

The Role of Interactive Media in Sustainable Curricula

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If machines influenced the first half of the century, then clearly a concern for the earth and a response to this incredible global network of information is certainly the iconography of the future.

– James Wines, from the video:
Ecological Design: Inventing the Future

The above quote represents a dramatic shift in our prevailing conception of architecture. If we are moving towards a profession dominated by issues of ecology and information, it is only fitting to explore the impact of such thinking upon architectural curricula. Assuming that many presenters in this conference will speak about curriculum issues in general, this paper will specifically explore the role of new media within a curriculum based on sustainable principles. In order to facilitate the discussion, the paper will be divided into three parts: A brief attempt to define some of the characteristics of a sustainable curricula; an exploration of the role of new media within that context; and, lastly, a case study of a sustainable educational tool using new media. In addition, the terms *new media* and *interactive media* will be used interchangeably throughout this paper.

CHARACTERISTICS OF SUSTAINABLE CURRICULA

There is no set formula to follow in developing a sustainable curriculum. This is probably best illustrated in the case of the Educating Architects for a Sustainable Environment (EASE) project where top educators from around the country gathered to propose new models of education for a sustainable future.¹ The goal of this paper is not to present the information from EASE or even to define exactly what a sustainable curriculum looks like. Instead, a brief discussion of some of the characteristics of a sustainable curriculum will be provided in order to develop a context for the primary discussion of new media. Some of the characteristics listed below are derived from the EASE project while others have been gleaned from teaching design studio within an ecological context for the last two years.

Holistic-based learning involves a student collecting related pieces of knowledge and putting them together to compose a comprehensible image of the whole. Lateral thinking is crucial to this process in that students must find ways to make connections between seemingly disparate pieces of information.

Generalized learning requires the student to become adept at all facets of architecture rather than "specializing" in a particular kind, type, methodology, or belief system of design. In a generalized model, students attempt to comprehend the entire of canvas with all of its ramifications in order to gain a holistic vision. If they encounter enough of the components of architectural education repeatedly and in a variety of relationships, students could potentially become generalists.

Collaborative based learning involves immersing the students in many projects where they are forced to achieve a collective vision through the medium of design. While this may be painful for students, they will receive numerous challenges to their pre-existing perceptions of architecture and also to their typical design process. Collaborative learning potentially exposes students to more and deeper interconnections between ideas and concepts, while simultaneously teaching the value of group process.

Reality based learning asks students to consider and test, by as many means as possible, the implications of their design intentions. This may involve physically laying out their building on the site with rope, or developing a very detailed three-dimensional computer model. In reality-based education, issues of environment, site response and assembly configuration become critical pieces of the design process. Ultimately, students may build an actual building and interact with real clients in real communities. In this mode students must confront the complexity and interdependence of their design project.

Space-based learning asks the students to discontinue viewing their building as discreet objects in the landscape and begin to imagine the building as a sequence of real, tangible and ultimately wonderful spaces. This sequence is extended out to the far reaches of the site. Space-based learning requires the use of color, texture, shade and shadow as a means of communicating the essential quality of the space. While sustainable studios will always have models, the rendered section and interior perspective become important drawings in a space based learning paradigm.

A *systems*-based approach allows the student to conceive his/her building as an animate entity with inherent value and perhaps spirit. In this mode, environmental systems are not something to integrate later, but become an integral part of the building concept from its inception. The building is imagined as alive and therefore must begin to provide for itself the basic elements such as light, water, power and air. More importantly, the student begins to think of the building as a series of interconnected systems: structure, mechanical, building assembly, circulation, daylighting, etc., all interacting and impacting each other and ultimately impacting the space itself.

Multi-culturalism values a diversity of views and thoughts as generated by a multitude of life experiences. Students need to have their reality constantly confronted and challenged in a nurturing environment. By exposing students to cultural views other than their own (either through diverse student body, diverse faculty or at minimum through diverse historical studies), an atmosphere of respect and openness can emerge.

Regional-based learning challenges the notion of universal design solutions and asks students to place themselves clearly within the region they are designing for. This will affect material choices, environmental systems and the location of the building. Students

can become aware that a thick stone wall will work well in one climate but in another climate it may not. Architecture now becomes about much more than style and form, it also becomes about what is appropriate for the region—environmentally, architecturally and culturally. In sustainable curricula, students are asked to complete design projects in a multitude of climates, terrain, cities and neighborhoods.

