Three Collaborative Models
for Computer Graphics Education

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Abstract

Visual communication is an area that acts as an integrator to other disciplines, business work projects and institutions. The collaborative models and innovative delivery systems described in this document provide "real world" experience, initiate accelerated learning and develop flexible structures for curriculum that meet the needs of business, industry, the learner and the educational environment. These models and samples address many of the current issues facing the computer graphics profession.
Keywords: *collaboration, inter-disciplinary, distance learning, video- conferencing.*

1. Introduction

Schoolcraft College is a public, tax-supported community college serving the people of northwest Wayne County, in Livonia, Michigan USA. The college district is composed of five public school districts: Clarenceville, Garden City, Livonia, Northville, Plymouth-Canton and part of the Novi Community Schools. Schoolcraft College was founded October 24, 1961.

The Computer Graphics Technology program at Schoolcraft College prepares students for careers in computer graphics and graphic design through a combination of classroom and real world experiences. With this mix, students learn to apply technical skills and develop professional work skills. This document identifies some issues facing the graphics profession and describes some structures and models used to address those issues.

2. Computer Graphics Education Issues

- shortage of qualified graphics professionals

- keeping curriculum current with rapidly changing technologies
- student expectations for high quality applicable experience

The shortage of qualified graphics professionals should not be over simplified to numbers reflecting supply and demand. The shortage is also due to a lack of coordinated efforts between business/industry and educational systems. Educational institutions struggle to keep the curriculum current due to both rapidly changing technologies and changing industry needs. Students expect and should receive a high quality educational experience that is applicable to the needs of the market. These are not new issues but the speed of change requires a new way of dealing with them. The old model of education, work experience and curriculum development as separate activities needs to unfold into a real-time simultaneous activity. Students can learn by experiencing real projects that simultaneously identify curriculum needs and deliver learning (section 3—Sample).

- complex integrated communications, software and hardware technologies require multiple experts
- faculty development and training are an institutional issue

Departmentalized educational institutions do not reflect the integrated multi-disciplined reality of the world. Complex integrated communications, software and hardware technologies require multiple experts for project/product development. Computer graphics and visual communication is a field that acts as an integrator to other disciplines. Educational systems can provide a value-added environment by allowing interdisciplinary experimentation. Coordinated joint instruction is not just a bonus for the student but has the added value of faculty development. We need to look at how we use our time—how we can allocate

human resources to simultaneously teach and learn (section 4—Sample).

- digital media, and communications technologies such as Interactive Video-conferencing and the Web are mechanisms for developing new relationships and experiences in collaborative work

New communications technologies have opened up opportunities for collaborative relationships. We have a need to share information in order to remain current in the specialized technologies we pursue. Large complex projects require multiple expertise and the Internet and Interactive technologies provide mechanisms to share expertise and information (section 5—Sample).

3. A Flexible Program Structure ...enables a "Real World" Project Philosophy

The Computer Graphics Technology department has adopted a "real world" project philosophy. To implement this philosophy, Stephen Wroble developed an innovative flexible curriculum structure that meets the changing needs of students, faculty, local business and industry, and can adapt to a changing technical environment. By creating a track system with crossover electives, students can create a more specialized sequence of instruction. The curriculum structure was developed with growth and change in mind.

The need for frequent curriculum revisions and for specialization due to rapid changes in graphics technology is also built into the curriculum structure. The design elective structure provides a mechanism for adding new courses and a testing ground for new tracks (see Figure 1).

For example, the screen design elective was implemented initially for the Multimedia track and initiated the development of the newest Web Design track. The storyboarding design elective is useful for many tracks and is currently a testing ground for future animation and videography tracks.

