The Journal of the International Digital Media and Arts Association

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Submission Guidelines

Articles on digital media and art related topics are welcome at any time. An abstract of not more than one page should be submitted to the editor via e-mail (mniederman@colum.edu). Please include "iDMAa Journal Submission" in the subject line.

Upon review, authors will be advised of acceptance for submission. The Journal will include a section for invited and refereed articles. While length will vary from issue to issue due to themes, articles will generally be 1500 to 4000 words. Any author preferring a peer review will automatically have the submission considered for the refereed section of the Journal.

While the Journal will normally appear in electronic form (PDF), at least one print version will be published annually.

All new Journals evolve and the iDMAa Journal is no exception. Please refer to our web site www.idmaa.org for updates.

Subscriptions

Membership in iDMAa includes a subscription to the journal. See the web site (www.idmaa.org) for details. The annual subscription rate for institutions is $95 which covers access to the electronic version as well as two copies of the printed issues per year.

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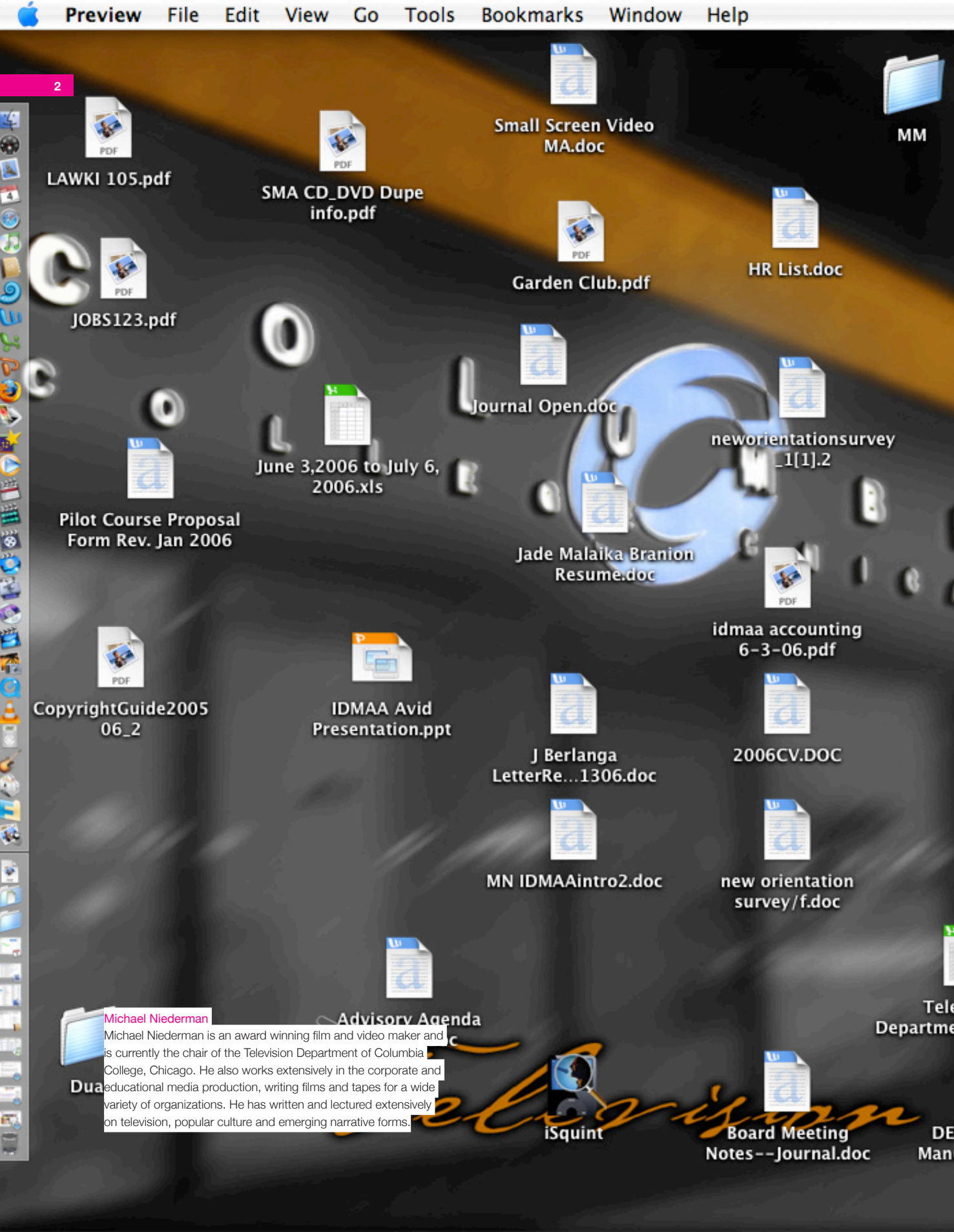
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Michael Niederman
Michael Niederman is an award winning film and video maker and is currently the chair of the Television Department of Columbia College, Chicago. He also works extensively in the corporate and educational media production, writing films and tapes for a wide variety of organizations. He has written and lectured extensively on television, popular culture and emerging narrative forms.
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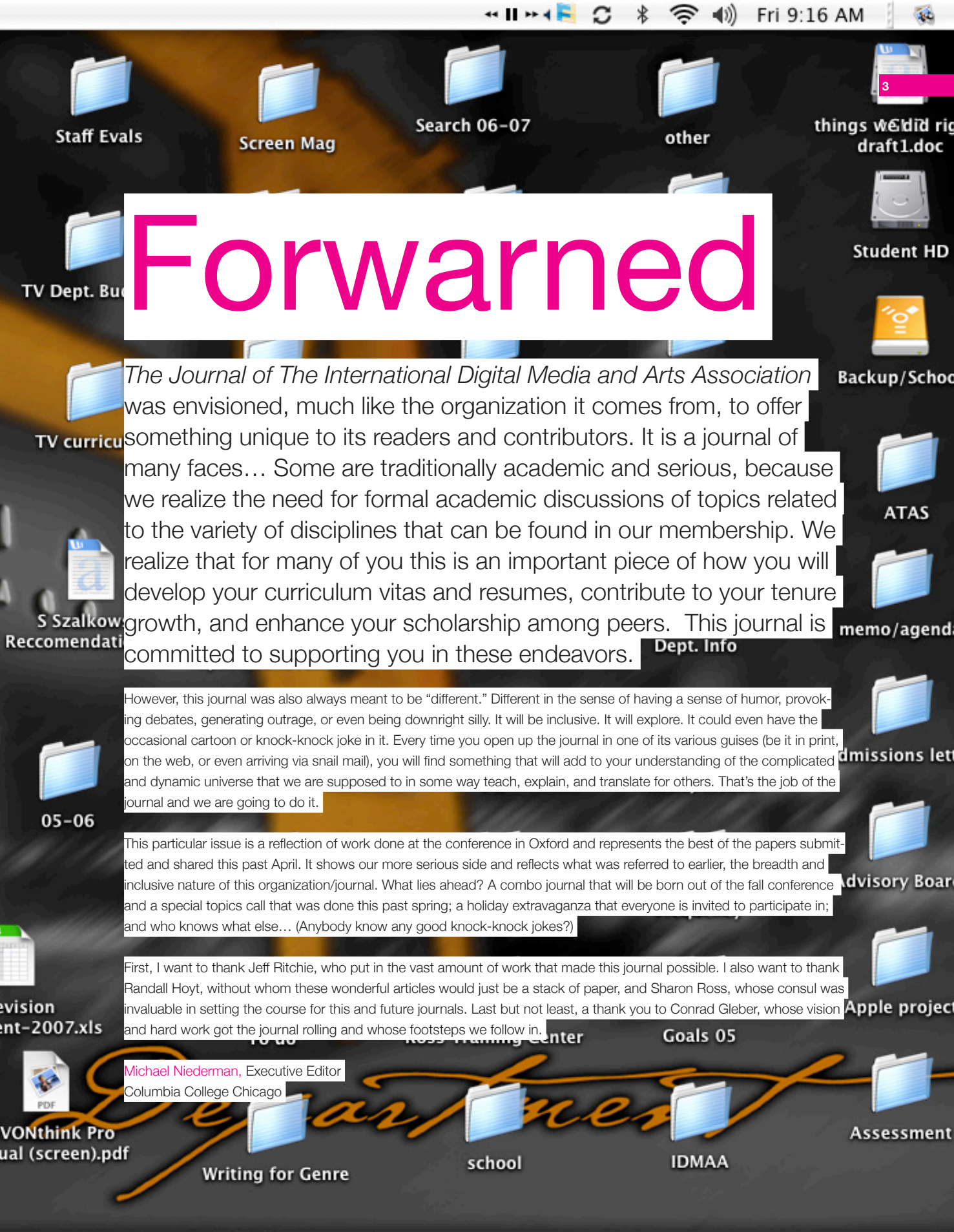


Forwarned

The Journal of The International Digital Media and Arts Association was envisioned, much like the organization it comes from, to offer something unique to its readers and contributors. It is a journal of many faces… Some are traditionally academic and serious, because we realize the need for formal academic discussions of topics related to the variety of disciplines that can be found in our membership. We realize that for many of you this is an important piece of how you will develop your curriculum vitas and resumes, contribute to your tenure growth, and enhance your scholarship among peers. This journal is committed to supporting you in these endeavors.

However, this journal was also always meant to be "different." Different in the sense of having a sense of humor, provoking debates, generating outrage, or even being downright silly. It will be inclusive. It will explore. It could even have the occasional cartoon or knock-knock joke in it. Every time you open up the journal in one of its various guises (be it in print, on the web, or even arriving via snail mail), you will find something that will add to your understanding of the complicated and dynamic universe that we are supposed to in some way teach, explain, and translate for others. That's the job of the journal and we are going to do it.

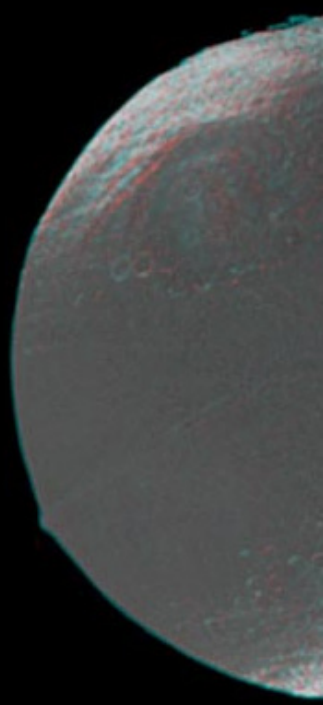
This particular issue is a reflection of work done at the conference in Oxford and represents the best of the papers submitted and shared this past April. It shows our more serious side and reflects what was referred to earlier, the breadth and inclusive nature of this organization/journal. What lies ahead? A combo journal that will be born out of the fall conference and a special topics call that was done this past spring; a holiday extravaganza that everyone is invited to participate in; and who knows what else… (Anybody know any good knock-knock jokes?)

First, I want to thank Jeff Ritchie, who put in the vast amount of work that made this journal possible. I also want to thank Randall Hoyt, without whom these wonderful articles would just be a stack of paper, and Sharon Ross, whose consul was invaluable in setting the course for this and future journals. Last but not least, a thank you to Conrad Gleber, whose vision and hard work got the journal rolling and whose footsteps we follow in.

Michael Niederman, Executive Editor
Columbia College Chicago

keywords

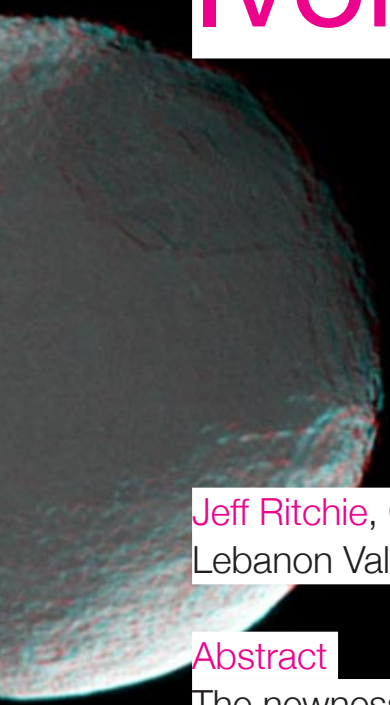
digital media, new media, interactive media, interdisciplinary studies, editing



Jeff Ritchie

Jeff Ritchie is an assistant professor of English and Digital Communications at Lebanon Valley College, where he teaches courses in writing, literature, and digital media and communications. He received a B.A. in English and a B.S. in Marketing from Indiana University, an M.A. in English from the University of South Carolina, and an M.Ed. in Educational Media and Computers and a Ph.D. in English literature from Arizona State University. He currently serves as the Conference Journal Editor for The iDMAa Journal and is Associate Editor of "Romantic Circles Reviews."

A Media in its Infancy and "Plaintext" in the Ivory Tower



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Lebanon Valley College, Annville, PA

Abstract

The newness and interdisciplinary nature of the field represented by the International Digital Media and Arts Association troubles academic discourse. The breadth of inquiry, the diverse fields, and the varied approaches—the varied academic codes, methods, and forms—present hurdles for creating and maintaining a dialog between the primary-disciplines that comprise this field. This essay proposes to speculate on why these different codes exist and advocates adopting an editorial policy that attempts to "decode" our dialog and instead privilege "plain text" and an instructive focus that will best suit the needs of our research, art, and pedagogy.

Prelude

In the late 18th century, during what was thought to be the Enlightenment's dying gasps, William Wordsworth wrote a preface to a collection of poems that he and a close friend had published. The *Preface to the Lyrical Ballads* became a seminal work of literary criticism. Filled with novel ideas about the nature of poetry, Wordsworth claimed that for poetry to be lasting and universal, it must not only touch upon those ideas that affect the lives of most people, but also be intelligible to them. All good poetry should be "in a selection of the language really used by men."[1] The revolutionary importance of this statement might not be readily apparent. To advocate that poetry, that canonized, high-cultural artifact and one of the most complex linguistic codes humans have devised, be written in the language of the average reader was a democratic coup. Poetry had been written for a relatively small, highly educated, and exclusive audience. Wordsworth took poetic discourse, boiled it down to its central, essential parts,[2] and based his theory of poetry on the results. In so doing, Wordsworth transformed the purpose, effect, and form of poetry so that it might reach a wider audience in a language that they might readily understand and deal with subjects that are of direct relevance to them.

The problems of a nascent, interdisciplinary field

So what does all this have to do with studying, teaching, and practicing in the nascent fields of Digital Media and Arts? Plenty. Look at the table of contents for the 2006 Conference edition of the International Digital Media and Arts Association journal. These articles represent a selection from all of the papers accepted to the 2006 iDMAa conference held in conjunction with the Interactive Media Studies conference at the University of Miami of Ohio. The theme of the 2006 conference is Code—"built around an examination of the many codes that drive the digital media and arts world"[3] Consider the breadth of inquiry, the diverse fields, and the varied approaches—the varied academic codes—represented in these papers. Note how the papers' methods and forms vary. This introduction to the 2006 conference edition of *The International Digital Media and Arts Association Journal* proposes to speculate on why these different codes exist and advocates adopting an editorial policy for the conference edition that attempts to "decode" our dialog and instead privilege "plain text" and an instructive focus that I hope will best suit the needs of our research, art, and pedagogy.

These differences between papers exist primarily due to two reasons—the newness of our field and its interdisciplinary nature. First, the media upon which our field is based is fairly new and while I'll agree that this statement might sound overdone, let's look at the facts. Compared to this history of the moveable type printing press, digital media, as a means of communications, has existed for a brief span of time.[4] During this time, we have only yet begun to define the conventions of our field (such as critical methodologies and vocabularies and suitable, commonly accepted and appropriate navigation devices for digital works). Whether we call ourselves New Media, Digital Media, Digital Art, Digital Storytelling, Interactive Art, Digital Communications, Interactive Media Studies, or Digital Critique, because of the field's relative newness, it has not yet negotiated a shared critical vocabulary or methodology or bibliographic tools useful in secondary research. While different departments and program have different goals, target markets, and realities, this fact that we work in a field so new that it doesn't yet know what to call itself poses very specific, very real problems that the field as a whole must negotiate; and as Cornet and Hriso point out later in this edition, the interdisciplinary field represented by Digital Media and Arts has, as of yet, no real accrediting body nor accepted best practices in our field. As we've not yet negotiated these central issues, our field remains heterogeneous in its approaches regarding scholarly and artistic practices.

This heterogeneity leads into the second reason for the variety within these papers; the very interdisciplinary nature of this group poses some serious problems to the act of scholarship and communicating with one another via journals such as this. Lev Manovich claims that our understanding of new media relies upon the conventions of pre-

1 William Wordsworth, "Preface to the Lyrical Ballads," in Abrams, M.H., ed. *The Norton Anthology of English Literature*, vol. 2, 7th ed. (New York: W.W. Norton & Company, Inc, 2000): 241-250.

2 We see a similar movement take this idea to its extreme in the artistry of Piet Mondrian, whose works seem to boil painting down to its essentials—lines and colors.

3 "Call for Papers," http://www.units.muohio.edu/codeconference/papers/pdf_cfp.htm.

4 For discussions of the history of print technology, see Ronald J. Deibert, *Parchment, Printing, and Hypermedia: Communication in the World Order Transformation* (New York: Columbia UP, 1997); Frederick G. Kilgour, *The Evolution of the Book* (New York and Oxford: Oxford UP, 1998); Jay David Bolter, *Writing Space: Computers, Hypertext, and the Remediation of Print*, 2nd edition (London, Mahwah: Lawrence Erlbaum Associates, 2003).

existing media.[5] We view the new media (and its potential) through the lens of the familiar media and, in so doing, adopt practices that do not make the best use of the new media's attributes. I maintain that this practice is equally true for this new discipline, cobbled together as it is from older, established "primary-disciplines." As a community of artists, designers, scholars, and teachers, many of us hail from different disciplinary backgrounds, such as Theatre, Computer Science, Art, Engineering, Journalism, Business, and English. These primary-disciplines form our expectations and practices. We each bring the assumptions and practices of our primary-discipline to our work and discourse in digital media and arts. We see this new discipline through the lens of our primary-discipline, often relying upon a discipline specific critical vocabulary or methodology, which in turn can trouble the discourse between those varied primary-disciplines that compose iDMAa.

I maintain that this practice is equally true for this new discipline, cobbled together as it is from older, established "primary-disciplines."

These differences form the basis for this association's strength; and a journal should capitalize on this strength as well as allow for and benefit a varied, wide audience. We must, however, be frank in our examination of these differences. In an interdisciplinary field such as this, how does this interdisciplinary group learn, write, and thrive in a culture where terms have different meanings dependent upon the author's primary-discipline? In such a heterogeneous audience, authors cannot assume that the critical vocabulary they use is free of the biases, jargon, and assumptions of their discipline.

For example, what does perspective mean? According to Mark Stephen Meadows, there are "at least two kinds of perspective: emotional (or cognitive) and dimensional (or visual)."[6] Yet within art, architecture, and literature, the term perspective varies in meaning. Can we write a work that deals with perspective, for a diverse audience, without first defining those terms central (or even secondary) to our project's purpose? Another example is the term multi-modal. What does it mean? Two articles in this edition use the same term, but with different meanings. Hedgecock, Wang, and Fernandez's "Mobile Media and Digital Wayfinding: Strategies for Implementation" associate multi-modal with a location and define it as a location that integrates multiple public transportation systems (such as air, train, bus, etc.). However, in McDaniel, Fiore, Greenwood-Ericksen, Scielzo, and Cannon-Bowers's "Video Games as Learning Tools for Project Management," "multimodal refers to the practice of using combined modes of sound, imagery, or text." We have two different papers from ostensibly two different primary-disciplines that define this term in two different ways. Exasperating this problem is the fact that we continue to attempt to define digital media related processes and concepts using different terms (such as using the terms interactive text, digital text, new media, ergodic literature, and cybertext to refer to the same object). Such confusion is understandable given the young age of the field and its interdisciplinary origins, but this confusion poses problems nonetheless.

The difficulties posed by iDMAa's interdisciplinary composition manifests itself in other ways as well. For example, how would a member of our field go about a critically analyzing a digital work? A humanities paper could examine the interplay of elements in the work and how these elements fulfill the work's rhetorical purpose (assuming it had one), or the cultural assumptions implicit in the work's construction. These are valued analyses, yet these approaches to studying this work are only a few of the possible means of studying digital media and arts. These two studies differ from more social science oriented research (which privileges different methods and evidence), as well as the creative/production oriented side of the discipline. But what about an artistic response to this work, or an analysis of its effectiveness as a marketing tool, or a sociological study of its varied uses? In many ways, the interdisciplinary nature of this field constitutes a microcosm of the academic world—only with the adjective "digital" or "interactive" prefixed to it.

