A Technology-Centered Model for Primary, Secondary & Post-Secondary Educational Partnership

by

Brian R. Sinclair

Faculty of Architecture
University of Manitoba, Canada

Brian Sinclair

is Director of CADLAB and Co-Director Architecture•Music New Media Centre, Faculty of Architecture at UManitoba. His mandate includes design, computational tools, environmental psycology and continuing education. Professor Sinclair recently served as Associate @ Arthur Erickson / AWA Architects. He is Continuing Eduction Committee Member Manitoba Associate of Architects, Chairman Tri-Provincial Prairie Architects Organization and Vice-President Apple Design & Modelling Centres Consortium.

Abstract

Societal appreciation of architecture, the environment and the role of design & planning professionals should begin early in the educational stream. Working from this premise, a model was developed which relied on a combination of learning strategies: Cognitive, Psychomotor and Affective. The project's primary goal was to build knowledge of architecture and the environment in K-12 children, with particular emphasis on primary levels. More specifically, the ARCH was selected thematically as a strong architectonic element through which to promote a better connection with and responsibility for the environment. The educational experience comprised three sequential forms: visual history of the ARCH, physical construction using foam blocks, and finally "construction" in the computer using a multi-media interactive three-dimensionally focused program. Pedagogically the sequencing provided explanation and context, built awareness through making, and finally reinforced the lessons of the previous steps while highlighting the potential of information technology. To deliver the curriculum an installa-

tion was built at a local museum, with primary grade children arriving on field trips. Architecture faculty and students designed the curriculum and installation, including the computer modules. Secondary school students were trained, with the intention that they would in turn educate primary school students at the installation. In disseminating knowledge downwards through the various educational levels, awareness was promoted concerning the architects role, architectural elements, and the broader built environment. Using the ARCH as the theme, realization of the inter-connectedness of the environment was advanced. Through linking and learning, participants came to better understand the value of their individual contributions and the critical need for collaboration.

"I am not a teacher, only a fellow traveler of whom you asked the way.
I pointed ahead - ahead of myself as well as you."

— George Bernard Shaw

An old African proverb suggests "It takes an entire village to raise one child." This proposition underscores not only the wisdom inherent in multiple points of view (i.e., none of us is as smart as all of us), but more importantly draws attention to the rich consensual and cooperative aspects of settlement. Modern life, however, often stands in opposition to such ideals of shared experience and group responsibility. The present project developed from a fundamental belief that modern problems are best understood and approached from a comprehensive perspective. Such a position incorporates an awareness of city, community, the environment and most importantly of one another. A subsequent assumption informing the project was that design & planning professionals will be better positioned to address complex challenges when their potential contribution is better understood and valued by a much broader cross-section of the population. Conversely these same professionals must be equipped, in large measure through their formal education, with a much more encompassing and holistic frame of reference than has traditionally been developed. Students of these professions must build sound philosophical bases and effective approaches to practice that respect various viewpoints while celebrating interdisciplinary, cooperative problem solving.

Civitas. To be of the city. To be engaged in its life and to connect with its soul. To be a citizen. Throughout much of the developed world, cities and their underlying social, economic + physical structures, are in upheaval (Figure 1). Theorists highlight these changes as drastic, with many holding the scope and character to be so significant as to impact existence at the global scale. Transition is across a wide spectrum of areas including technology, family structure, culture, religion, politics, business and values.

Futurists Alvin & Heidi Toffler[1] (1994) stress, “Change so many social, technological and cultural elements at once and you create not just a transition but a transformation, not just a new society but the beginnings, at least, of a totally new civilization.” Within this ethos of change, the delicate and necessary balance of private and public realms has also seriously shifted, resulting in a citizenry who may no longer know how to partake in common experiences of the city. Greinacher[2] (1995), interpreting urban transformation in light of new media technologies, further suggests “Electronic space replaces public space, and unlimited communication results in the ‘medievalization’ of our urban environment.” Urban dwellers at millennium’s edge have tipped the scales away from extroversion, participation and engagement in favor of introversion, isolation and retraction. In numerous cases the exodus from the public realm is so severe that civic settings become unkempt, unwelcoming and unsafe — places regress into inanimate and anonymous spaces, devoid of meaning and spirit.