Community-based learning asks the students to comprehend the complex network of systems that make a community. By designing communities rather than autonomous buildings, students are exposed to the concept of interlacing systems including socio-economic relationships and the questions that emanate from such an undertaking. Ultimately, architecture becomes one of many systems within the total scope of design. Secondly, a design studio will work with real communities to solve real problems with the ultimate goal of seeing something built.

Multi-disciplinary design-based learning attempts to celebrate the intersection of different disciplines within a shared project. Implicit in this mode are issues of collaborative learning with the added complexity of different disciplines. This offers the students a rich experience and again, an opportunity to see architecture in its wider context.

THE LINK BETWEEN NEW MEDIA AND SUSTAINABLE CURRICULA

Embedded within the characteristics briefly described above are unique kinds of thinking/teaching/learning. Non-linear, lateral thinking emerges as a primary thought pattern of sustainable curriculum because students are attempting to understand dynamic interdependent systems of a building and its ecological relationships with the environment. Beyond issues of environment, a student's design, assuming a holistic approach, leads to the development of a design aesthetic that must include issues of diversity, history and community as requisite parts of the ecological continuum. Multi-culturalism, regionalism and community-based influences enter into the broader definition of learning if students are to become truly sustainable in their approach. In the end, they are asked to assimilate and synthesize vast amounts of information as part of their design process. New media offers students expanded access to vast amounts of information of varying degrees of quality. At the same time, however, there are excellent opportunities for serendipitous learning as students explore web sites dynamically.

In conjunction with emerging methods of thinking/teaching/learning are correspondingly new forms of presentation and communication. With students working in a collaborative, multi-disciplinary setting, new media has the potential to become the *Esperanto* of the design profession, where pieces of information, design proposals, relevant discussions, background information all come together under the realm of an interactive electronic presentation. The presentation itself exists in a non-linear state accessed differently by various audiences. A web page becomes a vehicle to archive the design process and also to express the final design solution. Email and list serves foster a dialogue between students across geographical and cultural boundaries. Ultimately, teleconferencing will become a common form of presentation among students involved in collaborative projects between schools.²

Lastly, building designs can now begin to be viewed dynamically from the inside out in unpredictable paths. Unlike a computer generated animation, which moves through a pre-defined path as defined by the designer, new programs like Quicktime VR and VRML allow complete control of the presentation by the viewer. This represents a dramatic change from a single student presenting singular images to a diverse audience to a diverse audience interacting with unlimited views. The student begins to lose control of the presentation in exchange for interaction by the audience. Ultimately, the student is studying and presenting the space of the

building as a series of experiences including sight and sound rather than as a tectonic object in the landscape.

THE POTENTIAL IMPACT OF NEW MEDIA ACROSS THE ARCHITECTURAL CURRICULUM

Interactive media can and does assist students and faculty in thinking laterally because of its own non-linear, interconnected structuring of information. It should be noted that within interactive media like the World Wide Web and CD-ROM, the lateral links are preprogrammed by the designer/author. However, there is unlimited variation in the order in which information is accessed opening to veritable tree of information. The question remains: how will interactive media specifically contribute to the enhancement and quality of sustainable curricula?

As one example, imagine the way a professor lectures to a group of students on the subject of architectural history. Typically this course is taught in a linear format beginning with the stone age and moving through to contemporary architecture. The primary teaching medium is almost always a set of slides and a text book—each moving in a chronological path. Deviation and digression within the lecture is accomplished only verbally or by awkwardly moving backward through the set of slides to find a pertinent image.

In a non-linear version of the same course, a professor may begin his/her presentation of the material at various points throughout history and work outward or, begin in the present and move back to history when needed to discuss specific origins of an idea or image. In addition, a nonlinear lecture is able to handle digressions or deviations from the script of the lecture. This is important to encourage the students to think laterally, but it will also allow adequate visual support for such lateral investigations. For example, the professor may be lecturing on Deconstructivism, only to find that the students are asking about Russian Constructivism as a possible source or inspiration. If the professor has access to an interactive, visual database of the entire slide collection (already digitized) he/she can hit a number of buttons to generate pertinent images for discussions. In fact, the possibility exists for juxtaposing an earlier image with a later one in order to facilitate the discussion.³ There are many slide/database programs that are pre-made with links to pertinent information already developed. If the school does not have access to a high-speed networks on campus they can simulate the non-linear experience with specially designed CD ROMs (see last section for demonstration). Secondly, new media allows a wider range of presentation types to explain the subject matter. For example, a professor may click a button to open a video of Frank Lloyd Wright discussing architecture on a past episode of *60 Minutes*. Now the lecture format becomes multi dimensional in that more points of views (other than solely the professor's) are introduced to the students. It should be noted that this is very different than simply showing a video about Frank Lloyd Wright to the class in that a video is also linear and difficult to interrupt.