Given our heterogeneity, my attempt to establish guidelines for choosing papers from this conference replicates Wordsworth's act of boiling down poetic expression to its

5 See Lev Manovich, *The Language of New Media* (Cambridge: MIT Press, 2001), 71.

6 Mark Stephen Meadows, *Pause and Effect: The Art of Interactive Narrative* (Indianapolis: New Riders Press, 2003): 12.

constituent parts and should catalyze, I hope, a discussion concerning the nature of scholarship in our field. I have divided my assessment of what a paper should do into four basic parts. First, the paper must say something new or of interest to our audience. Second, it must situate the paper within a larger critical discussion through referencing other critical or artistic works. Third, the paper must make its claims in a clear and concise manner. Fourth, the paper must adequately support all claims it makes. Part of the debate I'd like this edition and these papers to engender concerns the meaning and practices of scholarship and practice within such a diverse, interdisciplinary field. Can we as an organization reside in one ivory tower, or should we resign ourselves to lead our separate lives in our varied, separate towers? Does such a debate, focused as it is on the scholarly side of the organization, privilege the critical over the artistic, and give creative expression short shrift? Does it overly privilege my own primary-discipline's critical methodologies at the expense of other fields'? Should we even consider setting scholarship standards in such a field or would continuing on in our silos best serve this organization, having constructed a Tower of Babel rather than a single ivory tower, housing us all? Should our tower be ivory at all—given the practioner base of iDMAa membership?

The Humanities is predicated on the assumption that specific, authoritative editions of texts exist and upon which critical exchanges were based.

"On the same page"

These problems facing the discipline of digital media/New media would be common among most new, interdisciplinary fields. While I'd maintain that there need not be a unified, monolithic approach to work in this field as the richness of this field stems from its varied perspectives and ideas, from an editorial standpoint, however, the paper-based medium in which this journal is published and the varied media in which we work compounds our troubles. The nature of the media in which we work poses several problems. First, most methods of citation and attribution are largely based on a paper medium, not a digital. Paper works form what is known as uni-cursal works, having only one reading path through them. An example of a uni-cursal work is a paper that follows the linear path of the line of print. This paper has a discrete beginning, middle, and end and the author intends that it be read in the same order, no matter who reads it. Digital media, however, allows for what is known as multi-cursal works, which have varied paths through them. A good example of a multi-cursal work is a video game that allows users to follow their own paths and interact with the game as they see fit (the SIMs would be a good example). Each time a game is played, slight (or major) differences in the game manifest themselves due to the choices of the audience. Uni-cursal works don't pose the same editorial and citation problem as multi-cursal works that allow for user action in order for the work to take place. Multi-cursal works, have no set path, resulting in no set, shared text or experience to reference or cite. This isn't necessarily bad, but it does challenge many of the assumptions governing publishing research that had existed before the advent of digital media.

The Humanities is predicated on the assumption that specific, authoritative editions of texts exist and upon which critical exchanges were based. One of the fundamental premises of scholarship in the Humanities is the citation and attribution of primary and secondary sources.[7] To illustrate how citations demonstrate our disciplinary values, let's look at the logic of citations. Citation and attribution practices, while seemingly trivial, reflect the deep-seated values of a culture predicated on print technology and on the values and concerns of different disciplines. The humanities documentary note (name of the author, work, publishing information, page numbers) attends to textual evidence and the need for accuracy in quotation, as well as privileging the author. Obviously, both the humanities documentary note and the science's author/year are means to attribute material to sources and acknowledge an intellectual debt. Implicit within these two choices, however, are the values of different constituencies. In both, the author's name is included because we as a culture attribute value to individual, original thought. Date/year is included because of the need for timely information in fields where research becomes dated and the timeliness of the information is important. Including page numbers is largely an artifact of

7 See George Landow and Paul Delany's "Hypertext, Hypermedia and Literary Studies: The State of the Art" *Hypertext and Literary Study* (Cambridge: MIT Press, 1991): 10-11. This essay discusses the secondary nature of text in footnotes, and how hypertext changes this power relationship.

the print-age, relying upon the navigating conventions of print to serve as a reference point. Citing page numbers also allows individuals to verify the accuracy of the citation, the humanities equivalent of repeating an experiment to attempt to get the same results. Including the publication information of a work—the place of publication, the publisher, and the date that a work was published—create a means to differentiate more readily between different texts or authors with the same names (and helps establish the credibility of a text, basing the judgment on the perceived rigor of different presses). Exact reproduction of quotes is a hallmark of print technology.

The documentary note format has problems associated with it, because when applied to digital media, this practice relies upon the conventions of print technology (such as page numbers) to works that no longer abide by these conventions. Multi-cursal works result in many of these assumptions being overturned. From an editorial and scholarly standpoint, how would we reference in a scholarly article a specific instance in a work such as a video game, where there is no "standard" edition because we "co-author" the work? There are no page numbers to cite. We could resort to requiring a procedural literacy and look at, reference, and cite the code of a digital object,[8] but the code only supplies a fraction of the work as a whole; it overlooks the influence of the user on the text. The fact remains, however, that as long as scholarship takes to paper as a medium or continues to abide by conventions based on print technology, we will need to develop better means to cite digital, multi-cursal works.

In many digital media works, there really aren't the navigational cues analogous to those in print. Besides the internet (where URLs might work), the different navigational cues upon which the humanities documentary note relies have yet to be firmly established and are still in flux. The print medium of this journal poses problems as well, in that we're rendering a digital world on paper. I suppose that this is the same challenge faced by social sciences such as anthropology or those fields that face recording ephemeral acts and events. How do you reduce this grand spectrum down to the black and white of a printed page? Reducing a rule-based media such as multi-cursal, interactive works in digital media, is like forcing an ephemeral, digital peg through a book shaped hole. The process doesn't do the digital world justice. Perhaps we as a discipline should begin to debate the merits of Jay David Bolter's call for a hybrid merging of new media practice and academic theory into the world of scholarly prose and his questioning academic establishment regarding their willingness to change their notions of critical research to include new media forms.[9] However, as a discipline, we need to question whether new media forms that are non-linear and multi-linear or multi-cursal can sustain logic and argument—the cornerstones of academic scholarship.

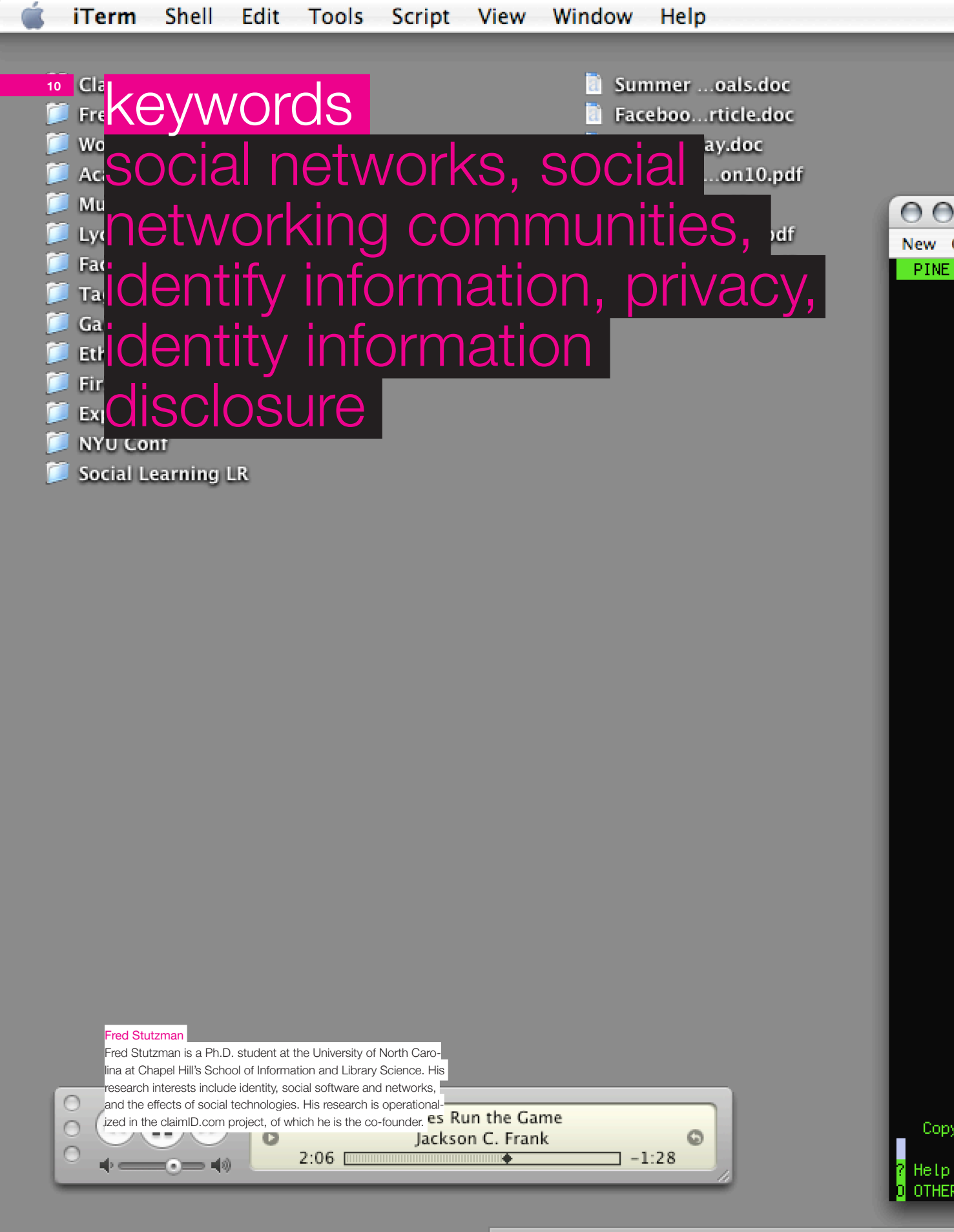
The purpose of this conference journal edition, as I see it, is to record the dialog that takes place every year between those diverse fields that comprise digital media arts. As a result, I have edited these papers so that they "educate, not obfuscate."[10] Wherever possible, I have asked that the authors avoid jargon and use footnotes to explain and define those discipline specific terms, processes, and ideas that they use. The idea is that we bring together our collective voices so that, outside of our individual silos, we can continue the conference's critical dialog concerning our research, practices, and pedagogy.

As a result of this problem posed, I've proposed to establish editorial policies that follow Wordsworth's edict. By boiling down our prose to its constituent parts, avoiding jargon, writing in clear, general language and generously explaining in footnotes the nature of the ideas, terms, and processes in our papers, this conference edition will come to be the editorial equivalent of plain text. Plaintext is text without the different, varied codes that are available to us as writers. By using plaintext, we guarantee that we will be able to communicate our message to our audience, no matter what codes in which they operate. Of course, some degree of loss will occur, but absent of those codes unique to our respective fields, the message will be readable. It is within these two notions—that of Wordsworth's preface and that of the metaphor of plaintext—that I have based the editorial practices of *The International Digital Media and Arts Association Journal* conference edition. I hope that you find it as instructive and edifying as I had.

8 Procedural literacy is the idea that those studying the field of digital media and arts demonstrate a knowledge of code—the "procedural literacy" of how multi-cursal, interactive and digital objects work—to demonstrate a knowledge of how the work operates. See Michael Mateas, "Procedural Literacy: Educating the New Media Practitioner."

9 Jay David Bolter. "Theory and Practice in New Media Studies," in *Digital Media Revisited: Theoretical and Conceptual Innovation in Digital Domains* Edited by Gunnar Liestøl, Andrew Morrison, and Terje Rasmussen (Cambridge: The MIT Press, 2003): 30 and 29.

10 Design Editor Randall Hoyt's great turn of phrase.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keywords
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Fred Stutzman is a Ph.D. student at the University of North Carolina at Chapel Hill's School of Information and Library Science. His research interests include identity, social software and networks, and the effects of social technologies. His research is operationalized in the claimID.com project, of which he is the co-founder.
es Run the Game
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Help

An Evaluation of Identity-Sharing Behavior in Social Network Communities

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Abstract

Social network communities facilitate the sharing of identity information in a directed network. Compared with traditional methods for identity information disclosure, such as a campus directory, the social network community fosters a more subjective and holistic disclosure of identity information. The following paper presents the results of a quantitative analysis of identity information disclosure in social network communities, as well as subject opinions regarding identity protection and information disclosure. Through comparative analysis, the need for further analysis of the value and jeopardy of identity information sharing in social network communities is identified.

As institutions work to protect student identity information, is it possible that students are actively undermining these protections through participation in social network communities?

1 Introduction

The management and protection of student identity information is a high priority for academic institutions. Federal legislation, such as the Family Educational Rights and Privacy Act (FERPA), provides guidelines for academic institutions with regards to the disclosure of identity information. In compliance with legislation such as FERPA, and mindful of the prevalence of identity theft,[1] academic institutions have taken the necessary, difficult steps to protect student identity information. As institutions work to protect student identity information, is it possible that students are actively undermining these protections through participation in social network communities?

In recent years, social network communities (SNC) such as Facebook.com and Myspace.com have drawn significant press from the business and academic communities. boyd [sic], describes SNCs as technologies that enable the public articulation of social networks.[2] Indeed, the inherent sociality of these communities have led to strong adoption trends,[3] particularly among the college demographic.

SNCs allow more than the public articulation of social networks; in each service, a user creates a richly detailed personal profile. The data in an individual's profile ranges from the relatively innocuous (favorite book or movie) to the potentially invasive (such as sexual orientation, political views, and photos). From a research and administrative standpoint, it seemed wise to evaluate the breadth of SNC penetration, and the scope of identity information shared in SNC profiles on a typical college campus.

Mindful of recent trends in identity theft,[4] and particularly identity theft on the web,[5] a pilot study was commissioned to extract quantitative metrics on student SNC participation and identity information disclosure. The data contained in SNCs, while differing in levels of accessibility,[6] is generally trivial for an outsider to access. As we have seen in the work of Hogg et al. and Liu et al.,[7] the notion of outsiders harvesting data in SNCs for ancillary purposes is established. Just as SNC data can be harvested for recommender and reputation systems,[8] third parties may mine an SNC for an individual's identity information. Indeed, SNCs are dramatically changing how identity information is shared online; through this primary analysis, we develop a measure of just how SNCs are redefining the identity sharing behavior of a campus population.

2 Study Perspective

The primary goal of the pilot study was to develop quantitative metrics on SNC participation on a college campus. The secondary goal of the pilot study was to investigate and comparatively analyze population attitudes about participation in SNCs, and online identity sharing in general. Understanding that outsiders (in this case, entities not linked to a social group) in SNCs generally have the lowest level of access to data,[9] and that third party identity information harvesters will *at most* be outsiders, the analysis is conducted from the standpoint of the outsider. Additionally, this standpoint sets a reasonable baseline for future investigative research from different, more-connected standpoints.

1 Federal Trade Commission, *National and State Trends in Fraud & Identity Theft,* January-December 2004. Federal Trade Commission, Washington DC (2004); G. Newman, "Identity Theft: Problem-Oriented Guides for Police," Guide Number 25. U.S. Department of Justice, Washington DC (2004); Goldman, E.: "The Growing Thread of Identity Theft." *Educase Review*, June/July (2004) 66-67

2 d. boyd [sic], "Friendster and Publicly Articulated Social Networking" (paper presented at the Conference on Human Factors and Computing Systems, ACM, Vienna, Austria, 2004).

3 As of July 2006, the Myspace network reports over 89 million users. This information is gathered from the profile of Tom Anderson (http://myspace.com/tom), creator of Myspace.

4 Federal Trade Commission, *National and State Trends in Fraud & Identity Theft* (Washington DC, Federal Trade Commission, January-December 2004); G. Newman, "Identity Theft: Problem-Oriented Guides for Police" *Guide* 25 (Washington DC, U.S. Department of Justice, 2004); E. Goldman, "The Growing Thread of Identity Theft" *Educase Review,* June/July (2004): 66-67.

5 H. Berghel, "Identity Theft: Social Security Numbers, and the Web," *Communications of the ACM* 43 no. 2 (February, 2000): 17-21.

6 I. O'Murchu, J. Breslin, and S. Decker, *Online Social and Business Networking Communities.* DERI Technical Report 2004-08-11. Galway Ireland (August 2004).

7 T. Hogg, and L. Adamic, *Enhancing Reputation Mechanisms via Online Social Networks* (EC 2004, New York, 2004); H. Liu and P. Maes, "InterestMap: Harvesting Social Network Profiles for Recommendations" IUI 2005, Workshop: Beyond Personalization, San Diego California (2005).

8 For example, in Liu and Maes, social network data is captured and used to seed a social recommendation system.

9 D. Watts, P.S. Dodds, and M.E.J. Newman, "Identity and Search in Social Networks" *Science* 296 (2002): 1302-1305.

3 Methodology

The pilot study was guided by a number of goals, included among them a viability test for conducting research in SNCs. Research goals were guided by the following questions:

- Which SNCs do students participate in?
- What identity information is disclosed in the SNCs?
- How does it compare to identity information previously disclosed by the university?
- How much identity information are students disclosing in SNCs?
- What are student opinions about identity information disclosure in SNCs?

3.1 Procedure

A random selection of students were asked to complete a survey about their use of SNCs and their feelings about disclosure of identity information. The first part of the survey was entirely quantitative; students indicated those SNCs in which they participated. A list of common SNCs, as well as an option to share other SNCs, were made available. In the second part of the survey, students were asked to respond to a number of statements about identity information disclosure, indicating their level of agreement with the statement. The statements dealt primarily with how students feel about their SNC profiles being accessed and about sharing identity information in general.

SNCs that occurred more than once in student responses were profiled. Profiling involved the construction of an identity information matrix for each service; respondents who indicated participation were then discovered in the service, and their level of identity disclosure recorded in the disclosure matrix. Student SNC participation data, identity information disclosure matrices, and the opinion data were then analyzed.

3.2 Participants

Of our randomly selected participants (N=200), 19 percent (N=38) completed the survey. Of the respondents, 20 were undergraduates, and 18 were graduate/professional (G/P). We are able to accept the respondents for generalization about the undergraduate and G/P sub-populations ($x^2_{(1)} = .6306$, $p < .1$).

4 Findings

4.1 Social Network Community Breadth

Seventy-one percent of all respondents indicated participation in an SNC, with participation skewing heavily towards undergraduates (90 percent reporting participation) as compared to G/P students (44 percent reporting participation). The most popular SNC was Facebook,[10] with 90 percent of undergraduates reporting use. Friendster and Myspace were the other common (used by more than two respondents) SNCs reported by respondents.

4.2 Social Network Community Identity Data Analysis

The three common SNCs, Facebook, Friendster, and Myspace, were profiled for identity information disclosure, and a common element comparison is presented in Table 1. To retain perspective, publicly accessible campus directory information was included in the comparison.

Facebook and Myspace requested the disclosure of identity information beyond common elements, as described in Table 2. The non-common elements are presented here to display the notable level of identity information disclosure these communities request. It is important to note that terms have been pooled to handle space considerations, and only when the pooling clearly didn't change the intended meaning of the term.

4.3 Identity Information Disclosure in Facebook

The SNC with the highest level of campus participation was Facebook. A relatively new SNC, Facebook is heavily utilized by undergraduates (90 percent report use), and lightly utilized by G/P students (22 percent report use). As a result, Facebook was selected as the SNC that would be analyzed for student identity information disclosure.

The analysis process is described as follows: for each student that indicated use of Facebook, the student's profile is "discovered" in the service. Students are located in the service only with information publicly disclosed in the student directory, thereby ensuring that the investigator remains an outsider.[11] Student responses to information requested by Facebook are marked in the disclosure matrix as a positive response. Students that indicate use of Facebook but aren't found in the service receive a negative response in each field in the disclosure matrix. No attempts are made to verify the veracity of information disclosed.[12]

10 http://facebook.com

11 The outsider perspective assumes that the student directory information has been acquired through a directed web crawler. A web crawler is an automatic web browser that crawls and downloads information from a website.

12 The challenge of verifying the veracity of information disclosed is beyond the scope of this study. Additionally, the veracity of identity information disclosed publicly may be irrelevant to outsiders, especially those who wish to use the information for disingenuous motives.