There are currently 5 tracks in the curriculum. Publishing, Illustration, Digital Imaging, Multimedia and Web Design. Students choose

2 tracks for an associate degree or can get post associate certificates (see Figure 2). Our student population includes both the traditional students and graphic professionals returning to update their skills. This mix gives the classroom an energetic dynamic and a professional maturity.
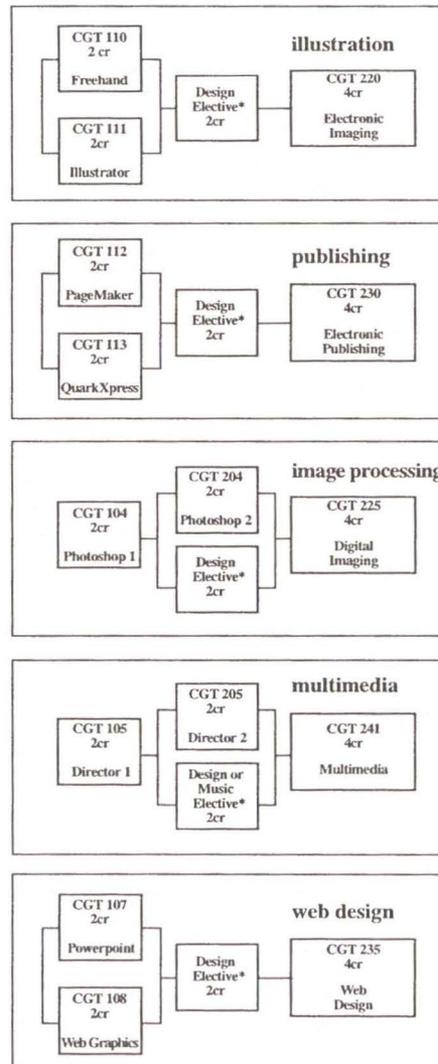
Design Electives Flexible Module Choices

CGT 150–Typography	Design modules in development
CGT 151–Survey of Design	–Color Theory
CGT 152–Screen Design	–Legal/Business Issues
CGT 153–Portfolio Development	–Interactive Writing
CGT 154–Music Sound Design	–Transformational Geometry
CGT 155–Storyboards	–Digital Video
CGT 156–Photography	

Figure 1. CGT Tracks
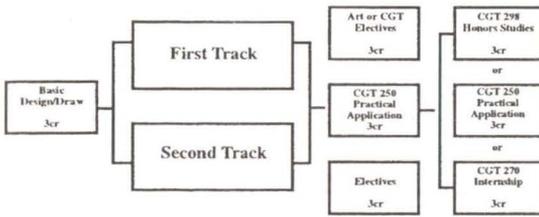
Figure 2. CGT Requirements for Associate Degree

Each track starts with foundation skills in the basic drawing and design; application software skills follow, along with design electives. Once these skills are established, they are applied in specialized projects for the track (CGT 220, 230, 225, 235, 241).

All of the tracks then converge into the CGT 250 Practical Applications. Students from all tracks are mixed into this project class. The "real world" project philosophy provides students with a career experience in a supportive environment.

In these project classes, students' partner with business and industry, non-profit organizations or on-campus marketing design groups to experience and learn through actual projects. Because all projects do not fit neatly into semester timeframes, projects can be extended if necessary into a variety of forms: honors studies, internships or additional practical applications classes (CGT 251, 270, 298).

As a result of working on a real project, students gain valuable experience in:

- Application of design techniques and processes
- Project design and time management
- Systems thinking
- Budgeting and production constraints and analysis
- Collaboration and teamwork and relationship building
- Decision making based on research and evaluation
- Communications, presentation
- Troubleshooting and problem solving
- Critical thinking, and data interpretation

Over the past 4 years, the Graphics Department faculty coordinated close to 200 large and small projects for non-profit

organizations and the college. These were used in both the track classes and in the Practical Applications classes. Examples of the projects include layout design for two literary journals, the McGuffin and The Michigan Community College Journal. Logo and T-shirt design for the Walk for World Hunger and the disabled sports Wheel Chair Hockey league, building and campus maps for the Schoolcraft kiosks and Web site, graphic design training materials for Statewide Methodist Church publishers, displays for the Women's Resource Center, layout and design of the Siggraph Education catalog and CD, and cover designs for the Schoolcraft catalog and schedule.

