remarked that the second layer of glass in front of the computer was very strong.

"If they give us a keyboard, we will be here all the time," said Sanjay. Both children were attending a nearby government school that does not have a computer.

Where is the lesson in this? Said NIIT vice-president Suren Singh Rasaili: "The power of technology can fail against only one thing, the government."

Dr. Mitra called the experiment "minimally-invasive education".

In the process, he realized that computer literacy could be achieved with minimal or no formal instruction; the result was a sort of functional literacy.

The implications for a country like India are significant. Wherever governments have had the political will to farm out schemes to private operators, they have usually worked, Mr. Rasaili noted in a conversation with The Straits Times.

Dreams of applying IT to India's huge educational needs are still in the formative stage. Strategists at training institutes like the NIIT and in-state governments across the country are struggling to find ways to bridge India's education gap using the new technology.

The challenge is a formidable one.

NIIT is in many ways the engine of India's IT sector. It is the largest IT training institution in the world and among the projects it is involved in is Malaysia's Smart Schools program.

Thus far, NIIT has been feeding the voracious needs of IT professionals in an environment in which one must upgrade skills or perish. NIIT has also started NetVarsity.com, a virtual university.

These services could go beyond the universe of IT professionals and students and out to India's middle class of 200-300 million.

But what about the bulk of the population, about half of whom - especially women - are illiterate?

Significantly, the women in the slum outside the NIIT wall asked rhetorically whether having the computer available would bring them any food, and said they themselves did not have the "brains" to use the computer.

But they were against the idea of pulling out the computer because the children were having so much fun.

The answer could lie in the state of Tamil Nadu, which has been making strides in IT quietly while its neighbor Andhra Pradesh generates the hype and creates the crucial role-model in its cyber-savvy, notebook-toting chief minister N. Chandrababu Naidu.

MORE ACCESS TO COMPUTERS

Under a scheme farmed out to the private sector, the Tamil Nadu government gave 371 bare, 6m by 6m "classrooms" to, among others, the NIIT.

The institute renovated them, installed electrical and network cabling, air-conditioners, uninterrupted power supply units, computers and printers, and deployed 742 teachers in the classrooms, which were spread all over the state, from big towns to small villages.

Each classroom was equipped with 10 computers and one server.

Under this scheme, a total of 3,710 computers were installed in schools in 30 days. There is no Internet connectivity, but "that's just a step away," said Mr. Rasaili.

Clearly, he added, the technology has the power to transform the face of society. But the challenge of education, especially at the primary level where it is needed most, is enormous enough to warrant cautious optimism rather than blind euphoria.

The much-bandied about potential of distance learning has been slow to take off, not only in India, but worldwide. The academic world has had problems in the areas of authentication and certification.

The romanticized remote learning potential of the Internet ignores the reality that some contact with mentors is essential.

The role of the teacher and the classroom is not yet a thing of the past and may never be, considering the crucial importance of the element of motivation and inspiration that enliven the learning experience and make it necessary to attend a school rather than simply study an encyclopedia.

"A degree online is not truly a reality," says Mr. Sanjiv Kataria of NIIT, using the term "brick and portal" to underscore the point that the classroom will not be replaced.

“In learning, community is important," he noted.

NetVarsity.com tries to create that community with mentoring services available. So does egurucool.com.

But according to users, the latter serves best as a benchmarking site.

Students from a school in Bihar who aspire to be in one of the best schools in New Delhi, for example, can access the homework assignments and tutorials of a Delhi school and benchmark themselves.

Obtaining higher degrees through the Internet is currently something far from the minds of the children in the slum outside the MIT wall. But with every click, the dawn of that idea comes closer.

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The Writings of Guy Bensusan

Many of us have followed the writings of Dr. Guy Bensusan for a long time. Others are just discovering him. He is a frequent contributor to the DEOS listserv, and freely shares his rich experience and philosophy. Over the years, Ed Journal has published a number of his articles. He has given his kind permission to publish these each month starting with his writings of about five years ago.

His philosophy and practice have continued to grow with the advent of new technology and the acceptance of distance learning as a viable and effective alternative to traditional methods of teaching. He is the master teacher, leading us into new paradigms of teaching and learning. Through these writings he will take us on a journey of exploration and discussion. He will show us how to motivate students and achieve results with anywhere-anytime collaborative learning that are the envy of most classroom teachers.

The *Bensusan Method* is enriching the lives of tens of thousands of students. Ed Journal is grateful to have Dr. Bensusan present this series of articles each month so that you, your colleagues, and your students can enjoy and benefit from his experience.

Chapter B-4

Develop activities so students can interact and learn after class

by Guy Bensusan

Learning after class has been going on much longer than learning before class. The protracted prototype has been that students have listened to the lecture, taken notes, and go elsewhere to review, read the text and otherwise prepare for the quiz or examination. This certainly constitutes "learning after class," while the interaction part can easily have occurred when everyone got together to study. I would classify this process as being teacher-centered and content-centered, however, and not learning-centered.

The purpose of this chapter is to consider how student interaction and learning after class can be shifted over being both learner-centered and collaborative, as well as to become a rehearsal for lifelong learning-to-learn behavior. Two important aspects of this learning transformation have already been examined. One is that students will obtain information before class, and the other that they will engage in planned learning experiences during class. A ping-pong effect occurs when students read about part A out of class, and then discuss it in class; subsequently they read part B out of class, and then discuss that in class, and so on with C, D, E and the rest.