Common Identity Elements	UNC Directory	Facebook	Myspace	Friendster
Name	Yes	Yes*	Yes*	Yes*
Email Address	Yes	Yes*	Yes*	Yes*
Physical Address	Yes	Yes	No	No
Phone Number	Yes	Yes	No	No
Academic Classification	Yes	Yes*	No	No
Major	Yes	Yes	No	No
Website/RSS	Yes	Yes	No	Yes
Academic Status	Yes	Yes	No	No
Gender	No	Yes	Yes*	Yes*
Hometown	No	Yes	Yes	Yes
Birth date	No	Yes	Yes*	Yes*
Photo	No	Yes	Yes	Yes
Friend Network	No	Yes	Yes	Yes
Group Affiliation	No	Yes	Yes	Yes
Sexual Orientation	No	Yes	Yes	Yes
Relationship Status	No	Yes	Yes	Yes*
Interests	No	Yes	Yes	Yes
Job/Occupation	No	Yes	Yes	Yes
Favorite Music	No	Yes	Yes	Yes
Favorite Books	No	Yes	Yes	Yes
Favorite Movies	No	Yes	Yes	Yes
Personal Statement	No	Yes	Yes	Yes
Favorite TV Shows	No	No	Yes	Yes
School Information	Implied	Yes*	Yes	Yes
Zip Code	Implied	Yes	Yes*	Yes*
Country	Implied	No	Yes*	Yes*

Table 1
Common requested identity disclosure elements in three Social Network Communities, compared with identity information disclosed in a FERPA-compliant student directory service (UNC). Terms have been recoded to handle semantic difference between services. All disclosure elements are optional, except those marked by an asterisk

Service	Identity Element
Facebook	AIM Screen-name, Favorite Quotes, Summer Plans*, School Course Schedule
Myspace	Heroes, Religion, Drinking Status, Smoking Status, Children, Income, Networking*, Ethnicity, Body Type, Height

Table 2
Additional, non-common identity elements requested by Facebook and Myspace. Terms have been pooled in cases marked by an asterisk

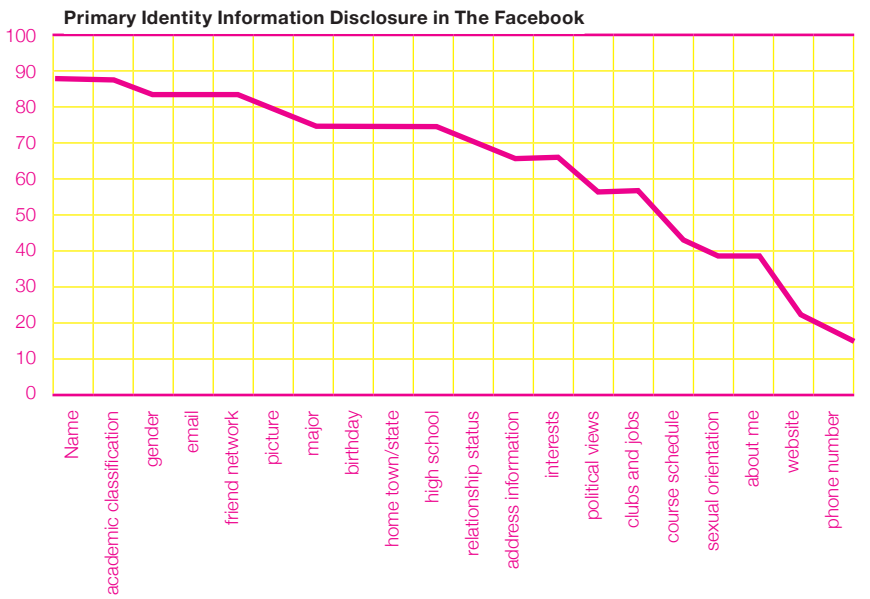


Figure 1
This graph explores selected primary identity information disclosed in Face-book, indexed by percentage of campus users that disclose the particular element. Elements marked with an asterisk have been pooled.

Statement	Average Response
I am OK with friends accessing my SNC profile	**4.55**
I am OK with family accessing my SNC profile	**3.78**
I am OK with classmates accessing my SNC profile	**3.76**
I am OK with strangers accessing my SNC profile	**3.15**
It is important to me to protect my identity information	**4.21**
I am concerned with the consequences of sharing identity info.	**3.29**
I am likely to share my identity information online in the future	**3.34**
I believe my identity information is well-protected online	**2.66**

Table 3
Average level of student agreement to selected statements about identity information disclosure. The scale ranges from 1, with 1 reflecting a level of strong disagreement with the statement, to 5, with 5 reflecting a level of strong agreement with the statement

The results are presented in Figure 1, providing insight into the metrics of identity disclosure in an SNC. It is important to note that to gain access to Facebook, an individual must possess an email address that ends with the institution's domain name. This measure exists largely for quality control, rather than as an information security measure. Terms were pooled when appropriate in the analysis presented in Figure 1.

4.4 Student Opinions on Identity Information Disclosure

Students were asked to react to a number of statements regarding identity information disclosure in SNCs. The responses are presented in Table 3.

5 Limitations and Future Directions

There are a number of limitations of the pilot study, including a) sample size, b) characteristics of survey respondents, c) lexical differences between SNCs, and d) the effective, but ad-hoc nature of being an outside analyst of SNCs. Concerns a) and b) can be easily addressed in the revised methodology of the full study. The sample size can be increased, and surveying methods may move away from the on-line survey, which may account for a disproportionately tech-savvy sample. Concern c) can also be addressed in the revised methodology required for a full study. A more thorough lexical normalization/recoding will take place to ensure parity between meanings of identity elements in SNCs. While the status of an outsider investigator (concern d) will remain service-dependent, it may be worthwhile to complete documentation of the bounds of outsider investigator behavior, so that future studies can use and improve the methodology.

6 Discussion and Conclusions

A number of key findings have been presented as a result of the pilot study. First, a quantitative analysis of SNCs on a typical college campus revealed a number of interesting trends. As might be expected, undergraduates use SNCs more commonly than G/P students. Additionally, the percentage of undergraduates utilizing the particular SNC Facebook is significant.

In Tables 1 and 2, we explore the level of identity information disclosure requested by common SNCs. From an outsider's perspective, some of the information would be potentially interesting, as it would require a personal connection to ascertain it otherwise; relationship status, location information, and political views are just a few of the many identity information elements that are disclosed in SNCs.

In Figure 1, we are presented with results of identity information discovery among survey respondents for Facebook. A large number of students share particularly personal information online. Comparing the trends we observed in Figure 1, with the opinions students present in Table 3, it strongly suggests a disconnect between the value of traditional identity information (Name, SSN) and the new types of identity information being disclosed (photo, political views, sexual orientation) in SNCs. This disconnect identifies the need for a new discussion of identity information protection on campus, one that is effectively holistic and SNC-aware.

References

1 Boyd, d. "Friendster and Publicly Articulated Social Networking." Paper presented at the Conference on Human Factors and Computing Systems, ACM, Vienna, Austria, 2004.

2 Federal Trade Commission. National and State Trends in Fraud & Identity Theft. Washington DC, Federal Trade Commission (January-December 2004).

3 Newman, G. "Identity Theft: Problem-Oriented Guides for Police." Guide 25. Washington DC, U.S. Department of Justice (2004).

4 Goldman, E. "The Growing Thread of Identity Theft." *Educase Review*, June/July (2004): 66-67.

5 Berghel, H. "Identity Theft: Social Security Numbers, and the Web." *Communications of the ACM* 43 no. 2 (February, 2000): 17-21.

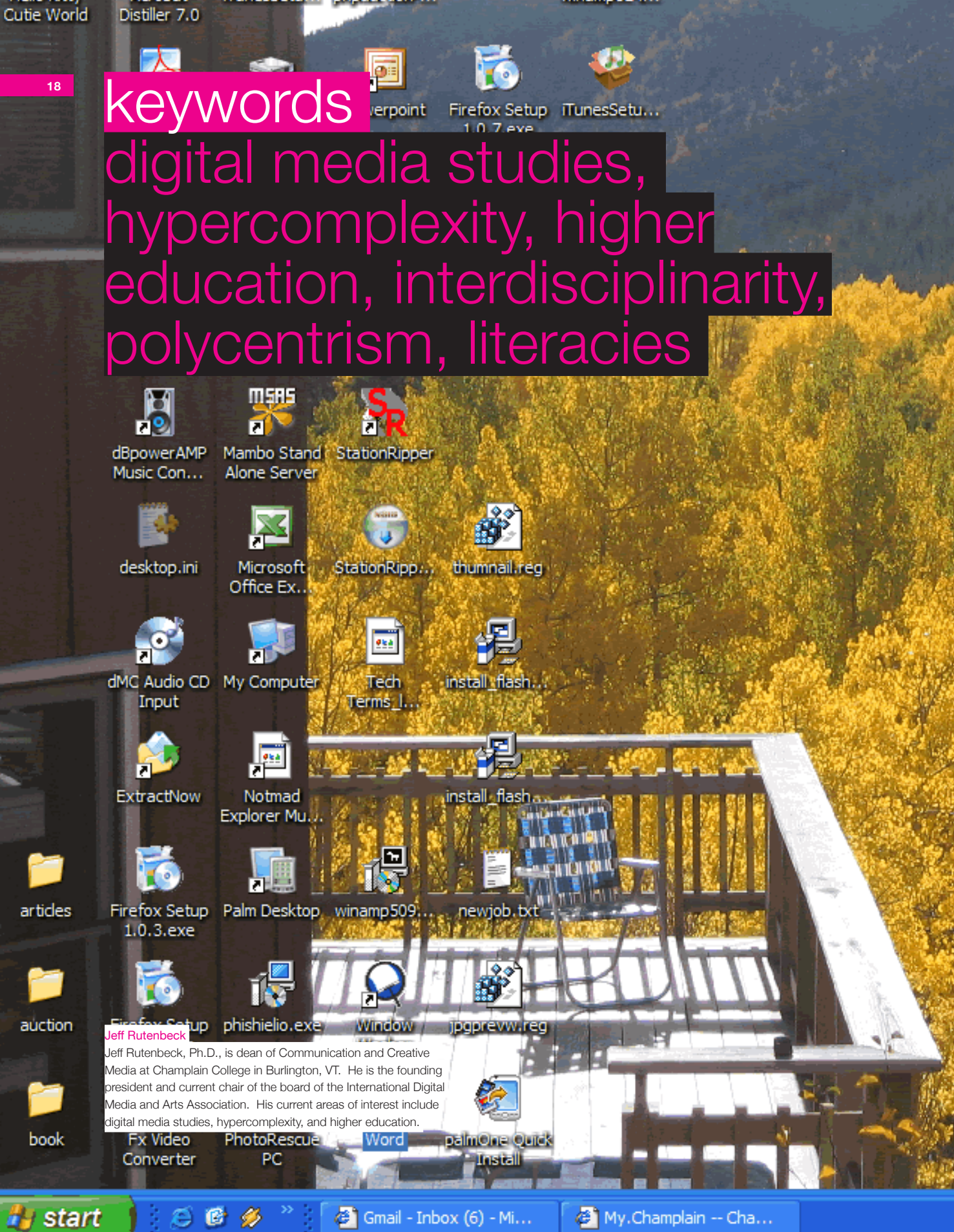
6 O'Murchu, I., Breslin, J., and Decker, S. Online Social and Business Networking Communities. DERI Technical Report 2004-08-11. Galway Ireland (August 2004).

7 Hogg, T., and Adamic, L. Enhancing Reputation Mechanisms via Online Social Networks. EC 2004, New York (2004).

8 Liu, H. and Maes, P. "InterestMap: Harvesting Social Network Profiles for Recommendations." IUI 2005, Workshop: Beyond Personalization, San Diego California (2005).

9 Watts, D., Dodds, P.S., and Newman, M.E.J. "Identity and Search in Social Networks." *Science* 296 (2002): 1302-1305.

keywords
digital media studies, hypercomplexity, higher education, interdisciplinarity, polycentrism, literacies



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Bit by Bit by Bit: Hypercomplexity, Digital Media Studies and Higher Education

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Abstract

In his 2003 book *The Hypercomplex Society* (2003), Lars Qvortrup provides a compelling perspective on the social, cultural and economic shifts taking place in the early 21st century, dispelling the notion that complexity is a problem to be "solved" or "minimized at all costs." This essay explores the basic tenets of Qvortrup's argument and applies them to the emerging interdisciplinary field of digital media studies. Several questions guide this inquiry: How does the formation and evolution of interdisciplinary digital media studies programs both reflect and model an increasingly hypercomplex society? In what ways do the experiences in digital media studies portend dramatic changes for institutions of higher education as they struggle for relevance in today's and tomorrow's hypercomplex age? And how might they resolve the paradoxical position that digital processes and practices play in further hypercomplexifying modern life?

In his 2003 book *The Hypercomplex Society* (2003), Lars Qvortrup provides a compelling perspective on the social, cultural and economic shifts taking place in the early 21st century, especially as they relate to the processes and practices of digitization. Dispelling the notions of the "information society," the "network society," the "knowledge society," the "learning society," etc.,[1] he advocates for a *social* theory that describes current trends in social organization. Qvortrup argues that "complexity" is the guiding concept that differentiates the current and emerging society—one that is determined by the "ability to manage complexity".[2] In Qvortrup's view, complexity is not a problem to be "solved" or "minimized at all costs." Rather, he asserts "[O]n the contrary, complexity is the solution. Stability is not achieved by the provision of a strong center, but through the provision of means for mutual observation. This is, by the way, the main reason for the importance of currently emerging new media technologies, with the Internet as the basic example….The functional objective of society is not to create "order" out of "chaos," but to manage complexity by complexity" (Qvortrup p. viii-ix).

This essay will explore the basic tenets of Qvortrup's theory of hypercomplexity and apply them to the emerging interdisciplinary field of digital media studies. Qvortrup's approach is similar to Poster's assertion that "the Internet is more like a social space than a thing; its effects are more like those of Germany than those of hammers."[3] Like Poster, I argue for a deeper appreciation of complex socio-digital dynamics, especially as that complexity influences approaches to emerging trends in higher education. Qvortrup affirms this belief that experiences and organizational structures in the digital age are fundamentally different. Taking a provocative look at the inscription of complexity within complexity ("hypercomplexity")—and the Internet's role in contemporary life, Qvortrup asserts that the Internet (and specifically the World Wide Web) "is the first communication medium that combines the dissemination– and the effect–media qualities in one media structure."[4] Qvortrup claims that the Internet, as a complex phenomenon, both expresses and manages complexity in ways not possible before its existence. In what he calls a structural coupling between the technological and social systems, "the Internet and the World Wide Web represent a 'social' or 'sociotechnical' invention, which is capable of tackling the problem of global digital accessibility without destroying the benefits of global access."[5] Qvortrup notes that information and communication technologies play a "paradoxical role" in that they both promote emerging problems (such as "electronic proximity') and represent the necessary tools for addressing those problems "because the only way to manage social complexity is to establish communication based couplings between people and institutions." Thus, a "sophistication of society must go hand in hand with a sophistication of information and communication technologies."[6]

Not only are the interactions among digital processes and practices increasingly complex, the social contexts in which they play a part are expanding as well. As we might extend Qvortrup's late 20th-century viewpoint into the current century, we would need to pay careful attention to the proliferation of personal and mobile digital media. The advent of "smart homes," "smart phones," "smart cars," "smart clothing," and so forth, suggests that digital processes and practices now stand to impact an ever-expanding range of human activities. As Qvortrup asserts, these new contexts remind us about two crucial aspects of digitization. First, as digital media operate as "complexity-management mechanisms" they stimulate "organizing processes" by organizing their own structure. Second, as they both encourage and express new types of social organization, new techno-social practices emerge. Qvortrup's examples include "elusive offices," "network universities," "virtual classrooms," "computer conferencing," "soft cities," "smart buildings," and "electronic libraries."[7] These expanding contexts and practices inject digital media into a wide range of social contexts and organizations, making it more and more difficult for individuals to carve out "non-digital" roles and un-mediated situations in which to exist. They also portend dramatic changes in the ways in which institutions of higher education will conduct their business and also in the ways they will continue to shape social change.

1 Lars Qvortrup, *The Hypercomplex Society (*New York: Peter Lang, 2003), 3.
2 Ibid., 4.
3 Mark Poster, "Cyber Democracy: The Internet and the Public Sphere," in *Reading Digital Culture,* Edited by David Trend (Oxford: Blackwell Publishers, 2001), 262.
4 Lars Qvortrup, *The Hypercomplex Society* (New York: Peter Lang, 2003), 177.
5 Ibid., 179.
6 Ibid., 10.
7 Ibid., 183

The Digital Situation

In a very broad sense, digitization both embodies and emboldens the blending of forms, contents, functionalities, and contexts of human activity in ways simply not possible before. It involves a complex relationship between the processes that make up the digital environment (e.g., generative structures and "solutions") and the practices of individuals that emerge through and shape processes. Andersen (2003) notes that computers either replace or enhance "nearly all artifacts of modern life," and that they blur the boundaries among three previously distinct types of objects: media, tools, and automata.[8] In Andersen's characterization, "medium" (what he calls an "artifact" that is designed to affect others "by offering information, issuing requests, posing questions, or yielding emotional experiences"), "tool" (an artifact that is under full control of a human operator and is "designed for producing or changing some physical object"), and "automata" (that which can, without human interference, "perform some reasonably complicated process that ends in a desired state") become almost indistinguishable from each other.[9] He notes that before the advent of computers, these three types of artifacts were implemented by completely different technologies, were usually found in distinctly different contexts, and were usually produced and used and studied by clearly separated professions and schools of thought. Now digital media present us with a compelling mixture of media, tools, and automata that are, in most cases, virtually impossible to isolate, operate and control independently. "When one buys one part, one simultaneously buys the other two as well."[10]

Gunther Kress (1998) extends this blurring of boundaries among artifacts and activities to the shifting landscape of human practices. Kress reminds us that digital media make it possible to collapse, blend, and transform what used to be distinctly different activities and skill sets (and thus distinctly different professions) into, via digital media, functionally singular activities undertaken by individuals who possess an increasingly diverse combination of skills and sensibilities. This complicates media production immensely because "this one person now has to understand the semiotic potentials of each mode–sound, visual, speech–and orchestrate them to accord with his or her design" (pp. 56-7). Thus, "multimedia production requires high levels of multi-modal competence based on knowledge of the operation of different modes, and highly developed design abilities to produce complex semiotic 'texts'" (Kress p. 57).

Liestol asserts that because the computer has become a "dominant tool for communication and exchange of meaning," and because of its unique semiotic impacts, we must go beyond traditional conceptions of "hardware" and "software" as "we are now experiencing the emergence of meaningware."[11] This new semiotic dynamic reframes traditional notions of production and reception, process and practice, effectively turning every "user" into a potential producer of digital media. Blogs, wikis, open-source content management systems (such as phpNuke, Mambo, and Drupal), and the growing attention paid to digital media production skills highlight this authorial/generative resurgence.

> Qvortrup asserts that the Internet (and specifically the World Wide Web) "is the first communication medium that combines the dissemination– and the effect–media qualities in one media structure."

This shift from consumption to production should matter to cultural theorists, if only because the role of producer may allow resistance to the dominant ideology to take new forms. As a consumer, one can only redirect the intended effects of media artifacts, but as a producer one can change the artifacts themselves. In this respect new media forms resemble some forms of handwriting and print to a greater degree than they resemble film or television.[12]

8 P. Bøgh Andersen, "Acting Machines," in *Digital Media Revisited: Theoretical and Conceptual Innovation in Digital Domains.* (Cambridge, MA: MIT Press, 2003), 184.
9 Ibid., 184.
10 Ibid., 183.

11 Gunnar Liestol, Andrew Morrison, and Terje Rasmussen, eds., *Digital Media Revisited: Theoretical and Conceptual Innovation in Digital Domains* (Cambridge, MA: MIT Press, 2003), 389.
12 Jay David Bolter, "Theory and Practice in New Media Studies," in *Digital Media Revisited: Theoretical and Conceptual Innovation in Digital Domains*. (Cambridge, MA: MIT Press, 2003), 27.