Several projects were also done with six business partners. Each business related project was initiated through the Workforce Development Office. The Workforce Development Office at Schoolcraft College facilitates and implements the development of partnerships between business, industry, the community and education. These partnerships help contribute to the development of new teaching and learning systems for the college. This model allows the business partner to take part in the learning environment and experience the same learning objectives as the student, while producing a product needed for the industry. The Project Driven Learning System and Courses (PDC's) are an example of a new learning system for the college. The first PDC was designed in partnership with General Motors Delphi. Computer Graphic Technology students produced a series of tools (Job Aids) that were designed to help GM employees perform tasks and operations. For the CGT program business partnerships included:

1. GM-Delphi
   Job Aids and Graphic Design Training Manuals
2. Ford Motor-EEME Emerging Export Market Engineers
   Intranet based time reporting interface design
3. Johnson Controls
   CDRom product implementation process training
4. Crucam
   Logo and marketing materials
5. Advanced Communication Incorporated
   Operations manual layout
6. Environmental Technology Corporation
   Marketing Trifold

Imperative in the building of the business partnership is the focus on the priority of the

learning process and not the actual product. Unique instructional tools and methodologies have also been produced to support the delivery of PDC's.

A proposal is written to document the deliverable product, and also includes the responsibilities of the learner, facilitator and business partner in the learning process. The proposal becomes the foundation for the course and dictates both the applied technical objectives, along with the process. A framework has also been developed that identifies a design process that guides the team through the project. (e.g. Understanding the scope of the project, the business partners environment, needs inventory, team processes, applying skills, devising production plans and implementing and delivering the product, debrief and learning analysis.)

As the class proceeds the project's needs are discovered. This happens through meetings, interviews, surveys, and other needs analysis tools. The curriculum needs emerge and are developed around the project needs. In the example of the Ford EEME interface design, CGI scripting, database and programming skills were needed along with the graphic design and HTML skills that already existed in the group. A second phase of the project was established as an internship for creating the database connection to the graphical interface. The students also learned about Ford Motor Company's culture and global markets.

The students maintain a skill process log where they record and reflect on their learning and team processes. A formal learning analysis presentation is required in addition to presenting the final product.

The benefit to the student for all types of projects is a real experience in the production process with both instructor facilitators and partners. The benefit to the facilitator is current curriculum and course development that meets the needs of actual work. The benefit to the partner is a learning environment to interact with potential employees and a deliverable product that meets a need. This direct input into the educational system benefits both the partner and the educational institution.

Two areas of caution and difficulty in implementation of the business projects are the partner's priority and the project selection process.

Partners who focused on the product and were not concerned with the learning rushed the process and became a management issue for the faculty facilitator. Also, projects that were selected more closely by the instructors were inherently more successful experiences for the students. Projects that were chosen incorrectly became extremely frustrating for the faculty. Project selection must be driven by the desire to provide the student with appropriate learning opportunities and not by some other political business relationship need.

By developing flexibility in the curriculum structure, a program has been developed that meets a wider range of individual specialization needs. By developing a framework for experimentation with "real world" projects, the program can respond to the job market in the community, fulfill non-profit service needs and provide a resource for the college. Real projects provide all participants with a relevant educational experience and authentic curriculum development.

4. Interdisciplinary Collaborating Environments ...Breaking the Barriers of Departments

Several experiments have been conducted with the Computer Graphics Technology department and other departments at Schoolcraft College. With these cross discipline experiments comes a glimpse at the possibility of infinite combinations of instructional offerings. Most recently in the business arena, three instructors are coordinating efforts in a course called Marketing and the Internet. This includes a marketing instructor, a graphic design instructor, and a language arts instructor. The students in this initial offering are marketing students, but the instructors have considered the integration of students from all three disciplines. Students are now analyzing Web marketing from multiple perspectives of language content, aesthetic look, technical and navigational information design, and marketing concepts. They have integrated graphic design and language arts skills into their marketing presentation design, merging different perspectives and blending concepts. Faculty are also broadening their knowledge base and learning from each other.

Other coordinated experiments have included a multimedia class that requires both visual graphics and the synchronization of sound and a Web design project integrating the interface designer and the programmer. An illustration class is proposed to include a graphic design instructor

and a mathematics instructor bringing in the dimension of transformational geometry.

For the student, the benefits of coordinated teaching are obvious. Coordinated teaching provides the student with the multiple expertise of several faculty members or consultants. The students become aware and understand on a multidimensional level. They also witness the collaboration and interaction as the instructors become actively involved in learning. The students were aware that this was an experimental environment and provided feedback and suggestions to all the instructors. This behavior made them more open to critiques of their own work as they learned to appreciated feedback as an opportunity for improvement.