Lastly, with the advent of teleconferencing, students can be exposed to multiple lectures in multiple cities with multiple points of view, all simultaneously. Diverse audiences in different locales can witness a single lecture, thus opening the opportunity for a much wider canvas of discussion. This mode of teaching certainly resides in the relativistic camp, where students from various countries or even parts of countries, with perhaps differing perceptions on architectural theory, are now free to interact and challenge each other's set of values. The limitations to such interactions at this point in time are primarily technological, but are slowly beginning to be overcome.⁴

New media has already impacted architectural research. Through the use of the World Wide Web, students have already begun to use this medium as a research tool. The advantage of such a resource is its immediacy, but also its dynamic potential for serendipitous discovery of related information. This is important within a sustain-

able curriculum in that many ecological design strategies have multiple benefits both environmentally and aesthetically. In the case of passive heating, for example, students may discover that a carefully designed atrium will allow opportunities for heating in certain climates. At the same time, they may also discover that an atrium is a good architectural form to support a living machine, which relies on sunlight, water, plants and animals to purify water. The student may then visit a web site that shows images, text and perhaps video clips of actual functioning living machines. Ultimately, students over time may begin to mimic their thought processes after the interactive nature of the web. They will begin to think laterally and demand access to increasing amounts of lateral information. The disadvantage of interactive, web based research is the likelihood that at least some of the information the student has received is either incomplete or questionable. There is, and will be an increasing demand among faculty to find ways for students to critically access the quality and quantity of the information. This is a trade-off in the search for current, non-linear information.

Directly related to the type of interactive research the students are conducting are presentation modes made possible by new media. Rather than writing a paper and inserting images in order to ultimately print it out, students can now submit their papers electronically including video clips, images, moving diagrams and text. The advantage of such an approach is that the student's work can be added to the electronic interactive continuum to be accessed later by faculty, other students and interested people all around the world.⁵ Many students are using Adobe PDF (portable document file) as a means of straddling the print and electronic media. This electronic media can also exist in the form of a printed document offering an effective transition to full interactive media.

New media offers the opportunity for students to involve themselves in situational problem solving experiences. This method of learning has been seen in the Sim Series games like Sim City, Sim Earth and Sim Tower. In these simulations, the user makes decisions over time and witnesses the effects of those decisions on a host of other factors including tax rates, crime rates, environmental quality and overall standard of living. Imagine the following simulation in a sustainable studio: the student is given a site with certain characteristics including sun angle, geological, hydrological and biological information (plant and animal types). He/she is asked to choose from several possible building locations within the confines of the site. The student is also asked to choose materials, structural systems, mechanical systems and from a set of building organizations. The computer can then simulate the impact of the building over time on the site, on the larger environment (pollution), on energy use, on material life cycle, and on building appearance. The student can then receive several ratings that measure the relative success or failure of the building. In interactive simulations, students begin to understand the relationship between different building systems and the larger environment. They are also able to understand the impact of their decisions over the long term (which materials will last, which will emit harmful gasses and particles, and which will decompose in 100 years). Through the simulation experience, the student is exposed to the process of decision making within an ecological context. In effect, they have learned how to adapt to different problems with different solutions with always varying constraints. Given the characteristics of sustainable curricula discussed earlier, this would seem to be crucial piece of learning.

NEW MEDIA: A CASE STUDY IN A SUSTAINABLE CONTEXT

The Seeds of Sustainability is an interactive CD-ROM exploring sustainability for the architect, designer and planner. It was developed as part of a thesis project I completed at Virginia Tech in 1996. It is an interactive resource that helps to define the term sustainability

