

Teaching Computer Graphics in the Online Environment

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ABSTRACT- Authors William Draves and Julie Coates estimate, in their book “Nine Shift”, that 50% of all education will take place on line by 2015. The teaching of graphical subjects on line will be a part of that shift. Graphics teachers have been slow to adopt online education solutions because of three technical problems. The three problems are: 1) making the creative process between student and teacher work at a distance, 2) providing reliable textual and graphical interactive help for students during the creative process, and 3) providing students with interactive evaluation of their finished work (critique). Both the methodology and the technology now exist to resolve these problems and support teaching graphical subjects in the online environment.

I. INTRODUCTION

Online education, within its short history, began life heavily focused on non-graphical programs. Although it is not very common yet, some teachers are putting illustrative arts programs on line. Unlike the teaching of mathematics or chemistry, where each problem presented by the teacher, has a single, predictable, correct answer, the teaching of illustrative arts involves problems with a near infinite number of possible solutions. For that reason alone, a different approach is required to teach illustrative arts on line.

Each of the three problems can be resolved; the resolution of each involves an understanding of the

underlying theory, a process that can bring the problem to resolution, and technology that is available to accomplish the application of the theory through the process.

II. CREATIVE PROCESS

Making the Creative Process between Student and Teacher Work at a Distance:

Theory:

The creative process, as we now understand it, has been best described (in popular literature) in the works of Betty Edwards. In her studies of R-mode thinking, she has defined a sequence of modes that most creative people pass through to get to a solution to a problem that requires creative resolution. That process has five modes, “first insight, saturation, incubation, illumination, and verification”. We pass through these distinct modes in every type of creative pursuit. For students to become aware of these steps, as they are engaged in them, requires an awakening cultivated by skilled teaching.

Bringing about this awakening in the undisciplined, often chaotic, minds of creative students is a challenge in a face-to-face (F2F) classroom where the teacher can guide student’s work real time. Accomplishing this awakening, without F2F guidance, through online interaction is a bigger challenge yet (see Appendix C).

Process:

The interactive process begins with the definition of the problem. Illustrative arts problems invariably have both a textual and a graphical component (usually in the form of a sketch). The classic text for entry-level drafting, Geisecke, *Technical Drawing*, contains hundreds of assignments; each one has a drawing paired with a written description. The teacher online mounts these assignments onto the delivery vehicle (web-based course-management software). Students can then complete their text assignments directly on the website, or in an alternative scenario, the teacher directs the students to read and then answer questions from a text.

Completed assignments can be e-mail/attached back to the teacher (as in the WCTC model, see Appendix B) or posted publicly. Public posting can be on line or in a classroom (as in the Syracuse, hybrid model, see Appendix A).

Technology:

Students access their assignments through several different delivery vehicles. The most common delivery vehicles are custom web sites and purchased delivery courseware. The development of a custom web site requires a significant investment in time, technical training, and expertise.

The most frequently selected, purchased delivery vehicles are Blackboard®, WebCT®, and Moodle®. Each of these prepackaged delivery vehicles have options to deliver the course materials in both text and graphics formats. Teachers can offer assignments for students to work directly from images containing the full text and graphics start-point for the assignment online

or students can download files containing the assignment.

III. INTERACTIVE HELP

Providing Reliable Textual and Graphical Interactive Help for Students during the Creative Process.

Theory:

If all students could complete courses without help, all of our degrees would come from CLEP University. The model for most non-illustrative arts courses consist of readings from a textbook, web/text-based discussion, and testing.

Again referencing the seminal work of Betty Edwards, the process involved in creative illustrative arts is much more complex and extensive. For this reason, personalized guidance is essential (see Appendix D).

When the student is in the mode, in the process, the teacher must be available; that is when the student needs the help and guidance. At the time the student solicits help, the successful teacher must be able to recognize the mode in which the student is thinking. The teacher must be both knowledgeable enough and self-disciplined enough to enter that mode at-will in order to interact with the student in the same mode.