A less obvious benefit from joint instruction is the benefit to the faculty. By working collaboratively in teams, around emerging technologies, faculty members learn together and are able to update their skills; training occurs while simultaneously teaching. The course develops out of the faculty and student knowledge bases and out of the social interaction taking place. This retraining and investment in faculty development will pay off in future offerings of the course and in the development of alternative delivery methods courseware.

Technology choices were made based on how the technology enhanced the learning. In the Marketing class, we experimented with email, discussion groups, Web analysis and Electronic Library research along with presentation technologies. These experiments quickly brought students together and formed a communications mechanism to do work. Marketing was the common language of the class, and the cross-disciplinary approaches were related to this foundational language. A decision to use Marketing as the foundation allowed this first offering to be managed and coordinated around marketing topics, with marketing students.

Future offerings will allow for better integration of language arts and graphic design principles into the planning. Future offerings should be modified to allow for more faculty integration and pre-planning time.

Several issues arose from this experimental class. Administrative support is an issue for new experimental delivery methods. The value of an innovative faculty member is reflected in that support. This is an issue that we must further address in the expansion of the course. Investment in faculty development through joint instruction and support will pay off in the future, allowing for improvement in the quality of our work. Each teaming configuration might require a different amount of overlap. A matrix compensation plan was proposed to assist the administration in dealing with the complex issues of compensation. The matrix relates class session percentages by instructor to a totaled minimum and maximum range for the course. Factoring in the benefit of instructor training can also help justify the expenses of joint instruction.

5. Interactive Videoconferencing ... a Shared Learning Experience with Multiple Institutions

The Internet, networks, and interactive video-conferencing systems have expanded the opportunities for collaboration across multiple institutions. After attending a NSF workshop on Instructional Computing, staff and instructors from several institutions set out to create a collaborative learning experience for students, instructors and media staff. By combining computer technologies with distance learning delivery systems, a joint interactive-TV art and design project emerged. This collaborative activity has been done several times over the past 2 years.

Various levels of graphic design students from three institutions were given a similar project. The project this year was to create a Red Cross Blood Drive poster. Students researched using the Internet and gained insight into blood types, donor populations and blood donation needs. Schoolcraft College and the University of Wisconsin-Stout graphic design instructors used email to prepare the guidelines for the project, while the media support personnel verify the compatibility and connection of the systems. Schoolcraft College agreed to act as the initiating site.

Second year students from the community college participated along with fourth year students from the University. The projects varied each year but had some common objectives:

1. Students learned the features and tools of graphic packages, while emphasizing design principles.

2. Students, instructors and support staff technicians were exposed to graphic design as applied to video conferencing equipment. This included a look at screen design and video monitor display including such topics as aspect ratio, safe title areas, interlacing, NTSC and color limitations, along with comparisons between compressed video resolution, TV resolution and computer monitor resolution. This gave the students experience in using features such as color correction techniques, to meet the technical limitations of the media.

3. Students had the opportunity to interact with students from other schools using the Internet and video conferencing equipment. This helped them to develop communications skills and introduced them to people who may be future collaborators. It also exposed them to work produced by students in other programs at other institutions. This is beneficial to the instructor as both a comparison check and for exposure to other instructors teaching approaches and critiquing comments.

4. Students were allowed to control the conferencing equipment from the touch control panel, giving them a unique new experience with a new technology.

Teams of students orally, visually and interactively presented their work for critique using the interactive classroom. Technicians assisted in training faculty and students so they could present live in the Interactive TV classroom.

The interactive TV room has a British Telecom Codec that does any connection from a single ISDN to a 1/2 T-1. The instructor/student used a control panel that is Windows NT based. Equipment is controlled using a touchscreen icon based panel. This includes audio and video switching and peripheral control. Video and audio routing is through software and interfaced to a 12x8 video matrix switcher card and a 4x4 audio matrix switcher. There is an RS232 interface to the professional VCR.

Audio functions from the control panel include microphone mute, gain, speaker volume control and mute, VCR volume control and mute, audio calibration, privacy and refresh. There are two directional classroom and instructor microphones and a speaker systems. Other functions of the system include automatic adapting to the acoustic environment; this eliminates echo, feedback and other noise.