for the design community. The CD-ROM begins with some background information about the author and the process of the development of the educational tool. The user can skip this section and move right into an interactive table of contents (fig. 1). A selection from any of the categories of interest can be made without accessing any other category. Then, there is a choice of seeing either an environmental self-study that illustrates the damaging environmental effects of typical design strategies, or an environmental response that demonstrates sustainable design strategies. For example, when the user chooses the green layer, a regional design strategy for reducing sprawl and directing development towards the urban core is displayed (fig. 2). There are four "seeds" of thought on the bottom of the screen which, when activated describe how designers in the past and present have approached this particular issue. The user can also click on a particular sub region and see building "archi-types" which demonstrate sustainable design strategies in more detail. The green ring button for example, allows the user to see a sustainable proposal for building houses in undeveloped natural areas (fig. 3). Returning to the main menu, the user is also able to read a short essay or listen to the author speak about a particular issue. Also, the user can choose a precedent button where he/she will be shown examples of built work that embodies the principle currently being discussed. Lastly, and perhaps most importantly, dynamic links to related sections of the CD-ROM are available. For example, in the case of the green layer, the user can click on links to the passive heating and cooling sections, where an example is shown of how green roofs can be an effective technology in this area.

In terms of non-linear and lateral thinking, this tool allows a wide array of options and pathways to knowledge. When using this tool as part of a curriculum, the danger exists of a student not encountering all the important pieces of information required to convey the full body of knowledge available. To this end, the CD-ROM can also be accessed in a completely linear fashion by using the forward and back buttons.

The CD-ROM is not a static resource. It is continually being updated and remade as more information is added. Perhaps the most powerful emerging technology in this area is the dynamic web link, where users can click on active web links directly from the CD-ROM. This allows a greatly expanded opportunity for knowledge and discovery. There could also be a separate web page for each section with new information and updated links.

Since this CD-ROM has been in limited use for about one year now, several critiques have emerged. The first being that the CD-ROM design is still too linear in that the user is constantly forced to choose between paths of environmental self-study and sustainable response. The feeling is that the self study should be accessed from the regional screen as option to provide context and meaning for the thrust of the information on sustainable design. Also, it became too difficult to quickly return to the main menu. The feeling was that a single click should return the user to the full matrix of information. In the past year several faculty and students have had the opportunity to use the CD-ROM or see it during larger presentations. The general feeling was that this would be an excellent addition to the architecture library, so that students and faculty could access the information freely. Because of copyright issues this has not yet been possible. During presentations to large groups using this tool, I have found it useful in answering questions from students who are seeking related bits of information. Through the interface, I can dynamically reach images, diagrams, or videos which could help answer questions.

The next phase of the CD-ROM, which is still under development, is an interactive simulation similar to the one described earlier. A user could enter the simulation before, after and during the use of the educational part of the CD-ROM. Perhaps a student could enter the simulation without any training. A score could be recorded. Later, after the student has used the educational part of the CD-ROM, they could reenter the simulation and try again to see if there is some improvement.

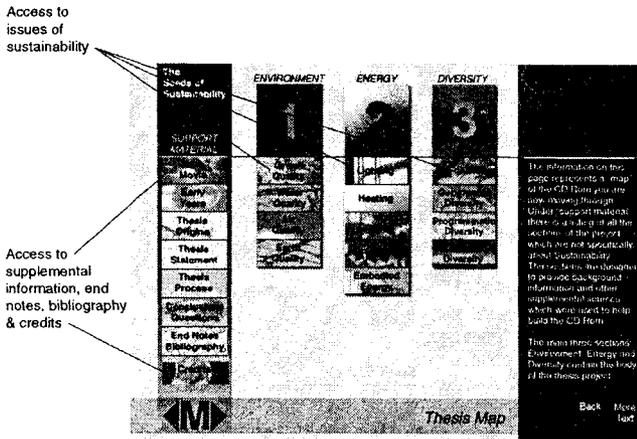


Fig. 1.

dia. The physical realm will continue to exist as students use scanners and digital cameras to convert their physical explorations into a format acceptable to new media.

Given the propensity of young students to gravitate towards electronic media, regardless of the curriculum emphasis, the demand for faculty to embrace and eventually utilize new media as a teaching/learning tool will most certainly emerge. It is up to us as educators to become proactive in our use of interactive media so that we may define its uses and its standards rather than have the media itself, through its own momentum, take us on an unpredictable ride into the future.

New media with its non-linear, lateral aspects lends itself to a curriculum that prizes holistic thinking. For architectural curriculum to benefit from such a relationship, we must immediately begin to ponder the meaning of new media within a sustainable curriculum. At the same time, we must also begin developing effective interactive media products before others, without architectural experience, do it for us. This already happened with the advent of computer aided design where the designers of software had no comprehension of architect's needs.⁶

If James Wines is right in that we are moving toward a century dominated by issues of ecology and information, it seems only logical that we now begin as architectural educators to ponder the limitations, potential and meaning of new media. This paper stands as a beginning rather than as a conclusion to the discussion on the issue on new media in sustainable curricula. In order to move the discussion forward, I ask the readers to post their comments or relevant links on the World Wide Web at <http://www.philacol.edu/archdes/newmedia>.