A Closer Look at the Theory of Hypercomplexity

In an effort to look beyond social theories that organize themselves around "absences" or "negations" from earlier phases (e.g., "postmodern"), Qvortrup ushers us into the world of "hypercomplexity" in an attempt to describe "an emerging social system that can be identified according to its own structures and dynamics."[13] Basing much of his fundamental work on the contributions of German sociologist Niklas Luhmann, Qvortrup builds upon Luhmann's examinations of complexity and its developments toward "polycentric" social systems that apply "different codes of self-observation related to different positions of observation, in order to manage an increasingly complex environment."[14] Qvortrup's key refinement of Luhmann's work extends the concept from one of "complexity," which is demonstrated by accelerating social processes on a global scale, to "hypercomplexity," which is demonstrated by "complexity inscribed in complexity." In Qvortrup's words, an example of hypercomplexity is "the result of one observer's description of another observer's descriptions of complexity, or it is the result of a complex observer's description of its own complexity."[15] Thus, we are now experiencing this movement toward a social systems built around many distinctly different and equally important "centers" (a polycentric social system) that apply "different codes of self-observation related to different positions of observation."[16] Qvortrup explores Luhmann's examples of these self-observational codes that form the social fabric of today's increasingly hypercomplex society:

The economy applies the code of profit and loss; the religious system the code of transcendence and immanence; the scientific system the code of truth; the political system the code of power, and so on. This means that the concept of universal "truth" or consensus is replaced by the need for transjunctional operations, which make it possible to switch codes and to decide which code is appropriate for specific social operation. One precondition is that the code must be capable of observing the world (and itself) as the differentiation of other codes (i.e., creating a hypercomplex operation).[17]

In an effort to "match external complexity with observational complexity," organizations now develop an increasingly wide variety of observational means and observational codes that draw upon a wide range of social domains. As Qvortrup mentions, business organizations now draw not only upon the economy, but also upon ethics, ecology, and more "in order to handle their hypercomplex social environment."[18]

Art has moved from a linear perspective (and a normative definition of aesthetics) to a polycentric perspective (and a reflective definition of aesthetics). The so-called public sphere has changed from a "place"—a lifeworld—in a society, in which "common sense" (consensus) is expected, into a specific meta-level observation and communication system based on public opinion, which isn't an essential thing but is an observation and communication code based on the distinction between the public and the private. In the public sphere we do not agree, but we observe each other according to special criteria."[19]

The theory of hypercomplexity embraces the primacy of communication in social processes and the paradox that "the only ideological constancy is the constant absence of a guiding social ideology."[20] This polycentrism is exemplified by the movement toward a society with an ever-increasing number of "functionally differentiated centers" that rely on "communication-based processes of coordination." In this sense, stability emerges from a fragile balance between complex social processes and decentralization. Communication and information technologies evolve to promote the "decentered processes of mutual observation and coordination among social sub-centers."[21] Social systems are guided by themselves, not by "an external subject" as they strive to match outer complexity with inner complexity.

Qvortrup charts the evolution toward hypercomplexity as an epistemic shift from "theocentrism" to "anthropocentrism," to "polycentrism," or as they specifically relate to the ideal of informed decision making—the movement from religious determination to human rationality to paradoxicality. Traditional theocentric societies that are "based on and structured by an ontologically or transcendentally given external 'force'" driven by a "divine rationality" (e.g., God, Destiny) are challenged by or replaced by an anthropocentric society in which individuals "expect to be capable of reaching informed decisions via "unlimited rationality." As complexity increases and the demands for hypercomplex systems intensify, society becomes polycentric, and unlim-

13 Lars Qvortrup, *The Hypercomplex Society* (New York: Peter Lang, 2003),6.
14 Ibid., 6.
15 Ibid., 6.
16 Ibid., 7.
17 Ibid., 7.

18 Ibid., 7.
19 Ibid., 7-8.
20 Ibid., 4.
21 Ibid., 4.

The theory of hypercomplexity embraces the primacy of communication in social processes and the paradox that “the only ideological constancy is the constant absence of a guiding social ideology.”

ited rationality gives way to "bounded rationality"— "the social fact that in every decisional situation the number of possibilities, not only for observation-based conclusions, but also for determining the premises of observations, exceeds the capability to make decisions."[22] Put another way, instead of producing a social environment where literally anything goes, such systems themselves produce their own "elements, relations, and conditionalizing forces."[23] And so, society becomes a hypercomplex system of a tremendous number of "communication centers" and codes, within which no universal point of observation is possible and no single individual can "couple" with all potentialities and therefore must "deconnect" (reduce the number of couplings) in order to function. An increasing number of observations within such a polycentric world are recursively turned toward each other—observations of others' observations (and of the observer's own observations). Modern-day blogging, with its perspective on perspectives all linked via RSS and search engines to an apparently unending set of related perspectives, might serve as one good example. Wikipedia, with its individual-generated content, its recursive inter-linking among entries, and its categorical refusal to publish "original research" (http://en.wikipedia.org/wiki/Wikipedia:No_original_research) serves as another prime example. "Ironically, just as the ideal behind the name must be given up, this social condition is labeled the 'information society.'"[24]

Qvortrup is careful to point out that hypercomplexity is evolutionary, absorbing uncertainty by building ever-more complex systems. Indeed, rather than serving as a grand theory of social organization, Qvortrup presents hypercomplexity as "a category that can explain a growing number of observation and communication processes in this society."[25] He devotes the rest of the book to an explication of these hypotheses, examining practical, aesthetic, and rational frames of self-observation and then exploring the relationship between social systems and the "media of self-observation," paying particular attention to communication, media, public opinion, and the ways in which the Internet both reflects and makes possible (via a "structural match") the shift toward a more hypercomplex life.

One of the most compelling and productive aspects of Qvortrup's work is that it encourages us to examine the Internet (and all digital media) as "socio-technical inventions" that both express and shape our increasingly hypercomplex society. Regarding the Internet specifically, Qvortrup claims that the "particular structural qualities of the hypercomplex society have been transformed into the structure of the Internet."[26] This "structural match" makes possible entirely new organizational forms that make it increasingly difficult to regard digital processes and practices as mere "tools" for social activity. In other words, the speed by which the Internet has grown might be partially explained by the increasing technical capacity of its digital systems, but it might be more persuasively explained as a coupling between the hypercomplex nature of its technical processes and the hypercomplex tendencies in contemporary social organizations.

> Qvortrup asserts that the Internet (and specifically the World Wide Web) "is the first communication medium that combines the dissemination– and the effect–media qualities in one media structure."

With the potential for global communication between people who are virtually present in time and space, the problems of managing complexity increase accordingly, simply because the complexity-management mechanisms in simple face-to-face communication are relatively limited in scope . . . Consequently, the global Internet—and, in particular, cyberspace—will never become anything like a "global community." On the contrary, the Internet has to "reinvent" the complexity-management tools of society, such as organized differentiations (for instance in mutually separated intranet systems) and functionally differentiated subsystems, each with its own symbolically generalized medium. Maybe this is the real revolutionary effect of the Internet: that it copies the structure of society into the medium, providing the Internet with an extraordinary social complexity-management potential compared with any other medium.[27]

22 Ibid., 13.
23 Ibid., 13.
24 Ibid., 14.
25 Ibid., 14.

26 Ibid., 167.
27 Ibid., 174.

Seeing the World (and Education) Differently Through Digital Media Studies

When I use the term "Digital Media Studies" I am referring to the wide variety of efforts among colleges and universities around the world designed to address, in various ways and measures, the aesthetic and technical processes and the critical/theoretical implications of digitization through the establishment of formal academic degree programs. Labels for such programs vary widely—from "Interactive Media Studies" to "Digital Storytelling" to "Electronic Media" to "New Media" and more. While only a few are actually labeled "Digital Media Studies," many of them are devoted to both the study of designing and producing digital AND the examination of the personal, cultural, social, economic, political, and global implications of digitization. To put it another way, as far as this paper is concerned "Digital Media Studies" most broadly addresses the inextricable connection between the ways in which digital media are made AND the ways in which digital media transform daily life.

The implications of Qvortrup's theory of hypercomplexity on digital media studies specifically, and higher education generally, are immense. On the surface, it would be easy to assert that trends in interdisciplinary work and the emergence of digital media study in traditional disciplines (such as art, literature, political science, and education) serve as evidence that higher education in America is adjusting well to this new hypercomplex environment. On the other hand, it might be even easier to assert that the structures and functions of higher education have not yet fully embraced the implications of their adventure into the digital unknown. This section of this paper will examine ways in which the theory of social hypercomplexity illuminates several key questions the role that digital media studies might play as institutions of higher education adapt to the ever-quickening pace of social changes.

At the most general level, the theory of hypercomplexity calls into question the traditional notion of what it means to be "broadly educated." An almost perfect reflection of the anthropocentric faith in the unlimited rationality of human beings, the liberal arts tradition reifies this belief as not only a roadmap of study but also as a pedagogical method through which students are taught the means of self expression, intellectual engagement, and the powers of reason. In most universities in the world (especially in the U.S.) the liberal arts remain distinct from professional studies such as business, communication, engineering, computer science, education, etc., and in most of such places those fields deemed to be "outside" of the liberal arts tradition are marginalized as less valuable and less legitimate areas of study.

Hypercomplexity requires a conversation about the possibility of a new model for higher education—one that embraces not only the anthropocentric traditions of liberal study, but one that might more systematically reach into the "professional" and "applied" realms that have become increasingly significant aspects of higher education. The broadly educated undergraduate of today needs to become aware of wide range of polycentric codes, most of which are now digitally mediated in a wide range of contexts. While meaningful collaboration among liberal arts program and professional/applied programs might occur, the fundamental distinction might be no longer valid in a world where digitization and hypercomplexity continue to transform personal, cultural, social, and global practices.

The "new liberal arts" must also embrace theocentric and anthropocentric influences in the cultural mashup of digital life today; i.e., the hypercomplex society creates more room for all forms of social expression and organization to exist. The implications of this expansiveness are far-reaching, especially because it paradoxically reduces the distances and distinctions between widely divergent perspectives on contemporary life. As Qvortrup writes, it makes an astounding number of social actions "communicatively accessible,"[28] requiring us to construct and operate vastly more complex social structures and institutions. There is no better example than a highly personalizable news portal, such as those available via Google, Yahoo, and others. Through such a portal an individual can construct an unlimited number of vantage points through which to form an up-to-the-minute perception of "what's going on" and what "everyone is thinking." Multiplied by millions, these personalized points of observation can also be made available to others (via blogs, RSS, etc.), inscribing yet another layer of complexity into the social framework.

Hypercomplexity also recasts many of the fundamental questions surrounding the studies of ways in which communicative acts are made explicit. Qvortrup addresses this concern through a discussion of "digital poetics"—the means by which "an artist shapes his or her material in order to give form to the artistic idea; how the process of poetical composition can be described."[29] I would expand this concern beyond the realm of the artist to include all

28 Lars Qvortrup, *The Hypercomplex Society* (New York: Peter Lang, 2003), 10.
29 Ibid., 76.

communicative acts that are manifested digitally. In this broader sense, interest expands from notions of traditional literacies (e.g., reading text, writing text, and examining content) toward notions of experience generation (e.g., creating points of navigation, modifying interfaces, and orchestrating interactions). From an educational standpoint, this expansion of "literal arts" underscores the multimodal nature of digital communication processes, where interpretation is often replaced by interaction, where involvement is often shaped (and reshaped) by interface, and where expression is often transformed by involvement. It also calls into question social stratifications based on traditional notions of literacy (or certifiable literacy skills) and begs us to consider the possibility that one's ability to effectively reduce complexity is becoming a primary social differentiator today. What social advantages and disadvantages are forthcoming for those who embrace digital practices (both on the individual and organizational level)? This is precisely the role that search engines, blogs, portals, intranets, directories, mobile media, and other complexity management strategies play in more and more lives in more and more places around the world every day.

As Qvortrup asserts, "digital media have a communication potential that is particularly adequate for making observations of a polycontextural society."[30] Yet at the same time digital media also transform the acts of observing in every literal sense. So while we use digital media to help up focus on phenomena "that have been previously difficult to see,"[31] we also transform the very nature of observation by making those observations communicatively accessible on a global scale. So the utterances of a high school geography teacher in Colorado who makes politically controversial remarks in his classroom one day might be recorded by a student on his iPod, distributed via email to the media by his parents, commented on via the web by a journalist in a newspaper 1,700 miles away, show up as a national headline on *CNN.com*, picked up by the global news media in a matter of hours, appear in literally thousands of blogs within hours, and result in the suspension of the teacher the next day. Such an example points out the "need for observing the world differently"[32] simply because we are, indeed, observing the world differently.

Crucial to Qvortrup's treatment of hypercomplexity is Simon's idea (1945) of "bounded rationality"—the assertion that a "complex environment cannot be managed by a single human's rationality, but that we always face a deficit of rationality, i.e., that the complexity of an organization's environment exceeds the management capacity of the organization. Consequently, the basic function of an organization is to reduce complexity and the challenges for managers is to develop complexity-management strategies and structures."[33] Digital processes and practices play key roles in this discussion because they offer not only the means by which humans can narrow the range of choices before making a decision (a complexity management function), but they also can be embedded with means of automating, refining, and transforming those decision processes themselves (a complexity amplification function). Zuboff refers to the latter as the "informating process,"[34] the means by which digital processes not only respond to inputs and perform tasks, but also the ways in which they generate data about data, share those data, and initiate actions based on those data. The situation with the high school geography teacher mentioned above was fueled, in large part, by the automated processes of meta-data creation, data sharing, data crawling, data consolidation, and data presentation that required little or no direct human involvement. So, it is not only that humans are seeing the world differently, but also that their world is being increasingly mediated by digital processes that can condense literally billions of self-regulating computational decisions into a matter of seconds. As Qvortrup asserts, this "re-entry function" allows for geometric expansion of the system while avoiding the creation of chaos, making for a truly hypercomplex social phenomena where the system depends on its ability to observe phenomena AND observe observations.[35]

Hypercomplexity and Higher Education

So if we're living in an increasingly hypercomplex age, to what extent are institutions of higher education capable of not only managing complexity themselves but also of producing knowledge and producing graduates that thrive in hypercomplex environments? And what role might digital media studies play in shaping the higher education response to hypercomplexification?

On the most fundamental level, higher education needs to manifest more effectively the structural coupling between the media it uses and the forms they take by unifying the

30 Ibid., 85.
31 Ibid.
32 Ibid., 86.

33 Ibid., 186.
34 Shoshana Zuboff, "Dilemmas of Transformation in the Age of the Smart Machine," in *Reading Digital Culture.* Edited by David Trend. (Oxford: Blackwell Publishers, 2000).
35 Lars Qvortrup, *The Hypercomplex Society (*New York: Peter Lang, 2003), 181.

conversations about digitization and structure, digitization and pedagogy, and digitization and disciplinarity. The processes and practices of digitization need to be examined systematically in every corner of the academic enterprise because they are inextricably linked with transformations of every corner of the academic enterprise. As Qvortrup points out, a society can deal effectively with complexity only by building up complexity—"a society that recreates itself in new versions, on the basis of what it has already learned."[36] In other words, our social structures and institutions must become much more sophisticated "complexity-management systems."[37] It is, to some extent, ironic that colleges and universities around the world have been the birthing ground for the Internet, and they have also been focused on digitizing many aspects of their operation while at the same time most have resisted allowing the study of digital media into the mainstream of their daily enterprise. On perhaps an even more fundamental level, institutions of higher education need to embrace a socio-technical sensibility—one that accepts that contemporary digital forms and practices do no operate outside or independent of social forms and practices. It is here where increased investment in the "digital arts" can serve to illuminate subtle yet significant alterations in the social landscape. By moving digital arts from the margins to the mainstream of higher education, it becomes conceivably easier to engage participants in the on-going process of discussion and design that make up such a significant aspect of the self-organizing systems of hypercomplexity.

Given the match between the Internet structures and hypercomplex social structures, it makes sense that colleges and universities need to evaluate the extent to which their own structures "match up," especially in terms of how those structures help them manage hypercomplexity. The self-organizing, recursive nature of the Internet suggests that universities need to embrace open systems and open architectures that allow for recursive reorganization. One example might be the expansion of multi-disciplinary initiatives as not only important "niche" programs, but also as fundamentally new organizational structures through which the daily business of the university gets done. Because hypercomplexity works through the "coupling" of communicatively accessible actions, and because these actions are accessible because they are digital in nature (and connected via a digital network), more energy needs to be paid to the provision of "coupling points" that allow opportunistic (and often temporary) connections among disciplines to be made (and rewarded). There are many examples of highly successful interdisciplinary efforts at many institutions throughout the world; however, rarely have these efforts culminated in any meaningful restructuring of the university mechanism itself. Disciplines need to become "coupleable" to promote both self-observation and cross-disciplinary observation of observations; specializations remain useful only as long as they remain open to couplings with other specializations—as they digitize and become net-centric, so they become coupleable (in principle).

The self-organizing, recursive nature of the Internet suggests that universities need to embrace open systems and open architectures that allow for recursive reorganization.

The same is true for curriculum management and curriculum development. Anthropocentric disciplinary models simply cannot endure in a hypercomplex environment because they assume unlimited rationality (and they fly in the face of increasingly dynamic change). Curriculum development needs to be seen as a recursively inventive process that models the mechanisms of contemporary social change and openly includes the activities of all of its constituents (including students). For example, universities continue to put much energy into course management systems (such as *Blackboard*, *WebCT*, and *eCollege*) while at the same time decrying student use of social networks such as *Facebook* and *Myspace* as not only counter-productive but also as anti-intellectual. More often than not college professors, academic departments, university divisions, and outside accreditors subject curricular revisions to extensive and drawn-out vetting processes that almost always ensure the new courses and new programs are out of date from the outset. What would happen if more resources were devoted to experimental courses on experimental topics? What would happen if more academics, more departments, and more deans saw at least some

36 Ibid., 121.
37 Ibid., 10.

aspect of curriculum development as a means of invention, a means of exploring new topics, new approaches, new forms of knowledge generation? What would happen if traditional liberal arts disciplines worked harder to embrace their professional and applied counterparts?

The traditional liberal arts model should be re-evaluated according to the implications of hypercomplexity, especially as it might embrace non-traditional areas of education (and thus be transformed by them). One of the best ways to thrive in a hypercomplex society is to develop the ability to see the world from various (and sometimes competing) points of observation, and one possible way to accomplish this is a fuller integration of traditional, professional, and applied studies through hypercomplex practices. Such efforts could rely heavily on individual training in communication and expression that matches the forms of social communication and expression of hypercomplex systems. For example, imagine the potential of a cross-disciplinary campus-wide "blogosphere" that expresses, documents, connects, and extends the work done by individual faculty members, students, and professionals with an eye toward the ways in which these activities might self-organize into social networks devoted to intellectual enterprise. Also imagine efforts across a college campus that emphasize the development of digital media creation skills that are embedded in the languages and codes of the specific disciplines. The output of these efforts then form the bases for a dramatic increase in "communicative accessibility" via the Internet, especially those that involve a full range of digital media forms (such as text, image, video, audio, animation, and interactivity). In other words, universities need to adopt individual training in communication and expression that matches the forms of social communication with contemporary forms of social organization.

Very special attention needs to be paid to the unique role that art (especially digital art) can and will play in illuminating the constantly transforming relationships embedded in hypercomplexity. The extent to which digital art is seen simply as a computerized version of previous non-digital artistic processes is likely to determine the extent to which any particular higher education enterprise is able to detect, react to, and organize around the transforming potential of widespread digital practices.

The study of digital media needs to "get personal;" in other words, higher education needs to carefully (and quickly) examine the potentially explosive impacts of "personal media." While Qvortrup's focus is obviously on the social dimensions of hypercomplexity, more attention needs to be paid to the increasingly powerful role that a larger and larger number of individuals are playing in the process of hypercomplexification. For the foreseeable future the media and communication landscape will be radically transformed by the emergence and expansion of "personal media" and broadband delivery systems. Fueled by convergence between the processes, practices, production, and consumption of traditional mass media (such as film, radio, television, and print) and those of emergent personal media (e.g., email, instant messaging, blogs, mobile media devices, digital video recorders, web cams, Internet telephony, file sharing, streaming media, video games, and EoIP—Everything over Internet Protocol), the traditional forms of both mass communication and human communication will be increasingly intermingled and altered by new media forms that offer affordable on-demand, mobile, ubiquitous, instantaneous, and networked personalized media and communication experiences. All aspects of modern life will intersect with these transformations, including interpersonal, familial, organizational, cultural, social, and global contexts. Personal media are especially important to examine because they are likely to serve as a hotbed for the creation of new forms of social organization that emerge through the full range of mediated practices (such as mass, digital, and personal).

And so it is with the Internet, which appears to be a kind of prototype of the spontaneous self-organization of the complexity-increasing society. For the Internet develops through self-growth; it is not organized in advance. In principle anyone can join, and everyone does so with thousands of different motives. But, in the wake of this self-growth of organizations, organized procedures for interaction are constantly being formed. The process gives rise to a spontaneously initiated reaction to complexity.[38]

Universities are logical breeding grounds for these types of applications, but such progress is unlikely unless such activities are embraced within the academic mission of the institution.

In its own way digital media studies becomes both the content medium for exploring the impacts of digitization and hypercomplexity *and* it becomes the "effect structure" through which other academic fields (what Qvortrup might call "subsystems") can evolve toward a more hypercomplex state. Yet until this entire range of activities comes to be seen as fundamental to the functioning and

38 Lars Qvortrup, *The Hypercomplex Society* (New York: Peter Lang, 2003), 177.

continued relevance of the higher education enterprise I fear that larger and larger portions of what academics do will become overshadowed, marginalized, and potentially eliminated from contemporary social discourse. So if social differentiation is determined, at least in part, by one's ability to manage complexity, then higher education as a primary arbiter of social differentiation not only loses its ability to produce qualified participants but also loses its ability to participate fully in the future transformation of society. And so we are required to rethink the current position of digital media studies in the academy and suggest that its presence (or absence) in higher education will probably play a very significant part in determining the ability of colleges and universities to not only manage their internal complexity, but also to adequately function in a world of increasing external complexity. The longer traditional disciplines "hold out" as they attempt to stem (or ignore) the increase of digitally mediated hypercomplexity, the sooner they will find themselves struggling to maintain a functional role in tomorrow's increasingly complex world.