The video functions such as camera selection, camera positioning, AV routing, VCR control and some testing are also controlled on the touchscreen panel. There are classroom cameras, an instructor camera, and a document camera; which serves the purpose of an overhead projector yet allows 3-D objects to be displayed. Twelve preset camera positions can be stored as a profile, allowing different instructors to preplan their camera positions. Panning and tilting up down and diagonally are controlled with variable speed tied to the firmness of touch. The VCR controls (play, stop, record, pause, fast forward, rewind, counter, reset, eject) are also available from the touchscreen and video recording can be of the local site or the remote classroom.

Other peripherals include; the Computer with Internet access, a video disk player, a facsimile machine, telephones for fax, voice-speaker, and remote diagnostics. There also is the capability to take control of the remotes site's cameras. One remote site demonstrated their wireless tracking system feature. The tracking system allowed the instructor to move around the room and remain on camera.

Schoolcraft College belongs to MiCTA. This is a communications organization that follows the recommendations of the (ITU) International Telecommunications Union. The ITU coordinates global telecommunications networks. (www.itu.int) MiCTA is a support mechanism for the college technicians and works to maintain interoperability specification for equipment and connections with other sites. Information about similar video conferencing systems can be found at (www.micta.org/mictamap/).

Students from Schoolcraft College and Washtenaw Community College and the University of Wisconsin-Stout have successfully participated in joint project critique sessions using the two way audio and video - computer interactive television classroom.

This project could be expanded. Schoolcraft College has agreed to act as the initiating site. The goals of this expanded project could include the following:

1. Create a 4-way link using a bridge to connect multiple schools.

2. Experiment with partners from other areas of the world. Initially in point to point connections and then in bridge connections.

3. Initiate student project teams from multiple institutions to collaborate and develop relationships across geographic boundaries, using Internet email communications with a few sessions for critique and sharing in the Interactive classroom environment.

An Internet variation of this concept could be developed for those who do not have interactive video capabilities.

6. Summary

The benefits of the collaborative models articulated in this paper deal with some of the issues and challenges of educating students in a rapid changing environment. They do not however come without some problems in implementation. As technologies continue to evolve and change at incredible rates, education must look at ways to integrate the tasks of education, work experience and curriculum development. The CGT program structure is very effective in providing a dynamic curriculum model. The program has grown from 2 to 5 tracks in less than 4 years and has doubled in enrollment. Employer's hiring CGT graduates have sent positive feedback to the program. Students expect a high quality applicable individualized experience. The flexible track and modular design elective structure allows students to tailor their curriculum to meet their unique interests or needs. Some students although, require extra guidance in this task, having experienced more rigid, less fluid structures in their past. Counselors also have difficulty with the choices and rapid changes in the curriculum. Faculty find themselves taking on an advisory role. Curriculum developed around actual real project requirements and employment needs has helped identify weaknesses and needs in the college's curriculum and has affirmed some of its strengths.

Faculty development must also occur quickly in a rapidly changing world. Joint coordinated instruction can promote peer learning among faculty. The course exceeded its goals for the initial offering, and identified some issues for improvement. A more integrated articulation of learning objectives will help coordinate efforts and assessment. The benefits to the future of the college along with the cost of faculty retraining must be part of the equation, when funding is re-evaluated.

We now live in a networked environment that provides us with wonderful opportunities for connections that we did not easily have in the past. Faculty from multiple institutions have opportunities to compare outcomes and collaborate in learning projects using communications technologies, such as Interactive TV and the Web. Opportunities exist to build and maintain global relationships through experiences enhanced through technologies.

Computer graphics as visual communication can act as an integrator for interdisciplinary courses, cross-institutional experiences, and "real world" projects. Improvement of learning happens with frequent interactions and active involvement, this is required in collaborative learning environments. Collaborations are waiting to be imagined.

Tell me and I'll forget.
Show me and I may not remember.
Involve me, and I'll understand.
—Native American saying

My thanks to Schoolcraft College, UW-Stout, Washtenaw Community College, GM-Delphi, Ford Motor-EEME, Crucam, ETC., Johnson Controls, Advanced Communications Corporation, and all the non-profit organizations for their willingness to experiment with new teaching and learning models.

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