NOTES

- 1 Joseph Bilello, AIA, "Sustainability-Based Curricula: Five Models from the Educating Architects for a Sustainable Environment (EASE) Project (1993-1997)" in *Constructing Identity: Proceedings of the 86th ACSA Annual Meeting & Technology Conference* (Washington, D.C.: ACSA Press, 1998), pp. 126-131 <http://www.arch.ease.bsu.edu>.
- 2 For some examples of schools who have used teleconferencing in a collaborative context with varying degrees of success see William Mitchell's *Recombinant Architecture*, a discussion of information technology and its use for a collaboration between six schools of architecture, <http://www.designinst.nl/doors/doors2/transcripts/mtiche.html> <<http://www.designinst.nl/doors/doors2/transcripts/mtiche.html>>. Also, see G. Vazquez de Valasco, "Adding an International Dimension to our Teaching: An Application of computer mediated Communication Technology" in *Constructing Identity: Proceedings of the 86th ACSA Annual Meeting & Technology Conference* (Washington, D.C.: ACSA Press, 1998), pp. 241-245. <<http://taz.tamu.edu/~ARCH405/01TXMX.html>>
- 3 This can be done in a regular slide lecture, but it must be preplanned. There are new electronic databases available with lateral links to historical context information, information about the artist/designer and other related topics. Software called Embark is one example.
- 4 See Nancy Yen-Weng Cheng, "Digital Identity in the Virtual Studio" in *Constructing Identity: Proceedings of the 86th ACSA Annual Meeting & Technology Conference* (Washington, D.C.: ACSA Press, 1998), pp. 246-253. <<http://darkwing.uoregon.edu/~nywc>>
- 5 See Virginia Tech's graduate architecture school web page for on-line thesis submissions: <<http://caus111.arch.vt.edu/students/thesis/index.html>>.
- 6 AutoCAD has been the dominant computer aided design software in the architectural profession but was originally designed for engineers. It has taken Autodesk many years to begin to make AutoCAD a truly usable tool. In recent releases, AutoCAD has become better suited to the architectural process—especially 3-D, but still requires third-party software to maximize its potential for documentation.

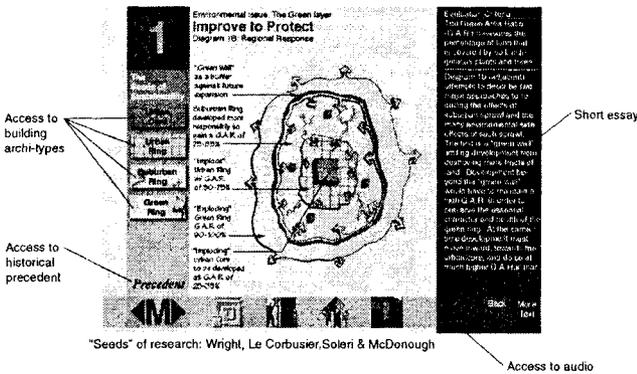


Fig. 2.

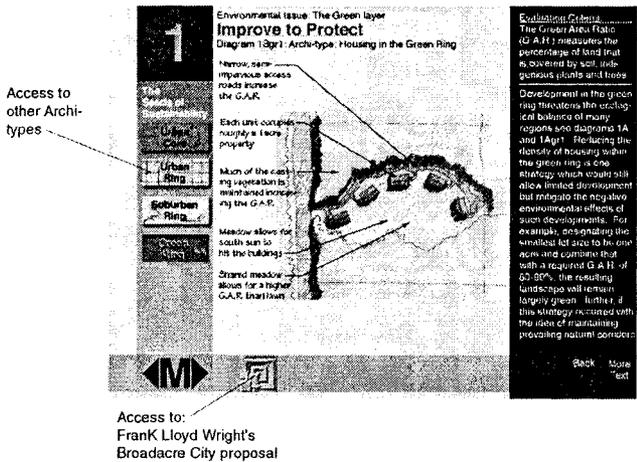


Fig. 3.

Conclusion

Despite the potential power of new media, its impact on architectural curriculum remains largely unrealized. Inherent in the adoption of new media is the migration from a material based system of communication (drawings, models, slides, papers, etc.) to a virtual-based environment where communication occurs through electronic me-