Fig. 1.

A subset of city, community has similarly transformed. Community today is frequently delineated by bureaucratically-delineated boundaries, but historically was better cast in light of social transactions and interpersonal connections (i.e., community as a group of people with common aspirations ands shared experiences versus an area of land contained within imposed geographical edges). Increased mobility, associated with both the arrival of rapid, convenient , far-reaching transportation and with the rise of multinational corporations, has also influenced connectedness with place in the physical sense and community in the social sense. Joel Garreau[3] (1991) in Edge City suggests, “Community today is ... entirely voluntary and thus fragile .... If you don’t like the ties that bind you to others — even for the most ephemeral or transitory or stupid reasons

— you can and may leave. You are no longer forced to proclaim your identity as part of any inexorable membership in a larger whole". When examining contemporary urban life the question arises, "Have we lost the sense of being responsible for one another?". In many instances throughout many of our cities the answer is an unquestionable and resounding "Yes".

Extending this suggestion of irresponsibility to broader scales, current environmental crises underscore problems that arise when anonymity and mobility takes hold over identity and connection to place. Van der Ryn & Calthorpe[4] (1986) suggest, "Our cities are zoned black and white, private or public, my space or nobody's space. The auto destroys the joys of urban streets, the shopping center destroys neighborhood stores, and depersonalization of public space grows with the scale of government." The gradual withdrawal of city dwellers from the 'commons' to the safety and security of their own homes and lives has translated into intentional disconnection from the critical social dimension of urban settlement. Interconnectedness of the environment is little understood and responsibility for its condition and care is not assumed. Can architects, and architecture, make some contribution towards a reclamation of the 'commons' and a rebuilding of cities across social dimensions? Crosbie[5] (1995), in a recent P/A editorial wrote, "The claim that architecture is a noble calling must rest on the fact that architects create the spaces for civic engagement. We form the public stage on which ideas are exchanged and debate unfolds. As creators of public space, don't we also have the obligation to preserve its use? If so, then architects must help reclaim the public realm."

Conceiving the Project - "ARCHES: Past & Present"

Societal awareness and appreciation of architecture and the environment, and subsequently of the role of design & planning professionals within this milieu, should begin early in the educational stream. Working from this premise, a model was developed to disseminate information about the built environment. The model referenced clinical[6] teaching as a foundation, relying on an interrelated combination of learning strategies: Cognitive, Psychomotor and Affective. Cognitive domain objectives emphasize application of theory and knowledge to practice. Psychomotor domain objectives stress acquisition of skills based on precise, well-coordinated movements. Affective domain objectives incorporate feelings, values and attitudes. Together these learning strategies promote a well-rounded, thorough educational experience (Figure 2). This educational approach, as frequently typified in clinical applications, emphasizes learning through inter•active thinking and doing — understanding is both attained and reinforced by performing : "Knowledge is not passed intact from a knower to a learner; it is actively constructed by learners who draw upon their previous knowledge, mental processes, and experiences to integrate new information in ways that expand their knowledge and experience."[7]