Bibliography

Andersen, P. Bogh. "Acting Machines." In *Digital Media Revisited: Theoretical and Conceptual Innovation in Digital Domains*. Cambridge, MA: MIT Press, 2003.

Bolter, Jay David. "Theory and Practice in New Media Studies." In *Digital Media Revisited: Theoretical and Conceptual Innovation in Digital Domains*. Cambridge, MA: MIT Press, 2003.

Kress, Gunther. *Multimodal Discourse: The Modes and Media of Contemporary Communication.* London: Arnold, 2001.

Kress, Gunther. Design and transformation: new theories of meaning. In *Multiliteracies: Literacy Learning and the Design of Social Futures*. Edited by Bill Cope and Mary Kalantzis. London: Routledge, 2002.

Kress, Gunther. *Literacy in the New Media Age*. London: Routledge, 2003.

Liestol, Gunnar, Morrison, Andrew, and Rasmussen, Terje, eds. *Digital Media Revisited: Theoretical and Conceptual Innovation in Digital Domains*. Cambridge, MA: MIT Press, 2003.

Lunenfeld, Peter. ed. *The Digital Dialectic: New Essays on New Media.* Cambridge, MA: MIT Press, 1999.

Poster, Mark. "Cyber Democracy: The Internet and the Public Sphere." In *Reading Digital Culture.* Edited by David Trend. Oxford: Blackwell Publishers, 2001.

Qvortrup, Lars. *The Hypercomplex Society.* New York: Peter Lang, 2003

Trend, David, ed. *Reading Digital Culture*. Oxford: Blackwell Publishers, 2001.

Zuboff, Shoshana. "Dilemmas of Transformation in the Age of the Smart Machine." In *Reading Digital Culture.* Edited by David Trend. Oxford: Blackwell Publishers, 2000.

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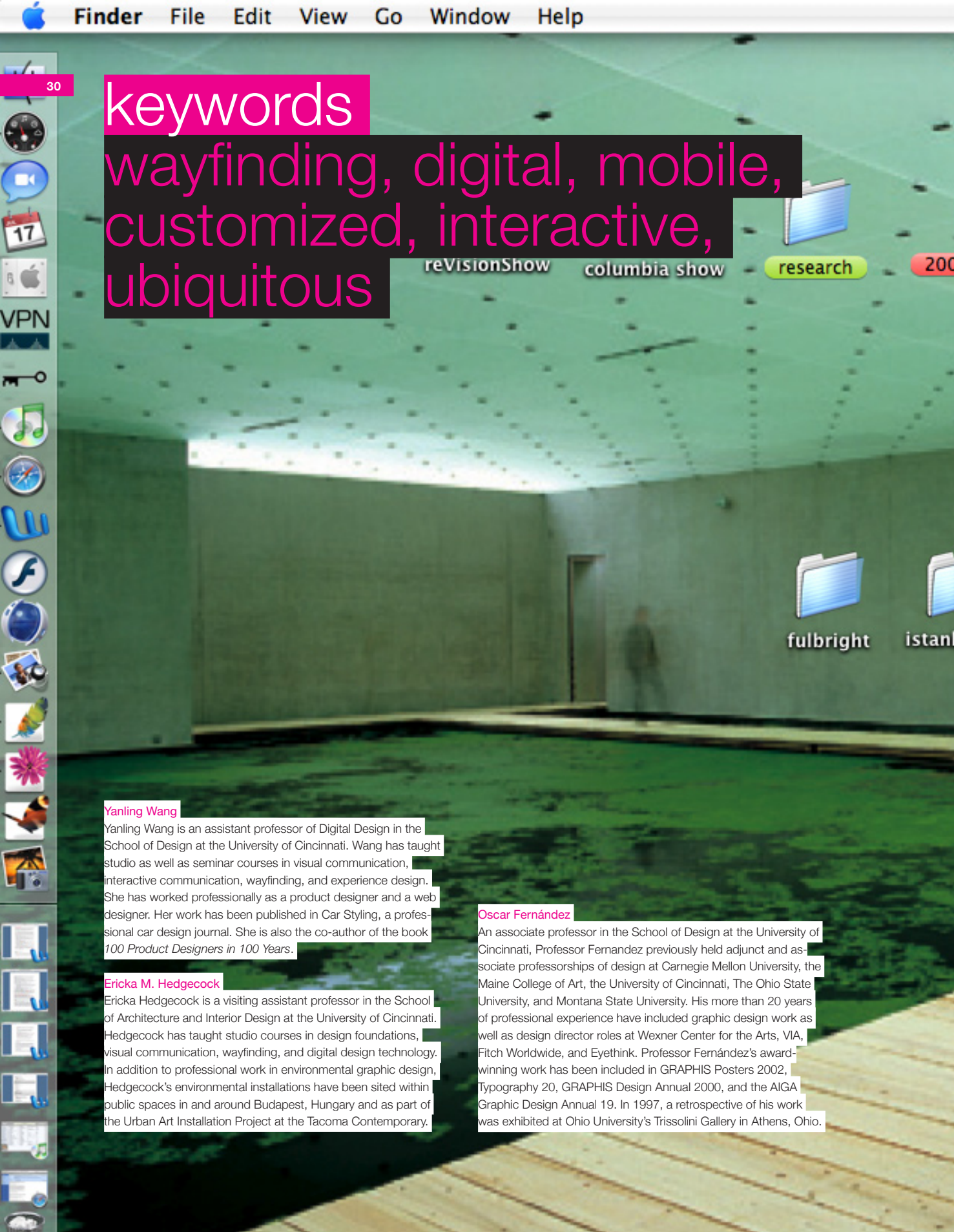

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Mobile Media and Digital Way-finding: Strategies for Implementation

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Abstract

Wayfinding can be viewed as one of the earliest and most basic activities engaged by humans. The increasingly complex built-environment and mobile lifestyle make wayfinding more challenging than ever. With societal demands for greater diversity and flexibility, the need for customized interactive wayfinding systems is now urgent. In this paper, the authors examine how mobile media can be introduced into a wayfinding system and offer guidelines for creating a customized, interactive digital wayfinding system, which will provide not only a positive and reassuring user experience, but also the customization to expedite reaching an intended destination.

Introduction

Given our inherent mobility, wayfinding, "a term introduced to describe the process of reaching a destination, whether in a familiar or unfamiliar environment," [1] can be described as one of the earliest human activities. In a simple environment, the human mind is capable of generating a cognitive map or "the internal spatial representation of environmental information." [2] Within a complex environment, an internal cognitive map alone may not allow the user to have a successful wayfinding experience and may lead to the formulation of representational inaccuracies.[3]

Traditional wayfinding solutions rely heavily on the physical features of already built environments to provide navigational cues. In addition to signage systems that help users find their way, strategies for architectural directives include lighting, material, or surface changes, and landmark elements such as water features or centralized gathering areas. Given the increasing demand for flexibility in a diverse society, these traditional fixed wayfinding approaches no longer satisfy today's users. They cannot promptly reflect the constant changes of the environmental information, provide information ubiquitously, and be customized for different user needs. The need for developing a customized interactive wayfinding system has become urgent.

Mobile media and interactive design offer an opportunity to improve the wayfinding experience in such a way that traditional, fixed wayfinding systems cannot. In this paper, the authors examine how mobile media can be introduced into a wayfinding system to create a ubiquitous wayfinding experience and offer guidelines for creating a customized, interactive digital wayfinding system.

Ubiquitous computing has long been an issue of discussion amongst theorists and futurists. However, the world of intelligent objects and reactive spaces is becoming a reality as the fields of computer science, architecture, visual communication, and industrial design collaborate to better serve specific human needs. The adaptability and flexibility of digital wayfinding can satisfy these demands simultaneously. Therefore, digital technology can be seen to play a key role for future wayfinding.

Background

Wayfinding as a field of study did not develop until the early 20th century. The term "way-finding" was coined in 1960 by city planner Kevin Lynch in his influential book *The Image of the City* and later became "wayfinding" in the mid-1970s. Lynch's major contribution to architectural design and urban planning is that he recognized the importance of an environmental image[4] for wayfinding tasks. To define elements of a city, Lynch identified the following terms: paths, edges, districts, nodes, and landmarks.[5] These terms continue to be widely used today in all aspects of environmental design and research.

Another important book, *Wayfinding: People, Signs, and Architecture*, was published in order to make an "impact on the design profession" the importance of wayfinding concepts.6 In this book, the authors continued to describe wayfinding as spatial problem solving and further specified it as "a term introduced to describe the process of reaching a destination, whether in a familiar or unfamiliar environment."[7]

Architects, urban planners, landscape architects, and environmental graphic designers, as well as behavioral and cognitive psychologists have been involved in the multidisciplinary study of wayfinding. Good designers have been able to solve wayfinding problems comprehensively by always beginning with a thorough analysis of the environment's entrances and exits, circulation paths, districts, nodes

1 Paul Arthur and Passini Romedi, *Wayfinding: People, Signs, and Architecture* (New York: McGraw-Hill Book Companies, 1992).

2 Reginald G. Golledge, editor., *Wayfinding Behavior: Cognitive Mapping and Other Spatial Processes* (Baltimore: Johns Hopkins University Press, 1999).

3 M. Raubal and M. Egenhofer, "Comparing the Complexity of Wayfinding Tasks in Built Environments." *Environment and Planning* B 25 (6) (1998): 895-913.

4 Lynch used the term "environmental image" to describe "the general mental picture of the exterior physical world that is held by an individual." It is "the product both of immediate sensation and of the memory of past experience, and it is used to interpret information and to guide action." Kevin Lynch, *The Image of the City.* (Cambridge, Mass.: The MIT Press, 1960).

5 Lynch defined paths as "the channels along which the observer customarily, occasionally, or potentially move;" edges as "the linear elements not used or considered as paths by the observer," or in another words, boundaries or barriers; districts as "the medium-to-large sections of the city;" nodes as "the strategic spots in a city into which an observer can enter;" and landmarks as the strategic spots which the observer does not enter within them, "they are external."

6 Paul Arthur and Passini Romedi, *Wayfinding: People, Signs, and Architecture* (New York: McGraw-Hill Book Companies, 1992).

7 Ibid.

(decision points), vertical circulation (stairs, elevators), and landmarks. In some cases, these architectural attributes are emphasized for wayfinding purposes. For instance, the entrance of a building can be extruded from its exterior and painted with bright colors enabling it to be easily identified as people approach the site. Signage systems are then implemented which provide users with site orientation, directional routing, building identification, and regulatory instructions.

Since Lynch first introduced the term *way-finding* nearly a half-century ago, this concept has now become a commonly applied design strategy in developing static signage systems. Despite this milestone, limitations remain even in the most successful solutions.

Limitations of static wayfinding solutions

The proliferation of the internet has enabled users to receive information on demand and on nearly any subject imaginable. Due to the proliferation and growing popularity of online mapping sites such as *Mapquest* (http://www.mapquest.com/), *Google Maps (*http://maps.google.com/), or the 3-D interface *Google Earth* (http://earth.google.com/), people can get detailed visual and textual information on how to drive from location A to location B before their actual visit.

In the physical environment however, it may be more difficult to find maps within a site or to access such displays within a particular building complex. With fixed signage systems, users must stay on routes that have been designed by wayfinding designers. Without consideration for how certain people move through space in search of a particular room or service, traditional signage elements offer little aid to a specific user navigating a complex structure. Is it possible that users can have access to information at anytime based on their own, personal search criteria?

Within existing static wayfinding systems, there is no way for users to access information in a personalized manner. One of the most recognized problems relative to this need is language difference. In international public spaces such as airports or sporting venues, a multi-language signage system is an immense challenge for wayfinding designers. International symbols have been developed and put to use for years to eliminate use of multiple languages on signs, but symbols alone cannot communicate adequately all the time. And, when multi-language information is provided, the amount of information inevitably crowds the display and slows down the process of information searching even with well-organized information design.

Visual directives from signs are of little use to people with visual impairment who rely on other types of sensory input such as aural or tactile devices. Braille messages, for example, are available only on the nameplate of some destinations, and minimally by law only on permanent room designation signs. As the pattern owner of *Raynes Rail*,[8] a Braille and Audio Handrail System questioned: “How could we honestly label doors with Braille without providing a directional link from the entrance of the building to the designated door?” [9] With the special needs of a diverse group of users, is it possible that wayfinding information can be more easily adapted to personal needs?

An additional limitation with static wayfinding is the inconvenience, time consumption, and extra costs involved in updating a fixed signage system. Before maintenance was recognized as a crucial part of wayfinding design, outdated information was a big problem: “Wayfinding systems must respond with speed and sensitivity to changes, or else they become more than outdated: they become liabilities.” [10] With better management and foresight, information can be updated whenever there are necessary changes in building information or as a response to changes in the organizational structure of the facility. The cost of physically changing a sign is found in both manpower and material; re-design of parts of a signage system may lead to inconsistency in overall, uniform signage if the original material can no longer be specified or the manufacturing contractor changes.

Digital Media & Wayfinding

Digital media and interactive design now offer opportunities to improve the wayfinding experience in a way that traditional, static wayfinding systems cannot. For example, airports and other multimodal locations (those integrating multiple public transportation systems such as air, train, taxi, bus, etc.) often use electronic signage to create a dynamic relationship between a constantly changing schedule of events and a very diverse group of information seekers.

8 Raynes Rail was developed by Boston based multidisciplinary design firm, Coco Raynes Associates, Inc (http://www.rayne-sassociates.com). It provides the missing link between the entrance of a building and the desired location. The Raynes Rail combines continuous Braille messages on its inner face, with audio modules positioned at strategic locations.

9 Bradford McKee, “Spaces between people.” *SEGDdesign* 01 (2003): 24-30.

10 Janet Carpman and Myron Grant, “Lost in Space.” *I. D.* 36 (Jan/ Feb, 1989): 66, 88.

Because active technology for wayfinding systems depends on human input, the environment may be able to communicate on a more personal level with the user through alternative auditory and visual cues.

In a sense, a digital wayfinding system is no longer a static component of the environment. It is flexible and dynamic in nature, at times responding to both the user and the changing environment. Because active technology for wayfinding systems depends on human input, the environment may be able to communicate on a more personal level with the user through alternative auditory and visual cues.

GPS-Enabled Tours

The Global Positioning System (GPS) was designed and is controlled by the United States Department of Defense. Although its primary application is for military research and documentation, the system is now used by countless civilians as well. Low cost GPS receivers are often used together with a PDA, laptop, and vehicular devices for navigation purposes. Since 2004, prospective students at Arizona State University are provided a set of headphones and a handheld computer for a GPS-enabled, self-guided tour (Carlson, 2004). The handheld computer will ask the student about his or her interests on campus and adjust the content of the tour accordingly. At the same time, a paper map is also provided for users. When a user arrives at a hot spot on campus, the location is supported by an audio-narrative, music, and a sample of sounds from campus life. While the handheld computers are providing a service for the campus tour, there are concerns for privacy of the location of its users. Additionally, the GPS system is only able to provide locational information for those navigating exterior zones of the campus, and does not track interiors.

Information Kiosk

The i-Site Information System used by Johns Hopkins University's Homewood Campus creates an interactive digital wayfinding and communication system. Sixteen i-Site kiosks were installed on the 128-acre campus to help visitors, students, and parents find their way around the campus. The kiosk includes a static map, LCD monitor with five buttons, a hidden microphone, and speaker for audio content. Usability tests of the prototype were conducted by environmental psychologist Dr. Peter Hecht to determine what information should be included and where the kiosks should be located (Greer, 2003). In addition to the two-dimensional map, users can touch the screen for information or push the Help Desk button to activate a hands-free telephone that dials out to live-assistance via campus security. Even if power is disrupted, users can refer to the two-dimensional map to find their way. As one of the jurors who awarded the SEGD Design Award to the project stated: "The kiosk demonstrates the power of interactive digital communications media to tailor wayfinding to the individual needs of a diverse range of users."[11]

Orientation Assistant Device Systems

Developed by the *Guide Dogs for the Blind Association* in the UK, Orientation Assistant Device (OAD) systems provide users training with guide dogs the ability to link with information provided about a space through a portable handheld unit. The system relies on radio beacons placed at strategic positions along a route that communicates information about the environment to the mobile device, usually in the form of simple directives and instructions. When the user encounters a beacon, it sends a signal to the device that then indicates its presence with an audible cue that directs the user through the space. This system has received wide accolades because it allows the trainer to focus on working with the dog and not the complexities of navigating their environment.[12] The OAD systems trainers can record successful wayfinding throughout a building, thus enabling a later user the ability to choose from a series of specific journeys based on their needs and preferences.

PhoneGuide

PhoneGuide is a museum guidance approach that uses camera-equipped mobile phones and on-device object recognition. The research project conducted by Föckler, Zeidler, Brombach, Bruns, and Bimber (2005) offers guidance to visitors within a museum by allowing them to take a picture of any exhibition in the museum with their cell phone. When the image is recognized by the device, presentation and information about the exhibition are displayed on the phone. Laboratory experiments and field surveys show that photographed museum exhibits can be recognized with a probability of over 90%.[13]

Miniature, context-aware devices such as the *PhoneGuide* and a similar device developed by Swedish researchers at the Viktoria Institute's Future Applications Lab are being embedded into furniture, textiles, and other objects. These devices are programmed to rely on communication from the users through a common user interface such as a cell

11 Nora Richter Greer,"Line of i-Site." *SEGDdesign* 02 (2003): 36-41.

12 J. Hine, D. Swan, J. Scott, D. Binnie, and J. Sharp, "Using Technology to Overcome the Tyranny of Space: Information Provision and Wayfinding." *Urban Studies* 37, Issue 10 (2000).

13 P. Föckler, T. Zeidler, B.Brombach, E. Bruns, and O. Bimber, "PhoneGuide: Museum Guidance Supported by On-Device Object Recognition on Mobile Phones." In proceedings of *International Conference on Mobile and Ubiquitous Computing* (MUM'05), 2005, quoted in *Augmented Reality: Research*, http://gonzo.uni-weimar.de/~bimber/research.php. (June, 2006).

Interactive kiosks and electronic presentations are becoming more widely used in wayfinding systems. However, because they are fixtures within the environment, they cannot facilitate a ubiquitous wayfinding experience.

phone or PDA. The format for this graphical user interface is of notable interest due to the potential for the development of context-aware mobile media to communicate information about the built environment; this technology has the potential to revolutionize the way in which we navigate in the built environment and indicates a new approach for wayfinding designers.

Strategies for Digital Wayfinding

Interactive kiosks and electronic presentations are becoming more widely used in wayfinding systems. However, because they are fixtures within the environment, they cannot facilitate a ubiquitous wayfinding experience. By introducing mobile media, such as cell phones and PDAs, into the wayfinding system, people can find their way with much greater ease.

In this section, the authors explore the components and principles of digital wayfinding and identify strategies for implementation. For wayfinding within a public building, existing signage is an immediate and available means to test the PhoneGuide technology developed by Föckler, et al. Powered by the PhoneGuide technology, users can take a picture of room designation signs and receive related multimedia presentations such as texts, maps, images, videos, and audio on their own phone. Alternatives include the ability for a user to input (via voice or keypad) information from the identification signs to receive multimedia content.

Components of Wayfinding Information

A comprehensive wayfinding system provides not only information that people need when they are in the environment, but also information that they need before and after the visit.

> Pre-visit Information: Pre-visit information is useful for people to generate an understanding of the environment before they visit. There are two different needs for pre-visit information: general information and information for planning the trip.

General information:

General information is especially useful when the user is not familiar with the site. An overview of the site, architectural organization, and facility information will be appropriate for this purpose. User surveys can be conducted to determine what information is relevant to the users of the site. A well-designed overall information design can help to create a cognitive map for wayfinding purpose and establish a sense of familiarity by visual and/or audio representations: such as texts, graphics, maps, photos, audios, videos, and 3-D models. The emphasis is not to provide specific wayfinding information, but to establish the identity of the site.

Planning the trip:

Specific information such as parking lots, bus stations, entrances, and accessible entrances (and elevators) are needed for planning the trip. *Map Quest* and *Google Maps* are commonly used online tools for acquiring driving directions. However, what these sites do not offer is more specific wayfinding information (i.e. location of the parking lot or accessible entries).

> On-site Information: On-site information should be very specific to help people find their way and can incorporate visual information, as well as sound and tactile surfaces for diverse user needs.