Process:

Teacher/student interactions, in the teaching of graphical materials, *cannot* be restricted to textual communications alone, since graphical and illustrative arts are not language based by definition; interaction with the student must be in a graphical format to facilitate the appropriate form of communication.

Anticipating those times when the mode of the creative process distorts the student's sense of

time, the teacher must design the course to accommodate those situations. A constructivist view of education is the most appropriate to adopt when teaching illustrative and/or other arts in an online environment (see Appendix D).

In a F2F environment, student and teacher can sit side-by-side. The student can work on an illustrative arts project and the teacher can correct the student either physically, or verbally, in process. The online equivalent of this process requires a software solution in which the remote teacher and the student can share the same image, and work on that image simultaneously. Such software does exist.

Technology:

No single online delivery vehicle offers a full range of solutions to deal with all three major issues of teaching graphical materials in an online environment at this time; a combination of products is required. Each of the software vehicles mentioned above offers both textual and non-textual interaction tools. The text tools in each of the popular delivery vehicles have adequate, but minimal editing features. Each of the delivery vehicles offers a whiteboard, or interactive sketch feature. None of these delivery vehicles has a graphics creation module with a save feature, so none of the work communally performed can be documented. Whiteboards, although they do offer an opportunity to interact in a graphical format, are only sufficiently sophisticated enough to share simple sketches.

Doodle®, a feature of Yahoo's Instant Messaging (IM) is an effective, interactive, graphics environment. Student and teacher can interact concurrently, textually, and graphically allowing both parties to work on a single image

and exchange text comments about that image. Doodle works well even at 2800 baud (modem speed). This software is free, easy to set-up, and operates intuitively.

Doodle offers a set of color crayons, three line weights, and an erase feature. Student can screen capture both image and textual exchanges for later reference, and the tool will persist on the students screen after the teacher has ended the session as further reference.

If more sophisticated, live, interaction is required, more powerful tools, such as Illuminate© or Microsoft's NetMeeting© can be used as "frames" in which student and teacher can share AutoCad, Adobe Photoshop, or 3D Studio MAX if both have sufficient bandwidth.

IV. INTERACTIVE EVALUATION

Providing Students with Interactive Evaluation of Their Work.

Theory:

The interactive evaluation process, or critique, universally accepted as essential to learning in all of the arts, can take place teacher to student, in a group online setting, or live, in a classroom. Later in this paper are examples of both options, titled the Syracuse model and the WCTC models.

Process:

One sequence viable to accomplishing the individual teacher to student critique, in an online environment, is for the student to submit finished work to the teacher. The teacher either accepts and grades the work or marks corrections on the digital work and returns the marked-up version to the student for rework. This interactive cycle repeats until the teacher accepts the work as complete.

This process however, requires a certain level of sophistication on the part of the student.

Live F2F orientation is essential to prepare students to transition from F2F education to online education. During a one-day orientation to an introductory level course (or first time online experience for traditional students), students can receive training in the use of CDs (that contain the course lectures) as well as hands-on familiarization by students with the delivery vehicle, hardware requirements, purchased software (if any), IMing, file opening, downloading, and online interaction. This guarantees a much lower failure and higher satisfaction rate.

This orientation provides the student with a full set of tools to navigate the environment in an illustrative arts course on line. The actual work generated by students can be in several forms, handwork (sketching, drawing, or painting), raster format (.gif, .tif, .jpg), or vector format (.ai, .dwg, .drw). The student attaches completed work to e-mail, places it in electronic “drop-boxes”, or uploads it to an FTP sites for pick-up by teachers.

Teachers can receive handwork scanned into raster format files from students, faxed, low quality, thumbnails and other types of sketches, as well as raster and vector format files in their native form or inserted into larger documents such as MSWord© or QuarkXpress© (as in the case in technical writing with illustrations).

The teacher can grade the work as received, or mark it up and return it for correction, with or without text comment.