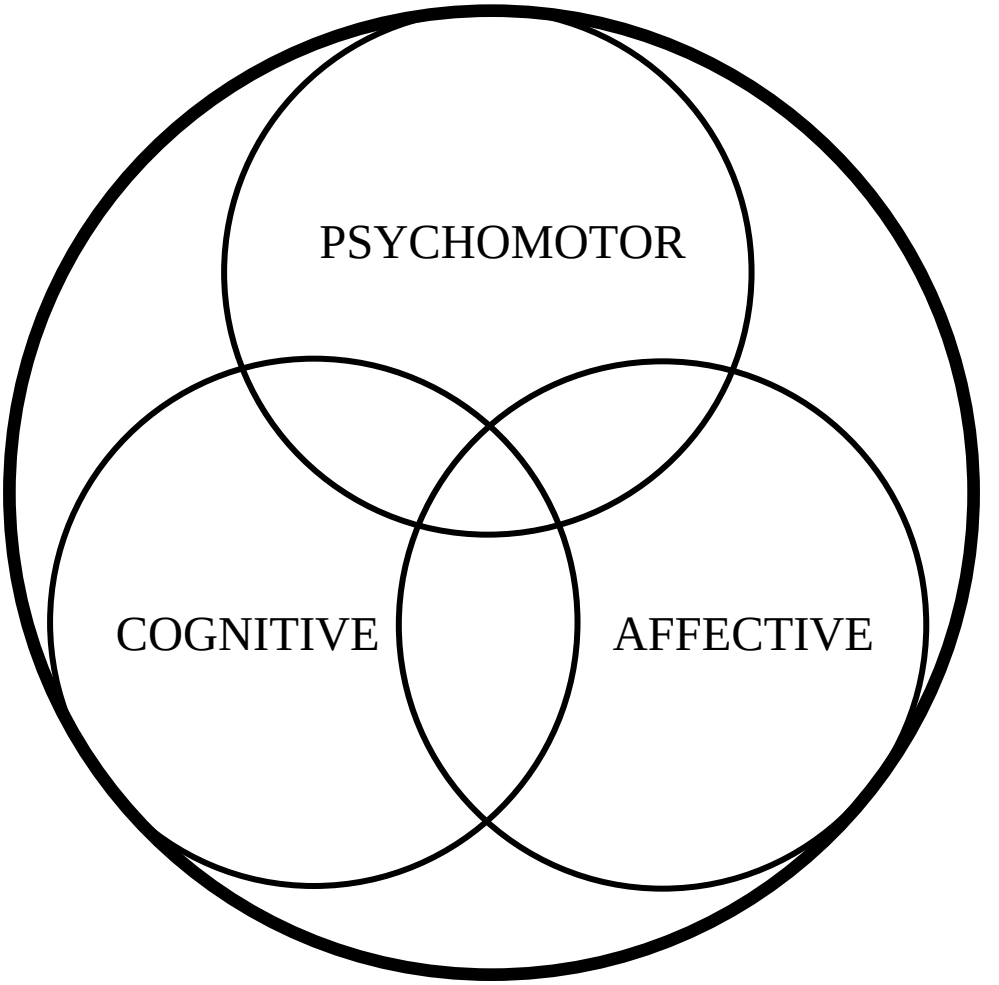
The present project encompassed each of these learning strategies. Cognitive dealt with the presentation of information, such as facts and figures. It manifest in two ways: 1. a static, highly graphic visual presentation, and, 2. a highly interactive, multi-sensory, multi-media presentation. Psychomotor approach was manifest in physical making. Hands-on "construction", using scaled building elements, helped make concrete more abstract ideas presented in the static visual displays. The Affective dimension was facilitated through group work and through the mentorship provided within the educational experience . Learning was directed at both lower and higher-order thinking (based on Bloom's Taxonomy[8]). More specifically, 'knowledge' and 'comprehension' were addressed primarily through the visual (i.e., graphic + text) displays. Higher-order thinking, and specifically 'application' was invoked through the physical manipulatives exercise, whereby students had to select and apply appropriate knowledge to solve a problem (building an ARCH — transferring an abstract concept into a concrete reality). The project team comprised primary, secondary and post-secondary students and educators, learning across this extended range of approaches and working together to better understand one another and their shared built environment.

The project's primary goal was to build knowledge of architecture and the environment in K-12 children, with particular emphasis on primary school levels. More specifically, the ARCH was selected thematically as a strong architectonic element through which to promote a better connection with and understanding of the environment — from this manageable theme would extend messages of environmental analysis, awareness and responsibility. Concern about place and place-making would arise through a focused examination of one facet of the environment shared among a group of individuals engaged in this learning experience.