Approaching the site:

For a public institution, on-site wayfinding begins by guiding users to the entrance. Effective wayfinding for this stage provides directional signs from outside the building to the entrance, and provides a clear identification sign to confirm the arrival. A meaningful identification sign will also contribute to establishing the identity of the site.

Reaching the destination

On-site information for wayfinding should include directives from the entrance to the user's desired destination(s). Examples typically include orthographic representation in

the form of a building's plan, which has been graphically simplified to provide the user with a clear understanding of the architectural organization. General information included within this signage may include room identification, location of building egress, restrooms and other public facilities, or vertical circulation (stairs and elevators).

With mobile phone or PDA in hand, users can type in or speak out information on the identification sign, or simply take a picture of the sign using the digital camera on the phone. Information related to the users' current location is then displayed on the phone. With further input, a customized direction will then be created for the user. Compared to traditional static wayfinding solutions, digital wayfinding with customized directives help users to find their way with greater ease.

Finding one's way out

Wayfinding is not complete when users reach their destination. It is also important to aid in finding one's way out. During emergency evacuations due to fire or other life and safety hazards, users rely critically on a building's wayfinding system. Decisions regarding a building's wayfinding strategy should be integrated within the architectural design process as early as possible, enabling all users to efficiently exit the building at all times.

Guidelines for Digital Wayfinding

Wayfinding design is not just about signage placement and indicating directions. More importantly, it is about creating a pleasant and memorable experience for users. Guidelines and strategies are available to aid designers of physical wayfinding systems, but little has been written relative to the development of guidelines for digital wayfinding. Without proper design considerations for mobile devices and interactive media, users will have to find not only their way in the physical environment, but also struggle with the technology designed to make their experience easier. It is important to develop guidelines that ensure new technologies are used to facilitate wayfinding, rather than creating a new barrier.

Guidelines for digital wayfinding are divided into two sections: usability and user satisfaction.

> Usability

Consistency

Effective presentation of information relies on clear and organized information delivery; it must instantly reveal information hierarchy and identify an order of priorities. When digital media is introduced into the wayfinding system, information presentation such as naming system, typeface, size, color, graphics, as well as auditory information and spatial animations should remain consistent. Information presented through digital media should be consistent with those data in the physical environment. This consistency and repetition in information presentation (visual, audio, or kinetic) helps develop an easily recognized pattern for users to follow and streamlines their navigation throughout the environment.

Simplicity

By simplifying the interface, designers can provide information based on user needs and not overload the user with too much "raw data." For example, a building plan that illustrates an entire complex might be unnecessary to the relative experience of the individual user. Because their needs would be addressed individually within a digital wayfinding system, extraneous/accessory information is presented to the user on a "need to know" basis.

Legibility and Readability

The Americans with Disabilities Act (ADA) introduced comprehensive guidelines for legibility and readability issues for physical wayfinding,[14] yet not much has been developed for digital wayfinding. Legibility and readability issues are especially critical when people are relying on mobile media for wayfinding. With a limited screen size, the careful selection of typeface, letterform size, color, and contrast is crucial.

Alternatives

While digital wayfinding incorporates new technologies for wayfinding purposes, traditional wayfinding means such as landmarks, maps, and signs should be an integrated part of the system to help people find their way when the technology is not available, which is especially true when users are finding their way out in an emergency.

Environmental Cues

Environmental cues such as landmarks are readily-identifiable features of a site that are important for wayfinding. It is much easier for users to remember a landmark in the environment and find their way based on its location. When digital media is applied, physical landmarks should be integrated into the system to help people navigate.

14 Society for Environmental Graphic Design. "The Americans with Disabilities Act White Paper: SEGD's Clarification and Interpretation of the ADA Signage Requirements." Paper published by Society for Environmental Graphic Design, Cambridge, Mass.: SEGD, April 1993.

Wayfinding design is not just about signage placement and indicating directions.

> User Satisfaction

Feedback

The major difference between a static wayfinding system and a digital wayfinding system is dynamic interaction between users and information. Feedback may be indicated as a change in color, size, movement, sound, etc., within the interface. Tangible and immediate feedback to a user's actions is crucial for satisfaction.

Customization

While traditional wayfinding approaches do not allow people to customize the content and presentation of the information, digital wayfinding enables people to find information based on personal needs and presents it in a way that is best suited for the user. A customized information presentation can help people to focus on their task and not distract them with irrelevant information. Guiding users through a building involves understanding who will be using the facility and designing for variations in age, education, language, physical mobility, etc. Providing alternatives for information retrieval will make the process easier and instill within the user a sense of control over their environment. For example, a user can choose to see information in different sizes and colors, still image presentation versus animations or videos, and aural versus visual information. Customization empowers people, leading to greater user satisfaction.

Non-visual Senses

A combination of visual information (static or kinetic), sound, and texture for the wayfinding system allows people to access information from various senses. Traditional wayfinding approaches emphasize the display of static visual information. Tactile surfaces are used mainly for Braille messages and available only on the nameplate of some destinations (and minimally by law only on permanent room designation signs). For a digital wayfinding system, it is much easier to incorporate sound, movement (the vibration of a cell phone, for instance), and texture to help people find their way with more options.

Interpersonal Communication

As social beings, we rely on interpersonal communication. When people get lost, they tend to ask for help. A digital wayfinding strategy can provide a needed human counterpart to the frustrating experience of being lost in a foreign environment. Trained personnel can stay online to answer wayfinding questions or talk to users directly on the phone.

Privacy

People want to know where they are and where they are going, but they don't necessarily want to let others know their location. It is important to consider privacy within the design of the digital wayfinding system.

Summary and Conclusions

The digital wayfinding system is becoming an integral partner with static systems. It is flexible and dynamic in nature, at times responding to both the user and the built environment. Compared to traditional static wayfinding, digital wayfinding offers environmental information that is ubiquitous, customized, and flexible. With mobile media connected to a wireless network, people can find their way around without spatial and temporal constraints. Additionally, a properly designed interface enables people to get information based on their diverse personal needs and instills a sense of comfort with the task of navigating a complex environment.

As building functions and designations change, wayfinding systems must be updated. Digital systems can be easily adapted to the needs of users through interface programming at a fraction of the cost of updating physical systems. Additionally, digital systems are easily updated for users with special needs, as technology can more easily accommodate the needs of special user groups.

A handheld mobile device provides the opportunity for wayfinding designers to examine the spatial components of a building to create a customizable interface that can provide users with choices as to how they want to move through the building. Incorporating mobile media and digital technology within a building's wayfinding strategy allows for ubiquitous, customized wayfinding experiences and may offer a more efficient wayfinding experience.

References

Arthur, Paul, and Romedi Passini. *Wayfinding: People, Signs, and Architecture*. New York: McGraw-Hill Book Companies, 1992.

Carlson, Scott. "Arizona State U. Updates the Student Tour Guide -- With Computers." *The Chronicle of Higher Education: Information Technology* (October, 2004), http://chronicle.com/weekly/v51/i07/07a03201.htm. (June, 2006).

Carpman, Janet and Myron Grant. "Lost in Space." *I. D.* 36 (Jan/Feb, 1989): 66, 88.

Föckler, P., T. Zeidler, B.Brombach, E. Bruns, and O. Bimber. "PhoneGuide: Museum Guidance Supported by On-Device Object Recognition on Mobile Phones." In proceedings of *International Conference on Mobile and Ubiquitous Computing* (MUM'05), 2005, quoted in Augmented Reality: Research, http://gonzo.uni-weimar.de/~bimber/research.php. (June, 2006).

Golledge, Reginald G., editor. *Wayfinding Behavior: Cognitive Mapping and Other Spatial Processes*. Baltimore: Johns Hopkins University Press, 1999.

Greer, Nora Richter. "Line of i-Site." *SEGDdesign* 02 (2003): 36-41.

Hine, J., D. Swan, J. Scott, D. Binnie, and J. Sharp. "Using technology to overcome the tyranny of space: information provision and wayfinding." *Urban Studies* 37, Issue 10 (2000).

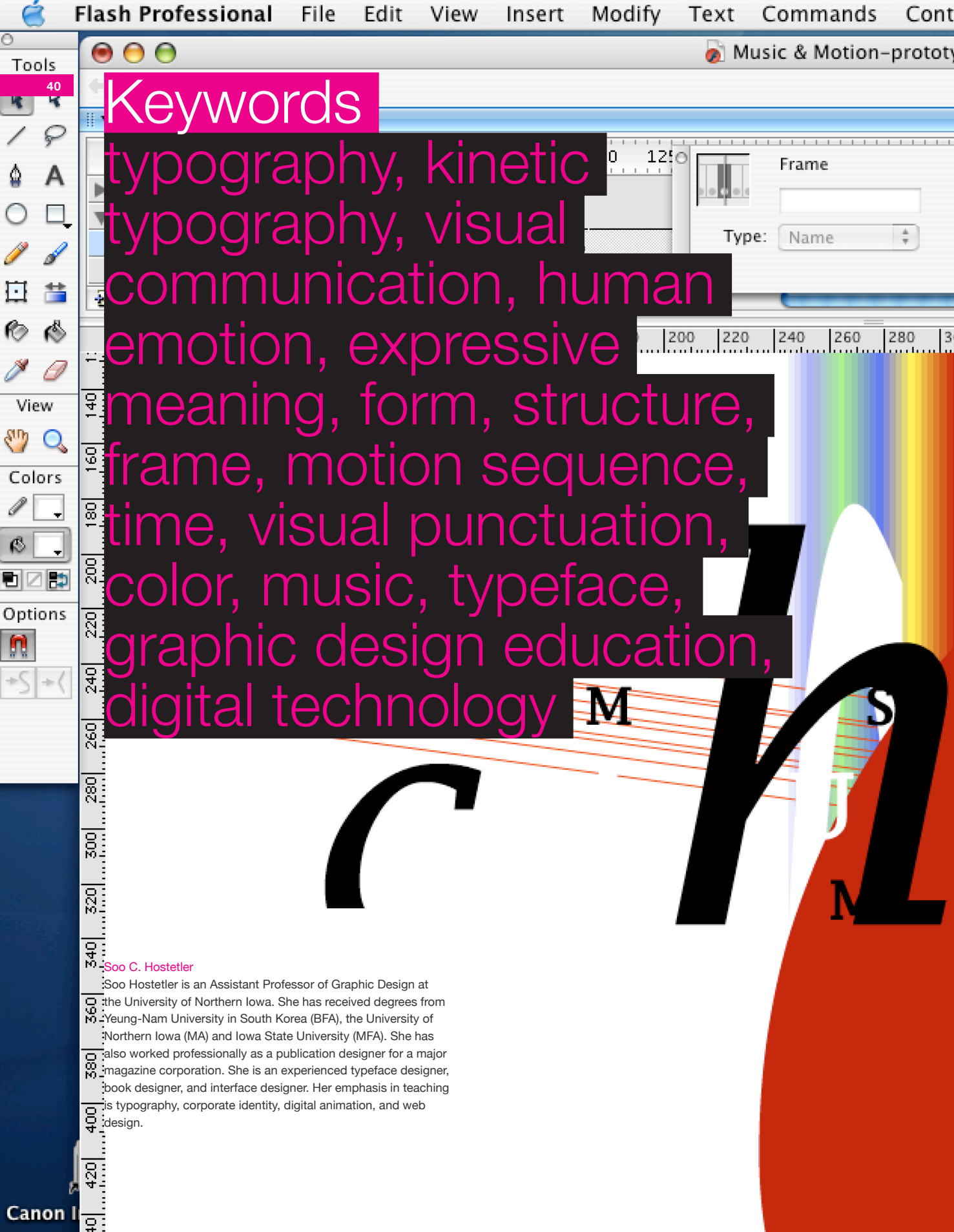
Horn, Robert E. "Information Design: Emergence of a New Profession." In *Information Design*. Edited by Robert Jacobson. Cambridge, Mass.: The MIT Press, 1999.

Lynch, Kevin. *The Image of the City.* Cambridge, Mass.: The MIT Press, 1960.

McKee, Bradford. "Spaces between people." *SEGDdesign* 01 (2003): 24-30.

Raubal, M., and M. Egenhofer. "Comparing the Complexity of Wayfinding Tasks in Built Environments." *Environment and Planning B* 25 (6) (1998): 895-913.

Society for Environmental Graphic Design. "The Americans with Disabilities Act White Paper: SEGD's Clarification and Interpretation of the ADA Signage Requirements." Paper published by Society for Environmental Graphic Design, Cambridge, Mass.: SEGD, April 1993.



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Integrating Typography and Motion in Visual Communication

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Abstract

Typography is a critical tool for effective visual communication, because it can strongly evoke human emotion by combining form with narrative text. Digital technology has provided a wealth of new opportunities for representing concepts through expressive visual forms. One result is kinetic typography, the combination of typography and motion. Kinetic typography conveys gestures that can function powerfully as visual images. Using kinetic typography, students create results that are richer and far more engaging than found in traditional approaches to typographic design. This paper is an overview of a design course. The purpose is to use kinetic typography to arrive at metaphors of human experience.

Typography is a critical tool in visual communication, in part because it can evoke human emotion by combining form with narrative text. Human feelings may serve as the basis for the design of compelling images of a wide range of circumstances in our surroundings. Emotion has a powerful voice, and it can be used in a soul-stirring way to convey the unique qualities of each individual.

Over time, typography has gradually changed in response to major factors like technological advancement, cultural evolution, and commercial needs. Motion is linked to the self-awareness of our physical environment, and, as such, is always inseparable from our daily experience.[1] By its very nature, through such discernible attributes as position, direction, and velocity, the mere presence of motion cannot help but call to mind such qualities as dynamism and energy.[2] When combined through technological means, typography, motion, and emotion retain many of their separate characteristics, while the synergistic consequences enable greater communicative abilities for designers.

In recent decades, technological innovation has greatly improved our potential for visual communication. In particular, digital technology has provided almost limitless opportunities for designers, artists, and others to represent their concepts through expressive visual forms. One result of this is kinetic typography, the combination of typography and motion, or what is also sometimes called typographic animation. Unlike static, print-based forms, kinetic typography uses motion to convey gestures in ways that can function powerfully as visual images. As a medium, it is inherently interdisciplinary, in the sense that it can integrate technology, typography, motion, graphic design, music, and literary narrative.

When we extend this marriage of typography and motion to graphic design education, it is essential that we provide our students with a solid foundation of the fundamentals of kinetic typography before expecting them to make innovative visual forms of concepts. These fundamentals could be grouped into four categories, with the overall purpose of teaching the synergistic interaction of one component with another. All components interact with and support all others, in the process of arriving at a rich, expressive message on the stage (sometimes also known as ground or field of activity). Below is a list of the attributes of the four categories, each of which contributes to the use of kinetic typography for communication.

Type & Expression of Ideas

> 1 Typography
> 2 Form
> 3 Expressive Meaning

Space

> 1 Structure
> 2 Frame

Time

> 1 Motion
> 2 Sequence

Supporting Elements

> 1 Visual Punctuation
> 2 Color
> 3 Music

The following are further explanations of the function of each of these aspects:

Type & Expression of Ideas

1. Typography: Choice of font for expressive purposes

Typography has a central role in kinetic typography. A full understanding of typographic applications will serve to direct the designer in choosing a suitable typeface with which to express and communicate a message. Each typeface has its own aesthetic, expressive qualities, as evidenced by the visual attributes of its letterforms. It is important for students to know the basic classifications of typefaces, for the reason that each type category has distinct, functional qualities. Within any category, each typeface has its own individual identity because of different proportions and a variety of line weights, widths, directional slants, and so on (figure 1). These individual qualities clearly determine that each typeface demonstrates a different use and purpose for expression. A well-combined variety of typefaces brings variations of expression and harmony to the design. Awareness of these classifications is an essential tool in developing a designer's ability to select an appropriate typeface that enhances the expressive message in kinetic typography.

1 Gyorgy Kepes, *The Nature and Art of Motion* (New York: George Braziller, 1965): ii.
2 Ibid., vi.

Motion is linked to the self-awareness of our physical environment, and, as such, is always inseparable from our daily experience.

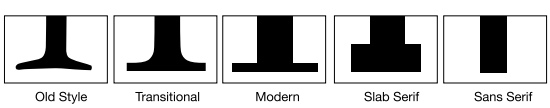

Figure 1 Basic Classifications of Typefaces

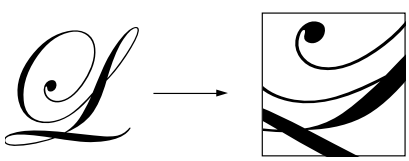

Figure 2 Details of Letter Form

2. Form

The use of typography is the primary means of presenting ideas and messages for expressive communication in kinetic typography. In this case, typography has a dual role: to represent a concept, and to do so in a visual form. This interplay of meaning and form brings a balanced harmony into the stage both in terms of function and of expression. Displaying type as a form provides a sense of a letterform's unique characteristics and abstract presentation. When a typeface is perceived as form, it no longer reads as a letter because it has been manipulated by distortion, texture, and enlargement, and has been extruded into a space. Space becomes an active live stage and brings a new dimension to our visual environment. The following example demonstrates how a letterform can be altered through enlargement to the point that it becomes abstract and its details become magnified.

3. Expressive Meaning

It is important to grasp the purpose of type itself. Its physical form has its own expressive personality as well as being able to interpret meaning and guide stories. The physical characteristics of type, such as light or bold, round or square, short or long, wide or narrow, slim or heavy, make their own personal impression. Some of them look beautiful, delightful, fresh, ugly, angry, formal, casual, loose, or stiff. It is as though each typeface has its own purpose for existence. Type also serves to represent the expression of various actions. Letterforms can appear to walk, run, jump, hide, climb, dance, fly, stand, rise, hang, float, sink, or crash. They can be quiet or loud, surprised, or appear to be shouting or crying. Each typeface represents its own expressive meaning through its strong personality. Letters, separate from type, have meaning as soon as they are combined as words or sentences. Sometimes they are

used subjectively, while at other times they support their neighboring letters. It is important to use an appropriate character to express the meaning of a concept, a meaning that is consistent with the typeface, its case, size, position, weight, color, and space. Well-balanced and appropriate typefaces, narrative structure, and movement can reinforce the meaning in a kinetic typographical environment. The examples in figure 3 show how type can demonstrate expressive meaning. Each typeface is selected to reinforce the essence of the word. The position and direction of the individual typeface can emphasize the action that the word represents.

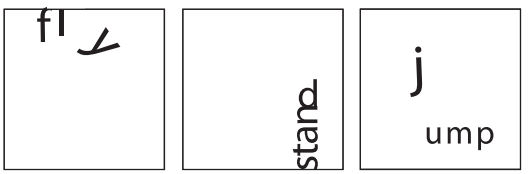

Figure 3 Expressive Meaning

Space

1. Structure

The space of a visual environment is limitless. Throughout space, we sense light, dark, direction, distance, balance, and depth. Space appears to us as a physical reality, as a thing that exists separately from our own bodies. Space can be flat or deep, and can be viewed from a two-dimensional or three-dimensional perspective. To perceive a visual object in two-dimensional space, a spatial structure must include such elements as points, lines, planes, and volumes. These same components also occur in kinetic typographic forms in which the space is observed on a computer screen.

In a visual environment, the physical depth of dimension creates a three-dimensional space that depicts a plane view (top and bottom view), a front view and a side view from any location.[3] It creates position, direction, gravity, and spatial environment in which we see in a perspective viewpoint.[4] Perspective is the use of lines and angles to create the illusion of three-dimensional objects within a two-dimensional framework. In a time-based kinetic typography space, a two-dimensional object can demonstrate three-dimensional reality by mimicking reality's effects. The objects move from one position to another, implying the illusion of spatial and tactile vision. It represents depth in visual space.

2. Frame

In a time-based kinetic typography environment, frame refers to a screen, which is an active composition of space or ground that displays moving objects. The moving object consists of a sequence of individually produced, framed pictures. A number of different frames create the illusion of motion in our vision (figure 4). Within a frame, the actual workspace for an object, referred to as the ground or stage, is a compositionally active zone. The compositional design actually appears to move from the inactive outside of the frame. The objects are only displayed within a ground (figure 5).