Going one step farther, the experienced teacher is well aware of what is coming next in the course and with planning can put it to use for the learning process by pointing out to students what some of the next steps will be and how they relate. One consequence is that students will begin to see connections that are not obvious when each element is separated from the others. In class, meanwhile, during the part A conversation, the teacher can introduce the connecting elements which will look ahead to part B, and foreshadow sessions even farther ahead. The ping-pong effect would have even more impact because students would be encouraged to anticipate the next step.

When we think along these lines, the learning-centered teacher can assemble the activities for class discussion A in three parts: (1) preparatory readings, (2) moderated interaction in the classroom and (3) subsequent after-class assignments which follow up on and reinforce what was done in class --- as well as a fourth part which constitute planning the readings in preparation for the next moderated class discussion. The idea behind this is for the teacher to create a continuous and lengthy flow of learning activities which will have a long-term effect on the students by having them practice the activities which train them for lifelong learning.

Three considerations appear in this process: the activities selected must all be relevant and useful, they must be placed in an order constructing the learning, and the purposes of those tasks in sequence must be clearly explained to the

learners. Otherwise, the lesson remains factual rather than productive, that is, it appears to be more for the purpose of preparing for a test than for the sake of comprehending the larger subject-matter picture. This is significant because it relates directly to whether the reason for engaging in the learning is short-term or long-term.

Let us look at this as if it were part of the Hexadigm process discussed in Chapter A-2, where we have a six part model which functions to awaken ideas and connections. Let us imagine that students have read the chapter explaining the Hexadigm and its component parts of Cultural Sequences, Mutual Influences, and the rest. That was their homework, their pre-class preparation so that when they came to class they would know the parts, know how each was defined, where each part fit in the pattern, and how they functioned as a continuing spiral of cultural evolution.

The teacher must choose activities that are relevant and useful to the development of the students thinking. Each segment must help in building a new step, either by going deeper into the information or laterally into other significant connections.

Teacher centered vs learner centered

It is apparent to me that the learning done before class contributes to the learning taking place during class, where we talk about and explore the ideas in the readings as well as discuss applications relating to the models and displays constantly in front of the room. As long as we were limited in our access to computers, to chat groups and group systems software, about the only thing I could assign to do after class was read the next assignment and work on essays and projects. But things do not stay the same, and the dynamics of our age plus the efforts of our campus learner support groups now are making it possible for students to interact and learn after class, too. *And changes for after class will influence during class activities.*

Learning comes from doing, from hands-on manipulation of information, its ideas, meanings, contexts and all the rest we have repeatedly mentioned (almost as if the chapters of this book were calculatedly an exercise in the learning process). In addition to the learning that can go on from the experiences that have been organized for the classroom, superior learning can also occur in other time frames and blocks. Learning comes from frequency as well as intensity; thereby implying what happens outside of class is also vital. Whether we call it homework, or workbook exercises, or reading the chapter for the next class discussion and answering the questions in advance, there is always the possibility for keeping the learning-pot on simmer in-between the actual class meetings.

Of course, a different way of looking at it has to do with what a three-hour course is worth in terms of hours per week. How many hours should we expect a student to spend in order to get three hours of credit. If we take the normal

formula we can suggest two hours outside of class for each hour in class, which can actually be put in to the learning.

With current technologies proliferating rapidly, many other options are opened. If students can be on electronic mail, they can interact with me within the convenience of their own time schedules, fit in around work. They send me an email discussing their ideas and questions when they are able to, which often will be late at night, and when I log on early in the morning when I wake up and can read it, I can reply. That is one way to do it. With Group Systems or other listserver and chat-group software, I can continue class discussion after class by putting questions out for students to consider and respond to. Moreover, they can do that by signing their names, or we can interact anonymously, where the ideational content becomes more important that the identification of who-said-what. Both are actually important and necessary: the former emphasizes the evaluative style in which we always consider ideas in the perspective of their authors, while the latter allows us to concentrate on the concepts themselves in terms of idea components, conceptual rationales, and schools of interpretation.

Most important is the habit of self-direction. Rather than being dependent upon teacher and class time for the initiation of learning, the student engages at will, based on personal needs and time allocations. Diurnal and nocturnal types can thus come together by computer. Group work can do the same thing when all parties have each other's electronic mail addresses. Individual students can summarize accomplishments and seek responses from peers. Multi-classroom projects can develop electronically, with their participants in many different locations, while peer assessment and evaluation can also take place. Many opportunities become possible, especially for students who have not had access before.

Still, a hazard exists when all students do not have access to the same facilities --- an overly legalistic approach may fear lawsuits and not allow any students to do such things until everyone is "equal." I personally do not think equity can be reached as we grow and expand, and I see no evidence that we are slowing down. I therefore do not want to wait, but rather will encourage use of all possibilities for as many students as have them and try to find additional learning mechanisms for those students who must function in places which are technologically less advanced. I have seen inter-site groups work just as effectively with FAX as with e-mail. The key here is continuity; learners need to keep the components and concepts of learning in motion as frequently as possible.

Think here also about the web courses; the various deliveries options, such as tapes, that can be used by groups who cannot meet the classes; and ways to use self pacing and self administered courses to the advantage of the student. We can also use videos (Carmen, plus others) by distributing videotapes to local centers, or on the web --- gradually making them accessible to all sites. We can place audiotapes, plus slides, into the Library, accessible for after class use. With the advent of more powerful technologies, and clarification of copyright

issues, all of these media can be delivered electronically through the World Wide Web.