Objectives of the project were:

- to provide an educational experience for post-secondary students that emphasized connection with and commitment to community;
- to provide an educational experience for secondary students based upon mentorship and leadership provided by post-secondary students;
- to provide an educational experience for secondary students that emphasized connection with and commitment to community;
- to provide an educational experience for primary students based upon mentorship and leadership provided by secondary students;
- to provide an educational experience for primary students that emphasized connection with and commitment to community;

Fig. 2.



- to build awareness among all project participants, facilitated through a range of learning strategies and experiences, of the importance of the environment;
- to introduce participants to new technologies that evoke multiple senses and encompass multiple media;
- to explore and promote team, in addition to individual, approaches to problem solving;
- to establish, nurture and demonstrate by example the critical partnership of three levels of public education.

Designing the Project - Multiple Learning, Tools & Media

Curriculum was developed by a team of educators representing the three institutional levels, with project leadership provided by the university partners. The architecturally-focused project discussed in the present paper is one of many conducted through the Manitoba Technology Initiative (MTI) under the authority of the state agency responsible for science and technology development. Through a broad range of strategies (such

as MTI) the agency seeks to develop competitive advantages for industry, education and government within a "knowledge-based economy"[9]. One of the key aspects of the MTI program is that it "... organizes activities to improve the working relationship of business and education, highlighting science and technology in the elementary school as a beginning focal point."[10]

The educational experience provided to the young children came in three sequential forms: static visual presentation; hands-on making, and interactive multi-media experience. A 10' X 20' "classroom" was defined by three walls built within a large gallery space at a local museum. The space, designed as a series of scaled facades, had intentional directionality. Visitors would experience "ARCHES: Past and Present" in the following order:

a. Static Visual Presentation

A visual history and explanation of the ARCH across time and within a range of settings. This section of the room included an introduction of architect & inventor Leonardo da Vinci, with his portrait and images from his sketchbooks enlarged dramatically. Also included was a montage of photographs, taken by students from the partnering high school, of arches found within the local urban center. The connection between the arch and the larger environment was reinforced through streetscape photographs, through the facade backdrop of the entire installation, and through the narration of mentors "delivering" the curriculum (i.e., directing the young children through the various stages of the project).

b. Hands-On Making

Following a review of the history and theory of the arch, students were required to study a series of diagrams explaining the nature of forces acting upon the arch. Immediately behind these images was a scaled building facade (in fact the background of the "classroom" was produced by reprographically enlarging computer drawings of a building onto 4' x 8' vellum panels which were then tiled together on the installation walls). On the floor in this section of the installation were a series of custom high-density foam blocks, based upon the dimensions of the arches on the scaled background. Students were required to physically construct (Figures 3 + 4) an ARCH using these pre-cut blocks. The arch had to be assembled with a particular block order, with the keystone placed as the finale. A critical aspect of assembly is that the arch could only be built as a TEAM — it was impossible for a single person to put the system of blocks together.

c. Interactive Multi-Media Experience

In the third and final stage of the installation students encountered a sophisticated (Apple Macintosh Quadra 840av) computer (Figure 5) with three-dimensional graphics, video, sound and interactivity. They were required to again "construct" an ARCH, this time within the computer using custom-programmed multi-media interactive software. The exercise (Figures 6 + 7) was conceptually the same as that conducted with physical objects — when all blocks were in place [i.e., keystone positioned last] the two dimensional graphic of the arch transformed into three dimensions and an animated journey commenced (Figures 8, 9 + 10). Software used for this component of the project included MiniCAD (GraphSoft), StrataVision (Strata Inc.), PhotoShop (Adobe) & AuthorWare (MacroMedia). At the end of the 3D exploration of the arch the students were presented with a dialogue box offering an opportunity to laser print a keepsake of their experience. The printout included a description of the arch in the environment, a review of some of the principles discovered, a list of project participants and, of course, some 2D & 3D images of arches.

From a pedagogical perspective the sequencing of the three components was intended to provide explanation and context, to built awareness through making with the hands, and finally to reinforce the lessons of the previous steps while concurrently messaging the power + potential of information technology. Reaction to the educational experience and the physical environment was positive — students enjoyed learning in this information-rich milieu and worked hard to grasp concepts and apply them.