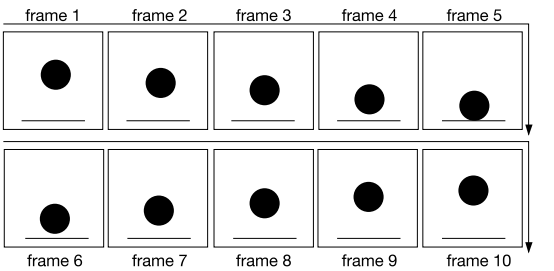

Figure 4 Sequence of Frame

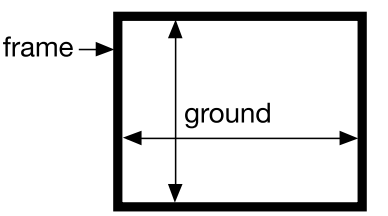

Figure 5 Frame/Ground

The frame has a certain ratio based on its usage. The frame aspect ratio is a relationship between the width and the height of the frame, and is expressed as "x:y". There are three common aspect ratios: The traditional television screen is 1.33:1 or 4:3 which means that for every 4 units wide it is 3 units high (4/3 = 1.33); a high definition television screen or European wide screen standard is 1.78:1 or 16:9; and a cinematography screen is 1.85:1. Computer monitors usually use the aspect ratio 1.33:1.[5]

3 Wucius Wong, *Principles of Form and Design* (New York: Van Nostrand Reinhold, 1993): 240.
4 Ibid., 244.
5 Matt Woolman and Jeff Bellantoni, *Moving Type: Designing for Time and Space* (Hove: RotoVision SA, 2000): 22.

The flow of movement, which consists of a mixture of passive and active rhythmic speeds, must keep a balance that coordinates the ultimate harmonies of time.

1. Motion

In kinetics, which represents dynamic movement, the viewer sees a spatial experience of visual communication through time. Using motion, objects appear or disappear into a space, which presents the appearance of rhythmic chronological time. The flow of movement, which consists of a mixture of passive and active rhythmic speeds, must keep a balance that coordinates the ultimate harmonies of time. Motion generates an emotional energy that prompts people to respond with a visual interconnection through a psychological reaction toward the movement. The intensity of motion affects one's mind through vision by intensifying the emotion.

To understand motion in kinetic typography, it is essential to understand the sequence of frames. There are two different kinds of frames: Key frames and in-between frames. Key frames occur at the beginning and end of a movement and register the changes in the sequence of a movement or a story. In-between frames occur between the two key frames, and serve to support the main movement. Adjusting the number of in-between frames makes the object appear to move more slowly or more quickly.

The number of frames between two key frames can visually cause a variety of emotional reactions for the spectator because of the speed of the motion. A larger number of frames in each in-between frame sequence make the object appear to move quicker while fewer frames make the object appear to move slower. These fast and slow movements evoke different emotional feelings. Fast movement generates a more powerful impact and creates a greater intensity of such familiar feelings as surprise, anger, hate, obsession, dynamism, emulation, tension, terror, or fright. Slow movement creates a sense of relaxation where the viewer feels peace, calm, serenity, or joy. Adjusting the number of in-between frames dramatically affects the pace of the narrative while also creating an appropriate atmosphere.

In using key frames and in-between frames, an essential consideration is the speed (or the tempo) of motion, the adjustment of which is referred to as "easing" in motion-based media. Using easing, the motion of objects can have the appearance of moving naturally, much like the effect that gravity has on objects in the real world. The two primary methods of easing are "easing in" and "easing out." Easing in makes the objects start slowly in the beginning and speed up toward the end of a movement. Easing out makes the object start quickly in the beginning and slow down toward the end of a movement. Positive and negative values are used to adjust the easing in and out. Easing in allows the situation to start quietly, peacefully, and calmly before accelerating its speed to enhance the visual rhythm and dynamism. Easing out begins with tension but gradually reduces the intensity. In either case, easing makes use of the tone of the motion and supports the sense of visual play.

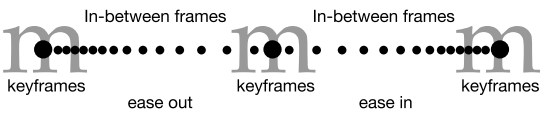

Figure 6 Easing In & Easing Out

2. Sequence

In time-based media, a sequence is made up of a continuous series of objects or scenes that are arranged in a linear structure and comprise a narrative unit that is ordered by time. Such sequences may of course also consist of sub-sequences that support a narrative story line. A linear sequence consists of one structural unit in a hierarchy. The diagram below shows the steps of development of a complete narrative sequence.

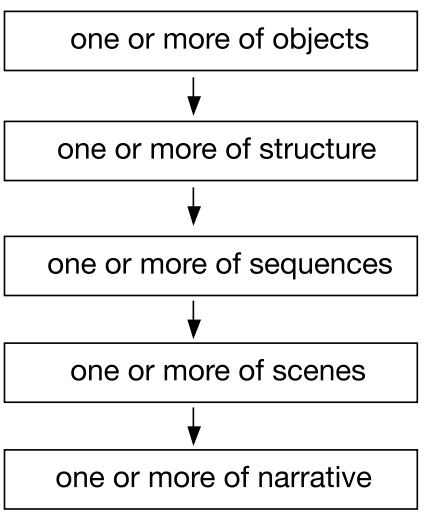

Figure 7 Step of Narrative Sequence

The structure is an arrangement of sequences that form a complex presentation. A linear sequence is all the events or elements that happen, following one after another, producing a logical timeline from beginning to end.

Figure 9. Visual Punctuation

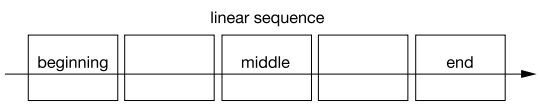

Figure 8 Structure

Supporting System

1. Visual punctuation

To improve the visualization and the function of a structure in kinetic typography, visual punctuation is often used as a way of blending objects to create a visual effect. The components of visual punctuation include such phenomena as lines, symbols, and shapes. Lines include horizontal, vertical, diagonal, and curved. Symbols may be alphabetic, iconic, numeric, or pictorial; and shape categories include geometric and organic. Using visual punctuation creates a focal point, emphasizes hierarchical interpretations, directs the viewer's attention, creates playful rhythmic patterns, produces dynamic movements, stimulates optical energy, and generates surprising forms. The combination of these various components is an all-important key in stimulating visual expression and presenting visual harmony.

Visual punctuation within a composition also affects our emotions. Organic shapes, lines, and symbols create beautiful, joyful, delightful, playful, and harmonious feelings that portray a positive outlook. In contrast, harsh lines and large sharp shapes create negative feelings such as irritation, frustration, grumpiness, rage, anger, or even disgust. Circular lines or shapes can develop emotions of caring or tenderness. Triangular shapes can represent achievement, desire, bitterness, or suffering. The alphabetic symbols, such as question marks or exclamation marks, can evoke excitement, thrill, hope, worry, and even apprehension. The mix of visual punctuation can be used to powerfully describe various feelings and to evoke multiple levels of emotions in a composition. In figure 9, the exclamation mark makes "Joy" more powerful as opposed to "Joy" without the exclamation mark. In contrast, the roundness and weight of the circular lines depict a more delicate and softer emotional feeling.

Using visual punctuation creates a focal point, emphasizes hierarchical interpretations, directs the viewer's attention, creates playful rhythmic patterns, produces dynamic movements, stimulates optical energy, and generates surprising forms.

2. Color

Color affects human behavior and emotion.[6] Although each color provokes a specific individual response, these effects may vary because of the diversity of cultures. For example, in Eastern cultures, white is the color of mourning, while, on the contrary, in Western cultures, white represents purity, innocence, and peace, while black represents mourning, death and evil. Red is a symbol of celebration and good luck in China, while in India it represents purity. In Eastern cultures, yellow means sacred and imperial, while in the West it is associated with joy and happiness. When we experience color, our sensory energies are stimulated. Colors connote spatial reality and direction, and movement, height, length, width, and weight. Color can trigger emotions in which we experience joy, sadness, happiness, anger, fear, surprise, love, and passion. Through our encounters with colors, we may experience memories of spring, summer, fall, and winter.[7] Merely to encounter light prompts us to open our vision, through which we observe color in visible space.[8]

3. Music

Music can have a profound effect on human emotions and psychology. It is a powerful means by which to evoke human expression. People experience emotional responses through music, whether consciously or subconsciously, and, as a result, may begin to feel calm, soothed, excited, or intense. People react differently to the same music based on their background and personal experiences. Music interacts with film, animation, multimedia, and digital media to produce distinctive styles of visual art.[9] Music is a time-based media, as is motion, and shares many of the qualities of motion. Among the elements of music are melody, harmony, rhythm, tone, form, pitch, intensity, and duration. These closely resemble the elements of motion. In kinetic typography, music is interwoven with compositional form, color, and motion to contribute to the emotional impact, to bring harmony, and to enhance the dynamic visual appeal of the message.

Graphic Design Course

In using typography and motion in the context of a graphic design course, one of the major purposes is to arrive at evocative metaphors of human experience. During the course, the emotive basis of personal experience is discussed and analyzed at length, as a way of enriching a range of designs. A main ingredient of the course is a double-layered method of learning both digital technology and concept development at the same time.

In the first part of the course, students are asked to represent a highly imaginative dream house of the future. By this assignment, students become conversant with basic technological skills and thereby gain the confidence to move on to the more conceptual stages of kinetic typography.

In a second phase, students explore the potential of expressive wordplay in combination with motion, which begins with their having chosen two words based on a personal experience. Concept development is especially critical here, because it provides the basis for designing images that use kinetic typography to convey human emotions. The addition of sounds is also a powerful way to enhance the impact of the emotive metaphor.

Third, students are asked to use emotion-based kinetic typography in a problem in which they make use of three aspects of a methodology. In developing their concept, these are: (a) a strong analysis of emotion is essential in conceptualizing the essence of the design. It grasps the significance of the emotion in terms of its physiological and psychological effects, (b) the creation of a narrative, and (c) a preparative or preproduction process that takes place in advance of constructing the animated design on the computer. This process both simplifies and accelerates the complicated stages in the use of time-based media as an effective visual communication tool. It relies on handwritten memos, preparatory sketches, and text-based summaries that explore the possibilities of a particular concept. In this preproduction process, a series of different stages have proven especially reliable in developing visual inventions: (1) mind maps, (2) rough sketches, (3) text-based storyboards, and (4) refined sketches. The goal of this particular phase is to convey the essence of the emotion in a poignant and powerfully memorable way, and to demonstrate how text and image can combine to convey a concept in a time-based medium.

In the fourth and final phase of the course, students are asked to develop a “film teaser” for a hypothetical DVD feature. Using typography as the main element, the students are required to create an emotional aura, while concurrently focusing on the narrative theme of the feature. The sound component follows the typographic rhythms, their harmony, contrast, and tonal details. This composition of sounds enhances the overall impact of the visual metaphor.

6 Gyorgy Kepes *Language of Vision* (Chicago: Paul Theobald, 1944): 167-168.
7 Ibid., 140.
8 Ibid., 134.
9 Kerry Brougher, Jeremy Stick, Ari Wiseman, and Judith Zilczer, *Visual Music: Synaesthesia in Art and Music Since 1900* (New York: Thames & Hudson, 2005):19-20.

This method of teaching kinetic typography is both creative and systematic, and provides the students with a better understanding of typography and concept development. In addition, it can communicate more vividly than do static forms alone, by making simultaneous use of the dual functions of typography, as both text and visual form. The deliberate combination of time, motion, and typography can acquaint students with the ways and means of using forms (shapes, colors, proportions, and so on) to represent emotional sensibilities, rhythmic visual expression, and dramatic gesture. Using kinetic typography, students can create a result that is richer and far more engaging than the inert flatness that is found in traditional, more restrictive approaches to typographic design.

References

Brougher, Kerry, Jeremy Stick, Ari Wiseman, and Judith Zilczer. *Visual Music: Synaesthesia in Art and Music Since 1900.* New York: Thames & Hudson, 2005

Carter, Rob. *Typographic Design: Form and Communication.* Second Edition, New York: Van Nostrand Reinhold, 2002.

Gibson, James Jerome. *The Perception of the Visual World.* Boston: Houghton Mifflin, 1950

Heller, Steven and Meggs, Philip B. *Texts on Type; Critical Writings on Typography.* New York: Allworth Press, 2001.

Kane, John. *A Type Primer.* Upper Saddle River: Prentice Hall Inc, 2003.

Kepes, Gyorgy. *Language of Vision.* Chicago: Paul Theobald, 1944.

Kepes, Gyorgy. *The Nature and Art of Motion.* New York: George Braziller, 1965.

Kovecses, Zoltan. *Emotion Concepts*. New York: Springer-Verlag, 1990.

Moholy-Nagy, Laszlo. *Vision in Motion.* Chicago: Paul Theobald, 1969.

Neale, Stephen. *Cinema and Technology: Image, Sound, Colour.* London: Macmillian, 1985.

Plutchik, Robert. *The Emotions: Facts, Theories, and a New Model.* New York: Random House, 1962.

Spiekermann Erik and Ginger E.M. *Stop Stealing Sheep & Find Out How Type Works.* Second Edition, Berkeley: Adobe Press, 2003.

Wong, Wucius. *Principles of Form and Design.* New York: Van Nostrand Reinhold, 1993.

Woolman, Matt and Bellantoni, Jeff. *Moving Type: Designing for Time and Space.* Hove: RotoVision SA, 2000.

Woolman, Matt. *Motion Design.* Hove: RotoVision SA, 2004.

keywords
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Developing a digital media curriculum at a regional liberal arts university: a case study

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Abstract

Faculty at state supported universities face significant challenges when developing digital media programs. Since computer graphics have a place in nearly every discipline, it is no surprise that digital media programs have been developed by diverse academic units in different universities. This fact alone indicates one of the challenges: balancing the need for cross-disciplinary instruction within the structure of a traditional university where disciplines tend to be segregated. The goal of this paper is to share an account of the East Tennessee State University faculty's experiences and lessons learned from the program development with those who are also in the process of developing a digital media curriculum.

Introduction

At East Tennessee State University (ETSU), the rapid evolution of digital media as a concentration in the Department of Technology & Geomatics, new directives from the Tennessee Board of Regents regarding general education requirements, the statewide standardization of hours required for degrees, and an influx of new faculty created an environment in which a major reconstruction of the digital media curriculum became necessary. It also provided an opportunity to apply lessons learned from the faculty's various industry experiences, research into industry expectations for the education of computer graphics specialists, and discussions generated by conference presentations for computer graphics educators[1] to the redesign of the Digital Media curriculum.

The Digital Media Program at ETSU began as the Engineering Design Graphics (EDG) program in the Department of Technology. Initially, training in CAD for manufacturing and architectural construction was the extent of the program. In 1994, the program was expanded to emphasize computer visualization, especially high-end 3-D modeling and animation, and quickly broadened to include character animation and special effects. Courses in interactive media and web site design and development were later added to support applications of computer mediated communication in business and industry.

In 2000, EDG faculty proposed a new program to replace the Engineering Design Graphics program. By fall 2002, a Bachelor of Science in Digital Media, with four areas of concentration in the undergraduate program—Visualization, Product Design, Hypermedia and Multimedia—was approved, and a new concentration in Digital Media was added to the Master of Science in Technology.

The student population within the Digital Media program is currently over 300 majors (undergraduate and graduate). Recent registration of incoming Technology students revealed that more than 50% were planning to pursue a concentration in Digital Media making it the fastest growing area of study within the Department of Technology.

1 Association for Computing Machinery's Special Interest Group on Graphics and Interactive Techniques (ACM SIGGRAPH) annual conferences, 2001-2003, and the International Game Developers Association (IGDA) annual conferences, 2002-2003.

As in other universities with digital media or computer graphics programs, the rapid development and evolution of this program presented some difficult challenges. These challenges included (but certainly weren't limited to):

- designing a curriculum that balances technical skills with conceptual and aesthetic skills, while making the best use of available faculty expertise
- keeping up with the rapid developments in computer graphics technology
- battling increasing funding requirements for support of the program
- managing the rapid growth of student enrollment with too few full-time faculty
- coping with frequent and often significant changes in the curriculum resulting in advisement problems, inconsistent and "mixed-bag" programs of study for students, and duplication and inconsistency in the delivery of course content
- attracting and retaining qualified faculty
- establishing and maintaining cross-disciplinary relationships with other departments and programs on campus
- managing a profound culture change resulting from the transition from traditional engineering graphics to a much broader emphasis encompassing 2-D and 3-D visualization, animation, and interactive multimedia

In 2001, the university recognized the necessity to increase the number of full-time faculty for the program from the current two and approved six new faculty lines, including a new program coordinator. The requirements for these positions included not only teaching experience in digital media related subjects, but also significant industry experience, a decision that later proved to be invaluable. In fall 2002, the newly hired faculty was charged with evaluating the newly implemented Digital Media curriculum, and making revisions and additions as necessary to provide an appropriate education for the students and to create a "world class" digital media program.

The new faculty team was faced immediately with a large task. The brand-new curriculum, which had not yet been tested, had to be implemented. Many of the courses were at the "new development" phase. At the same time, students were in a state of uncertainty and frustration due to the recent program changes and the unfamiliar faculty. Severe budget cuts statewide and dwindling external support had already eroded the state of the computer labs, which were quickly becoming outdated. Software was several versions behind in some cases, and multiple soft-

ware packages in the 3-D concentrations were being used, forcing students to start over with different software in successive courses, making it difficult to get to a reasonable level of expertise in any of them. At the same time, the Tennessee Board of Regents approved a substantial technology fee specifically for the digital media major to offset the high costs of the program, which, when announced, further exacerbated student's frustrations.

During this first semester, it became evident that there was still a tremendous amount of work to be done to develop the curriculum if it was to meet industry expectations.

Evaluation of the existing curriculum

As the faculty began the process of familiarizing themselves with the curriculum and analyzing the curriculum structure, significant problems were immediately identified. Foundation courses that should have been required for freshman or sophomores were only offered as senior-level electives. Some courses duplicated content. Courses from the engineering technology curriculum that had little or no relevance to the educational needs of digital media students were still required as part of the core curriculum. Courses required for each of the concentrations included many non-relevant courses, while courses that should be an absolute "must" for each of the areas were not listed at all. There was no course material dedicated to preparation of portfolios, so graduates were leaving with no understanding of industry requirements for presenting themselves and their work. Also, two of the concentration areas—Multimedia and Hypermedia—were too closely related to be truly separate concentrations of study.

There were other issues discovered in this first semester. Many entry level classes were predominantly occupied by senior level students who, though generally satisfied with the content, structure, and delivery of the courses, had to seek out advanced projects that allowed more sophisticated work to be developed for their portfolios. When we looked at our graduates, particularly those employed in our region, we found that a large number of graduates who had been trained in one concentration were not working in their desired field (for most, 3-D visualization or animation), but in another (print media primarily). Having previously worked in the commercial sector, each colleague immediately recognized the need to reset the established curriculum to meet current industry standards.

Acknowledging that the program would require more significant modification than originally supposed, the faculty elected to approach the redesign of the curriculum as if we were starting from scratch. We set an aggressive working schedule, meeting every other Friday for over a year to work out the details. Each faculty member took responsibility for part of the curriculum, reworking existing courses, and creating new courses as needed. Politically, this was a risky move for new, non-tenured faculty, so great care was taken to be able to justify the changes.

We began the evaluation process by looking at programs from which industry giants such as PIXAR, Digital Domain, Industrial Light & Magic (ILM) and Electronic Arts (EA) consistently recruited new talent. We used these programs as our initial benchmarks, evaluating the various curriculums, and noting the pros and cons of each.

We sought advice from professional organizations such as ACM SIGGRAPH and the International Game Developers Association (IGDA). Although neither organization reviews education curriculums, both had prepared guidelines for the development of digital media curricula. The ACM SIGGRAPH education committee held several sessions between 2001 and 2003 involving computer graphics educators working toward drafting an ideal curriculum related specifically to computer graphics in the visual arts. At the 2002 ACM SIGGRAPH conference, a report outlining proposed guidelines for curricula in computer graphics in the visual arts[2] was presented. In 2003, the IGDA education committee published on their website a modular curriculum framework for universities interested in designing programs for game related study.[3] This framework was not a single

…it became evident that there was still a tremendous amount of work to be done to develop the curriculum if it was to meet industry expectations.

2 Gary. R. Bertoline and Carey Laxer, "Forum: A Knowledge Base for the Computer Graphics Discipline." Paper presented at the annual American Computing Machinery (ACM) SIGGRAPH Conference, San Antonio, Texas, July 21-26, 2002.

3 IGDA Education Committee, Ed. *IGDA Curriculum Framework: The Study of Games and Game Development*, International Game Developers Association, 2003.

How do you design a curriculum that can provide students with a solid foundation of technical, aesthetic, and conceptual skills, give students a wide range of choices for specialization within their areas of concentration, and be flexible enough to adapt to changes in technology and the industry?

detailed curriculum, but a set of recommendations that described the knowledge areas and practical skills required for making and studying games. Material discussed at these sessions and presented in the IGDA guidelines was included in our considerations.