Technology:

After the resolution of the creative problems have been accomplished using tools like Doodle© or Illuminate©, there is a secondary grouping of

considerations to tackle. These considerations define the *visual* (as opposed to functional) success of each piece of illustrative arts work. These six standard criteria are line, value, color, form, texture, and composition (not all of which apply to every discipline). Again, unlike mathematical problems with a single correct solution, the resolution of problems in the illustrative arts is an iterative process arbitrarily concluded rather than coming to a finite “correct” answer. Interaction with the teacher becomes still more important. Live critique, designed to aid in this process, is common to both the Syracuse University model and the WCTC model.

Evaluation of the work in an online environment, (particularly where multiple, simultaneous courses are being taught by a single teacher), requires constant personal interaction between the teacher and students.

V. CONCLUSIONS

Increased bandwidth, better software and our new understanding of the modes of the creative processes that take place in the human mind, have all combined to make the online study of illustrative arts subjects possible.

Today, the primary output format is no longer paper; output may be in the form of online images, animation, or virtual walkthroughs. Drawings have given way to 3D models, and models to Virtual Reality. These may all, in turn, be accessed on line and used for estimating by Washington State, lumber merchants in the morning and as art by an ad campaign group in New York in the afternoon. Designing directly, often interactively on line, and designing for online have become necessary skills for the contemporary illustrative artist. For

contemporary illustrative arts educators, teaching and working on line are essential 21st century skills. Teachers must stay current with their student's computer graphics needs in order to prepare them with the skills they require to enter contemporary industry.

Hardware manufacturers, software developers, and a legion of creative teachers have recently, synergistically merged to begin to solve the problems facing those of us who wish to teach computer graphics in the online environment.

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APPENDIX A: *The West Central Tech. Model*

A single assignment proceeds as follows:

- 1) Student reads the assignment, (and reviews the graphical start-point(s), if any) provided on line.
- 2) Student submits preliminary work as an e-mail attachment to the teacher.
- 3) Student receives feedback from the instructor, reviews the comments/mark-ups and makes corrections.
- 4) Student resubmits the reworked assignment.
- 5) Full acceptance of work by the instructor, grade posted.

The WCTC program requires the submission of a working portfolio at the time of each course's final test day. The teacher, working alone, judges portfolio merit on form, content, and presentation.

APPENDIX B: *Syracuse University Model*

[This solution is closer to a traditional classroom solution.]

The Syracuse University Independent Study Degree Program (ISDP) for illustrators contains courses that work as follows:

- 1) Student picks up a required work list at orientation.
- 2) Student presents research and the first thumbnail sketches as a posting to a public (class only) website.
- 3) Class critique is solicited, via a text window. Each student is required to comment on at least three pieces of work posted by fellow students.
- 4) Critique continues thru various stages, but not to completion of the final product.

- 5) The final work review occurs live at the final class session.

Each Syracuse course ends with a group critique in a live classroom environment, first by the students followed the teacher. Teachers frequently solicited additional critique, from artists from the specialty area under reviewed.

APPENDIX C: *Constructivism*

A constructivist philosophy is essential to successfully teaching illustrative graphics in an online environment. R-mode, creative, or alpha-level thought is not time-based in nature, but "due dates" must be set in order to grade for a course, achieve publication deadlines, and have work ready for gallery showings. Time considerations are essential to function in the real world. By allowing students to adjust the time they need to work through the stages of creative work, a policy where all work is due at the final exam date lends itself better than daily or weekly goals in the management of creative courses.

APPENDIX D: *Parity, Art vs. Industry*

The current philosophy of art education suffers from a very basic and unresolved flaw. We judge the value of factory workers by the volume of their production, yet we do not apply those same criteria of value to artists, or their work. As an example, Pablo Picasso, who produced works numbering in the multiple thousands in his lifetime is valued no more highly for that accomplishment than Vincent Van Gogh who produced only several hundred pieces of work in his. Yet, with this discrepancy in mind, we still set "quantity of work" goals for our students in art school and judge their success by factory worker standards.