Implementing the Project - "Build It and They Shall Come"

To deliver the curriculum an installation was built at a local museum, as previously discussed. Primary grade children arrived to the event on day-long field trips [with many bused in from rural locales]. Dissemination of knowledge peaked across the full week that the installation was up and running, although learning occurred throughout the long course of design and testing that preceded the formal event. Staff and students at the Faculty of Architecture designed and developed the installation, including the multi-media computer modules. Secondary school educators and students were educated about the curriculum and "operations" of the installation, with the intention that these students would in turn educate primary school students at the installation site itself. A wealth of on-site beta-testing of the curriculum and software was conducted with children at the primary education partner's facility (Figure 11). The installation development and construction costs were subsidized by various private sector companies,

Fig. 3

Fig. 4.

including Apple Canada Inc., a high-density foam manufacturer and a local reprographics company.

Architectural Curricula Proposal

Today the education of an architect should broaden beyond the confines of discipline-specific knowledge, embracing broad political, economic and cultural issues in an effort to build the skills critical to solving complex problems. In an age of increasing specialization an architect's professional education must run counter to the status quo—demanding a comprehensive generalist grounding prior to electing to focus on one area or another. Dunham-Jones[11] (1990), in a review of liberal-arts concerns, suggested: "The need for grounding architectural study in knowledge of the world is increasingly imperative as both architecture and education get swept up in the currents of post-

Fig. 5.

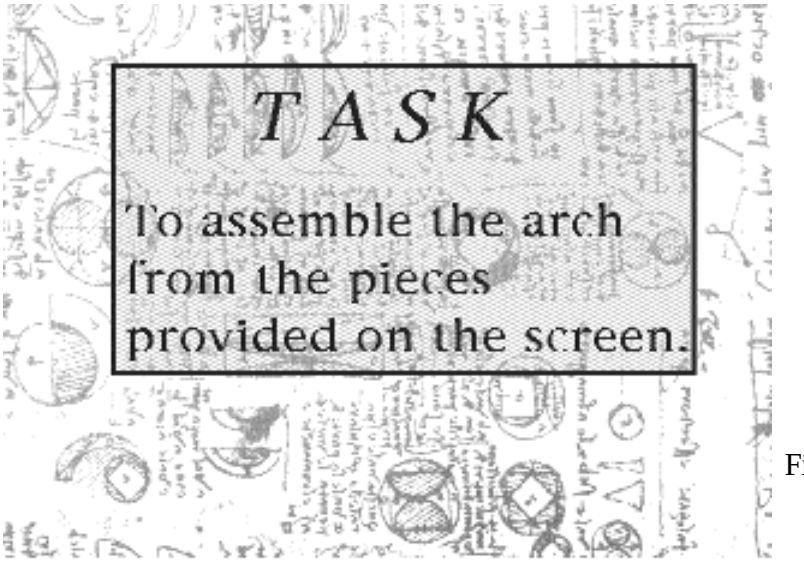


Fig. 6.

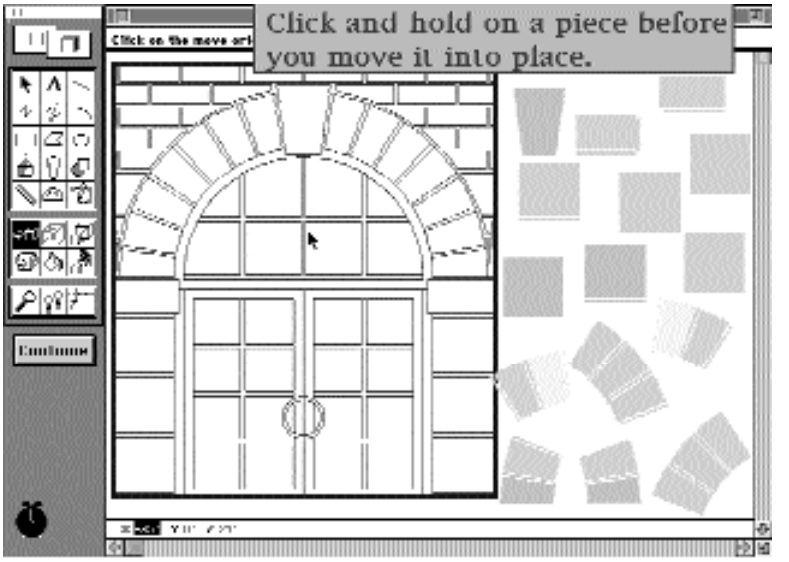
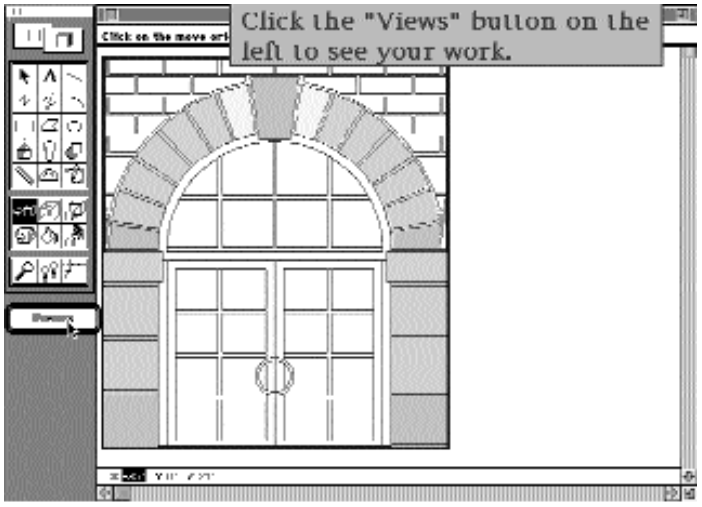


Fig. 7.

Fig. 8.



industrialism. Computers, with their emphasis on process over content, and the placelessness of telecommunications threaten to distance architecture from its role as the durable representation of human interaction and the elaboration of place." The present project illustrated the viability of introducing a hands-on, community-based mentoring experience to architecture students to broaden and enrich their professional education and enhance their "knowledge of the world".

The present model (Figure 12) holds promise for wider adoption in architectural curriculum, where such community-focused endeavors are ascending in importance and relevance. Requiring architectural students to teach others (i.e., to mentor) proves, in many cases, to be a rewarding undertaking with numerous benefits. Through the designing of curriculum architecture students are exposed to a wealth of information,

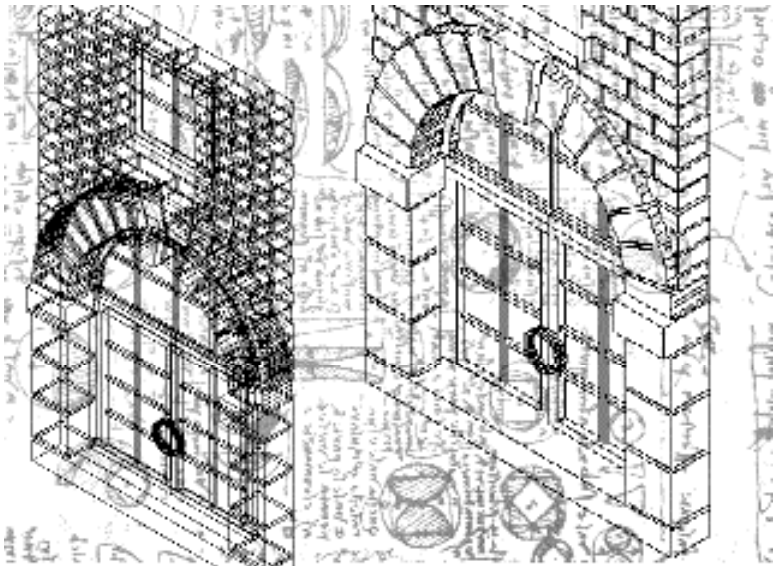
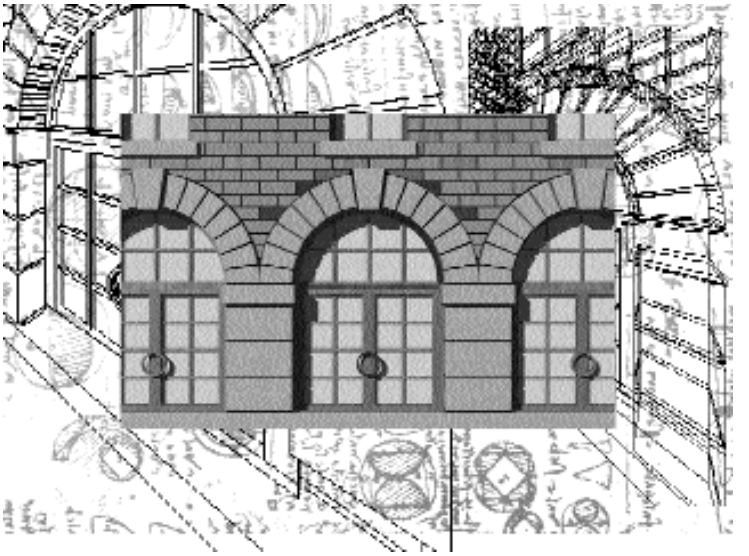


Fig. 9.

Fig. 10.



much of which they must understand before incorporating as “course’ content. Through educating the secondary students (i.e., training the trainers) architecture students learn how to communicate their own ideas and are exposed first-hand to the many challenges of effective teaching. Through supervising the secondary students as they in turn teach primary level students architecture students reap the rewards of their hard work, seeing the positive and direct effects of their mentoring on the two lower levels of education. Notions of partnership, teamwork and community come together as the three levels of education all participate in the learning experience.

Technology, and specifically computer technology, acted as a prime motivating factor in the learning experience. Many of the students (at all three educational levels) participating in the project expressed excitement about working on computers — the technology provided a strong focal point around which participants could rally. Rather than

Fig. 11.

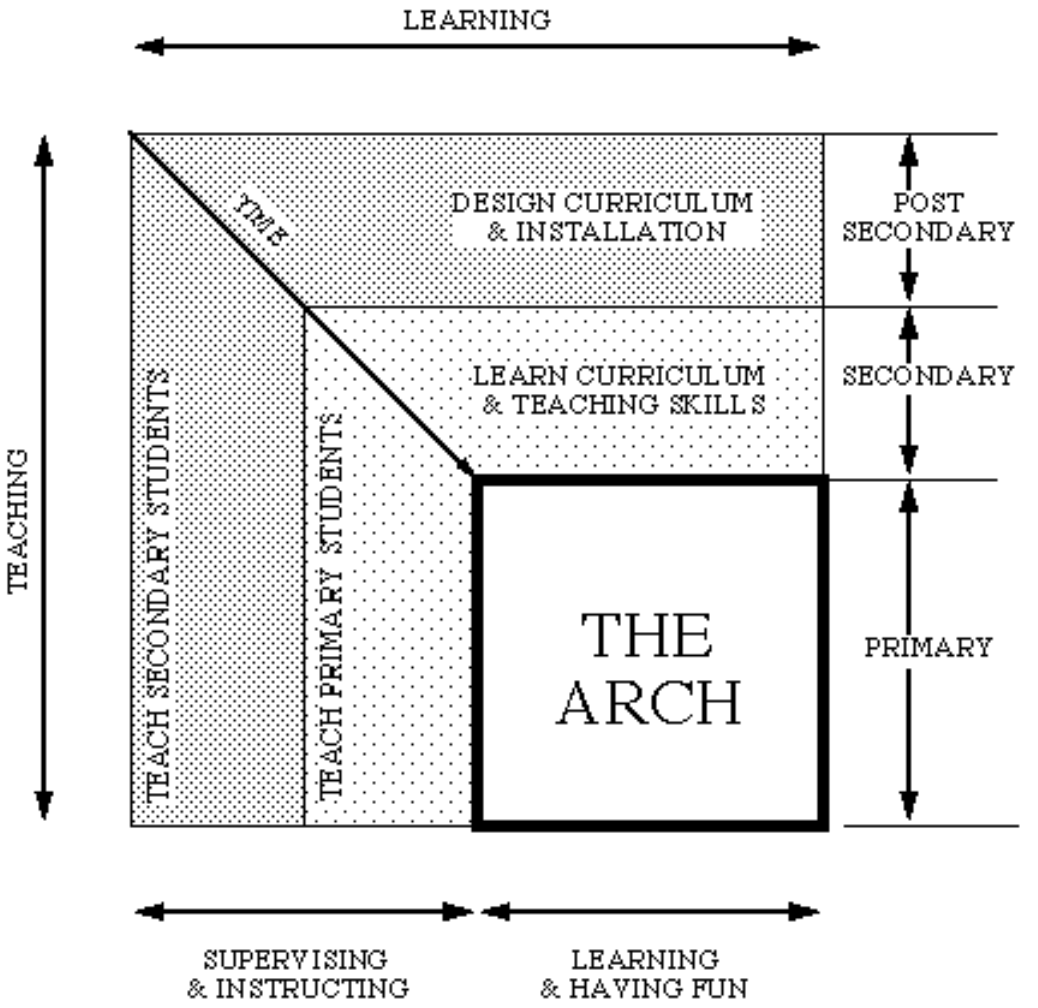
highlighting only process, all components of the project installation celebrated both content + process as embodied through the theme of the "ARCH". Employing multi-media tools attracted student interest, helped to focus attention and made the learning experience fun. This model, suggested for inclusion in architectural education, highlights mentorship, cooperative teaching + learning, new media and a focus on environmental concerns. The project's outreach locus places architectural students into the community, promoting their awareness of responsibility, increasing their public profile and underscoring the need for cooperation & collaboration in problem solving.

The present project incorporated a number of inter-related approaches to teaching & learning frequently employed in clinical education: Cognitive, Psychomotor and Affective. Through inclusion of these three approaches a comprehensive educational experience was assured. While time constraints and logistics in the present project limited primary grade level learning to 'knowledge'+ 'comprehension' (lower-order thinking) and 'application' (higher-order thinking), future implementation of this model could progress to incorporate 'analysis', 'synthesis' and 'evaluation'. These latter higher-order thinking skills could be readily addressed through an expanded multi-media session, including testing/assessment modules that would provide immediate feedback and reinforcement. By employing these more advanced processes the suitability of the model for higher primary grade levels would be increased. Building in more depth would enhance the educational experience of not only the K-12 participants, but also of architecture students vested with the challenge of curriculum development, teaching the 'teachers' and supervising the overall implementation of the model.

Reflecting on the Project - Lessons Learned

The project proved rewarding for all of the partners involved. It became clear in executing the project that the learning experience was not restricted to the primary level students alone (i.e., as per the Manitoba Technology Initiative mandate), but in fact was shared among all participants. In disseminating knowledge downwards through the various educational levels, awareness was promoted concerning the architect's role, architectural elements, and the broader built environment. Using the ARCH as the central theme, a realization of the inter-connectedness of the environment was advanced. Mixing learning strategies, tools and media promoted the retention of concepts while providing opportunities for exploration. In making and learning as a team, the breadth of project participants came to better understand both the value of their individual contributions and the critical need for collaboration.

Fig. 12.


LEARNING
TEACHING
TIME
DESIGN CURRICULUM
& INSTALLATION
POST
SECONDARY
LEARN CURRICULUM
& TEACHING SKILLS
SECONDARY
TEACH SECONDARY STUDENTS
TEACH PRIMARY STUDENTS
THE
ARCH
PRIMARY
SUPERVISING
& INSTRUCTING
LEARNING
& HAVING FUN