Our next step in the evaluation process involved recruiting an industry advisory board of digital media professionals from both our East Coast community and from the West Coast. Included were nationally recognized experts currently working within the digital media field and regional professionals who could speak to the needs of our own community. We enlisted individuals from web and multimedia development, game development, video and film production and post production, and from the 3-D visualization and animation fields. We met informally and individually with members of the board as we started working on a revamp of the curriculum. We held our first formal Advisory Board meeting with the East Coast advisors at the start of the 2003 fall semester to discuss changes that we had already made and how we could continue to re-engineer the program to better prepare our graduates to enter the workplace. We now have two scheduled Advisory Board meetings each year—one in the fall for our regional advisors, and one for our West Coast/national advisors held in conjunction with the SIGGRAPH conference.

Finally, the faculty looked at courses offered in related programs within the university, such as Art, Broadcasting, Computer Science, Advertising, and Theatre, in order to familiarize ourselves with these curricula, learn what courses would be available to our students as possible electives, and avoid duplicating courses. To this end, we met extensively with faculty and chairs of the related programs, and discussed the potential for opportunities to work together in the future as we developed our program.

Redesigning the curriculum

How do you design a curriculum that can provide students with a solid foundation of technical, aesthetic, and conceptual skills, give students a wide range of choices for specialization within their areas of concentration, and be flexible enough to adapt to changes in technology and the industry?

We started with the "givens." In Tennessee, all undergraduate programs are limited to 120 hours unless specific professional accreditation requirements demand otherwise. Forty-one of these hours must be taken from general education courses required for all liberal arts students in Baccalaureate programs. For the Bachelor of Science in Technology, some specific general education courses are required at ETSU, such as Probability and Statistics, Physics, and a second science course limited to science majors only. This left us 79 hours for the digital media curriculum. In our design, we elected to continue the practice of offering four credit hour lecture and laboratory courses for the majority of our production-based courses as this allowed lecture, demo, and in-class practice to take place simultaneously.

We agreed that the Digital Media program's (DIGM) focus should be on 3-D visualization, animation and interaction design as other programs did not emphasize these areas. We then looked at basic skill sets and principles that should be required for all students entering the digital media field that would cross over our program's areas of concentration. Essential areas of study were determined to include critical thinking, concept development, visual workflow, 2-D design concepts and principles, color theory, mathematics (at minimum pre-calculus), raster- and vector-based image manipulation and illustration techniques using industry standard software, an understanding of graphics file formats, computer graphics terminology, and a basic knowledge of the history of computer graphics. Based on our research and on industry advice, we also deemed as essential good written and oral communication skills, the ability to function well in teams and across disciplines, project management skills, an understanding of ethics and professional practices for the arts, and portfolio development.

We needed to inform our students about career choices available while they were still at the beginning of their academic training. Too many students were entering the program with a vision of working for PIXAR (for example) without fully understanding the reality and requirements of an animation production position. To broaden our students' awareness of real-world employment opportunities, and to give them hands-on experience in a cross-section of skills within our program's concentration areas, we developed two required foundations-based courses—Principles of Visualization and Principles of Interaction. These classes cover design and development of web and multimedia products and 3-D visualization and animation production. Both courses introduce related computer graphics history, an overview of the basic concepts and skills required, and an introduction to the career possibilities available to them in each discipline.

As we set up the order in which students would take courses, we considered how each course would thread to the next. First year students are introduced to rendering

techniques and visual perception as well as concept visualization and design process techniques in the DIGM Visual Thinking course, and take Color Theory and 2-D design courses offered in the Art Department. Students continue to learn and apply color, composition, and design principles in the Vector-Based and Raster-Based Imaging courses. These courses use applications such as Adobe Photoshop and Illustrator, standard design and illustration programs used in the digital media industry. These courses were also designed to meet "using information technology intensive" requirements specified by the Tennessee Board of Regents.

centrations require Drawing Fundamentals and 3-D Model Design. In Visualization, CADD was included as a requirement since many of these students find work in the Product and Industrial Design fields. The Animation concentration requires a new DIGM Animation Fundamentals course that was developed and Acting and Figure Drawing. Elective courses in Engineering Technology were encouraged for students wishing to find careers in Industrial Design fields, and electives in art were encouraged for Animation students. Intermediate and advanced elective courses in DIGM were developed for both of these concentrations

Nineteen courses were deleted, twenty new courses added,

Since we are in a Department of Technology, we decided to differentiate all of the DIGM courses from similar courses offered in other programs by emphasizing technical skills, while still stressing good aesthetics and creativity. Students then enter the principles courses, where they apply the technical and artistic skills learned to the creation of interactive and 3-D applications. These core digital media and art courses were designed to be completed by the end of the sophomore year.

Upon completion of these core requirements, students elect to focus on an area of concentration in Digital Animation, Digital Visualization, or Digital Interaction. Each concentration includes its own set of requirements that work to shape and refine the student's direction and skill sets.

In the Digital Interaction concentration we wanted students to have both strong visual design and computer programming skills. We found a thorough understanding of typography and graphic design to be fundamental and essential skills for interactive design students, and in this concentration, a good knowledge of print production is an advantage. Industry advisors indicate that today's graphic designers must have Web interaction skills to compete, and Web designers often have to produce print components to their interactive works. Students in this concentration begin to learn programming fundamentals through a basic procedural scripting course offered in the Computer Science program. The Web Design and Interaction Design courses further develop design and scripting skills as they are applied to interactive interface design, and stress Human-Computer Interaction (HCI) usability principles. Elective courses in web programming and development offered by the Computer Science program can be taken as part of student's course of study.

Both the Digital Visualization and Digital Animation con-

to include Lighting and Rendering, Product Design, 3-D Animation, 3-D Effects, Character Animation, and Technical Direction. A senior level Digital Media Production course was developed to give students in the various disciplines an opportunity to work as a class team on a single, semester long professional project.

Digital video courses were also added to support all of the concentration areas. These included instruction in non-linear editing, motion graphics, 3-D to video compositing, streaming media, and sound production. An interesting result of this series of courses has been an increasing number of our students entering the work force as digital video specialists. This has caused us to look at Motion Graphics as a potential new area of concentration.

In all concentrations, students are encouraged to take courses from the entire Digital Media course inventory as electives in order to broaden their range of skills. We also acknowledge the importance of engaging students in interdisciplinary study for a broader based education. With the significant amount of overlap in the digital media fields, a wide array of options both within and outside of the DIGM curriculum is available to the digital media student, so required advising in every semester is necessary to guide students in the selection of an appropriate mix of courses.

Finally, students take a Portfolio Development course in the last semester of their senior year, where they are required to produce both a print and an electronic (demo reel or website) portfolio. This class also covers professional practices, copyright law basics, and how to perform an effective job search in the digital media arena.

As a result of the program redesign, the old Visualization concentration was divided into two concentrations: Digital Visualization and Digital Animation. The Multimedia

and Hypermedia concentrations were collapsed into one: Digital Interaction. Nineteen courses were deleted, twenty new courses added, and seven courses were substantially redesigned. With this extensive a change, a plan had to be designed to help transition existing students into the new program since it was impractical to continue to offer all of the old courses until these students had graduated. This took working closely with the records office to work out appropriate substitutions for all of the previously required courses, and advising students became a larger than normal part of the faculty's duties during this time. This transition plan had to be submitted to the curriculum committees as part of the approval process.

and seven courses were substantially redesigned.

The revised curriculum was approved by the Tennessee Board of Regents in 2003, and offered in its updated form in the 2004-05 catalog. Work continues in the refinement of this curriculum. We worked with the Engineering Technology side of our department to develop the Product Design Concentration for which we will provide the digital media service courses; and a twenty four credit hour minor in Digital Media has now been designed. Both are currently going through the approval process and we expect to be able to offer both in the 2006-07 catalog. We are currently working with Computer Science to develop a collaborative program specific to game design and development.

Updating and Funding the Infrastructure

From the program's beginning twelve years ago, it was recognized that the maintenance of a digital media program was an expensive endeavor. Many universities that offer a digital media program, or even just digital media courses, have discovered the difficulty in maintaining these programs on state support alone. At ETSU, initial funding came through the sponsorship of Alias Wavefront and Silicon Graphics, who between them donated in excess of $15.5 million in equipment and software. At the time a single copy of the Alias software was approximately $250,000, and only operated on a Unix computer. This sponsorship was a direct result of faculty research with Alias Wavefront to develop the first degree program to use this innovative new software. A private philanthropist, Scott Niswonger, followed this up with a donation to the university of one million dollars to update facilities and equipment. Even with this support and additional grants for software tied to research being done by digital media faculty, there was no continuity of funding. When these initial funds were spent, faculty and other university officials had to spend a considerable amount of time trying to find additional sources of donated funding. Software and equipment costs fortunately have come down considerably, but with three 19-seat labs that must be replaced every three years in order to meet university information technology standards, and with the need to keep software updated, annual costs for a program the size of ETSU's Digital Media program have averaged in excess of $130,000 in the past three years for computers and software alone. As the program has grown, we are now looking at adding a fourth lab for the fall 2006 semester, which will increase the overall annual costs.

In Tennessee, budgets for education are lower than in most states, and tuition is also relatively low, making requests for more than the usual amount of funding for a program very difficult to justify and have approved. At ETSU, when private funding became less available, the university reallocated funds from other programs to help support Digital Media, which by this time had become a flagship program. This reallocation created corresponding problems with the relationship between the Digital Media program and other programs that provided the necessary support courses needed by DIGM students. Often these programs were denied funds needed for their own growth at the expense of the more visible Digital Media program.

When the new faculty came on board in 2002, we found a great facility, thanks to the Niswonger funding, but the equipment was reaching the end of its lifespan, much of the software was outdated, and there was little available in the way of teaching resources that students could use to develop projects (such as printers, scanners, cameras, light kits, graphics tablets, animation stands, and media resources). A proposal was made to the Board of Regents to allow for a dedicated program enhancement fee of one hundred dollars per credit hour for each Digital Media course, over and above tuition. The fee was implemented for the first time in the spring 2003 semester. This was a necessary, but very unpopular development with the students for reasons that extended beyond the rather substantial increase in the cost of their education. The new fee had not been announced to students ahead of time, and was implemented in the middle of the academic year when it was too late for students and parents to restructure financial aid. Furthermore, the increase was implemented without any kind of transition plan for students who were already enrolled in the program. The burden on the students was too much, too soon, and offered little chance that those currently enrolled in the program would see

the benefits prior to graduation. Protests by parents and students resulted in the president of the university working with us to establish a phase-in period for the fee for current students, while assessing the full fee for new students effective in summer 2003. Even so, student morale was very low during this period, and the fee resulted in a significant drop in enrollment.

It took over two years to raise enough money from the fee to replace equipment and software in the three labs. Now, the Digital Media Center is able to offer state-of-the-art labs and excellent resources to our students. Students who were enrolled during the transition are now able to see the benefits of the fee and are no longer opposed to the changes to cost or curriculum. Enrollment has reached its former levels, and when compared with programs we have benchmarked ourselves against, the cost for a digital media education at ETSU has proven to be a good value, even with the fee. We now have a sustainable source of income that allows us to ensure better than average facilities, equipment, and resources, as well as improved professional development for faculty, a dedicated program advisor, and support for student research and independent development activities. Also, faculty can focus their grant writing efforts on research, creative activity, and entrepreneurship rather than on securing funding for needed software and equipment.

Continuing challenges for growth and evolution of the digital media curriculum

We are now at the end of year four in the restructuring of our program. Much has been accomplished, but with the continuing growth of career opportunities requiring digital media skills, and rapid changes in the associated technology, continuing assessment of instruction and the commitment to adapt both program and infrastructure in order to meet current and future industry needs is essential. We have defined a mission for our program, have established instructional goals and learning objectives, and have started designing instruments for evaluating and assessing how well we are accomplishing these goals and objectives, but to truly be able to assess our program against our benchmark programs and according to commonly accepted standards for digital media programs, external review is needed.

Our position as a program within the Department of Technology in the College of Business & Technology (CBAT) presents some unique challenges in this regard. Our program is at its core a visual arts program, even though we have an emphasis in the applied use of technology to create digital media. We are the only program within our college that has a visual arts focus. CBAT administrators, and even our colleagues within our own department, are unfamiliar with the unique learning conditions required by students in the visual arts, and many decisions that affect our program are made by those with little or no in-depth understanding of art and design. Digital Media program needs are sometimes sacrificed in order to meet the requirements for a degree in science.

At present, the Digital Media program is not professionally accredited, so external program review and the benefits and protections of accreditation are currently unavailable to us. This includes the ability to justify and enforce standards common to other programs of our type—student/teacher ratios for studio and laboratory courses and the ability to specify general education or graduate program requirements that may differ from the requirements of the other disciplines within our department (Engineering Technologies). Accreditation would also provide external and unbiased assessment of our curriculum to insure that we stay accountable to national standards. We must therefore seek other ways of informing CBAT decision makers of our specific needs, such as expanded involvement of industry advisors, and external review panels recruited from other programs of our type. We are currently seeking accreditation, but have not yet been able to identify an appropriate organization that can fully accredit us. We are currently referencing National Association of Schools of Art & Design (NASAD) standards as a guide, and have started the process to be included as a "related" program and reviewed along with the Art Department in 2007. Our administration is however, strongly encouraging us to find an accrediting body within the engineering or computer science disciplines.

Expanding and improving opportunities for interdisciplinary study is a challenge at ETSU since we are separated from most of our potential interdisciplinary partners by college. Our ability to work effectively with Art, Broadcasting, Theatre, Advertising, Education, and other areas in the College of Arts & Sciences is considerably more difficult due to the inevitable political differences and philosophies between colleges. As a result, we have had to make a concerted effort to develop relationships with faculty in the arts disciplines while trying to avoid conflicts within our own college.

Lessons learned in this process

Due to the perceived "crisis" situation encountered by the new faculty and the immediate difficulties that had to be addressed in the first year of this process, much of the development began on the new curriculum before we had

firmly established a coherent set of goals for the program. We have since discovered that it is far easier to design a coherent curriculum when you take the time beforehand to define a program mission, establish assessable goals and learning objectives, and develop a strategic plan for growth and maintenance of the program. We have since done this, and have had to make subsequent changes to the original plan. One result of this has been a refusal by our College to allow us to bring forward new changes for nearly two years.

Some of the faculty have since gone through assessment training for instruction, which has proven to be extremely helpful as we prepare for future accreditation. Since program assessment should be an integral part of the curriculum design process, assessment training is helpful for any program undergoing new program development and is well worth the money spent.

Allow for much more time for curriculum redevelopment than you think it will take. We were extremely lucky to have been able to fast-track a lot of this development (in part due to statewide changes that coincided with our new development), but under normal circumstances it would be impossible to move as quickly as we did. The faculty must be willing to commit to the time needed to build a good program. It takes a lot of collaboration, a willingness to continue working toward consensus when colleagues disagree, and to compromise personal views when necessary in order to design a program in which all can be confident.

A substantial level of industry advisement is essential for more than just the advice they give. Since we are not an accredited program, we do not have the leverage accreditation standards give us to justify programmatic changes, teacher/student class ratios, credit hour requirements, and even funding requests. The recorded feedback from the advisory board meetings helps to offset the lack of formal accreditation as we evolve the program.

Get student feedback and support for curriculum and program revisions, and keep them informed well in advance of changes. We now have an online bulletin board (the Digital Media Forum) to give students a way to communicate with us and each other. We also have a general meeting for our students every year to report on how their dedicated fees are being spent, and to update them on curricular changes. This gives them an opportunity to make requests and ask questions, and allows them the opportunity to manage their educational plan more effectively with no unnecessary surprises. We have discovered that student involvement and support has made a big difference in our ability to implement needed changes.

Continually work with interdisciplinary partner programs to maintain a good level of communication and support. This is an ongoing process, and takes a huge commitment from all involved, but the advantages are equally huge. University approval of curriculum when supported by partner programs is easier, and awareness of issues across programs breeds more collaboration and expands opportunities for both faculty and students.

Finally, when restructuring an existing program, carefully craft a plan to help students transition smoothly into the new program as they are the ones most affected by ongoing changes. Required advising every semester helps to eliminate potential problems and minimize uncertainty during these times.

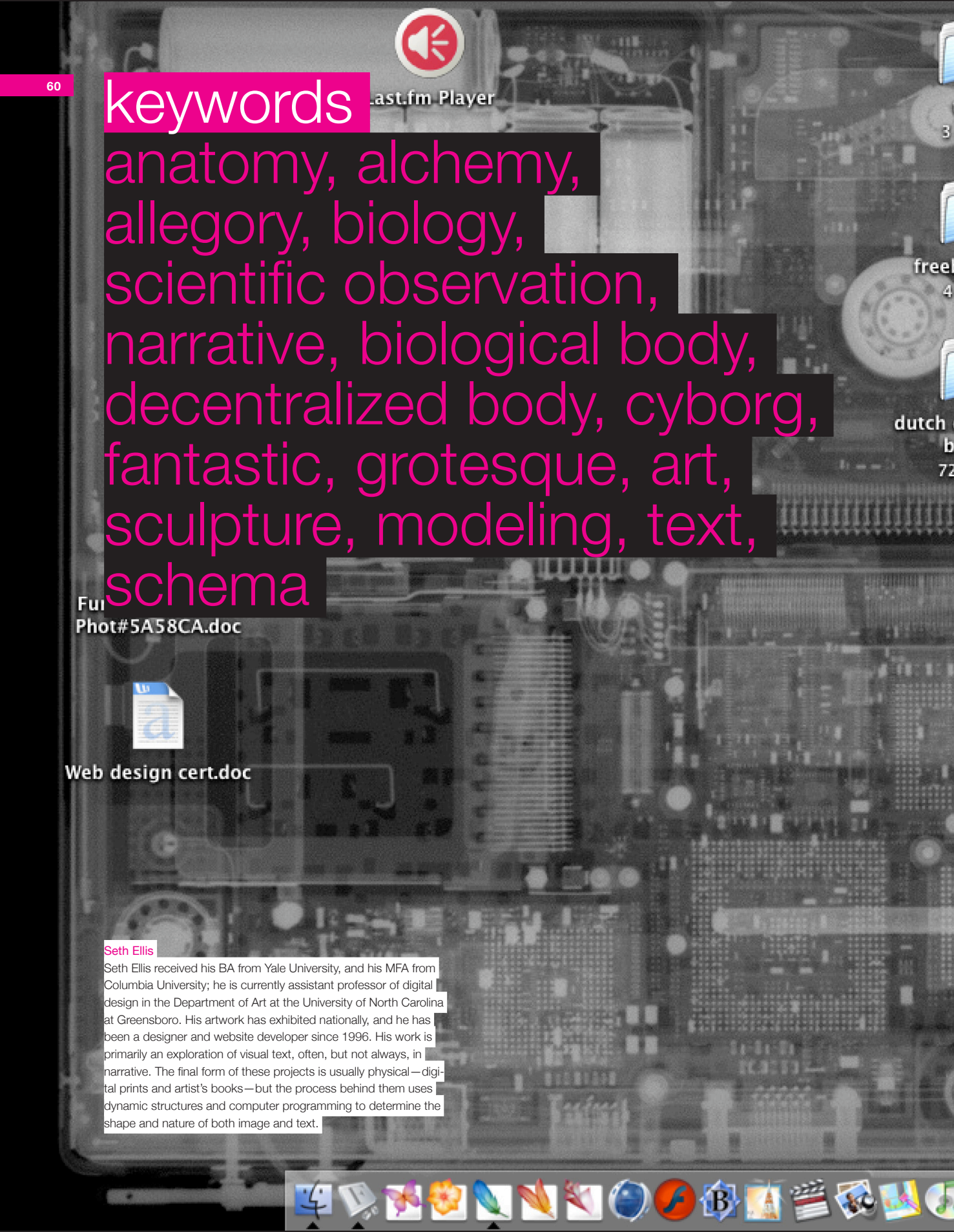
References

Bertoline, Gary. R. and Laxer, Carey, “Forum: A Knowledge Base for the Computer Graphics Discipline.” Paper presented at the annual American Computing Machinery (ACM) SIGGRAPH Conference, San Antonio, Texas, July 21-26, 2002. Available online at http://www.siggraph.org/s2006/downloads/bertoline.pdf

IGDA Education Committee, Ed. *IGDA Curriculum Framework: The Study of Games and Game Development*, International Game Developers Association, 2003. Available online at http://www.igda.org/academia/curriculum_framework.php

NASAD Membership and Board of Directors, Ed. *Addendum to the NASAD Handbook 2005-2006*, National Association of Schools of Art & Design, October, 2005. Available online at http://nasad.arts-accredit.org/site/docs/NASAD Handbook 2003-2004 PDF/NASAD HANDBOOK 2005-2006.pdf

keywords
anatomy, alchemy, allegory, biology, scientific observation, narrative, biological body, decentralized body, cyborg, fantastic, grotesque, art, sculpture, modeling, text, schema



Seth Ellis

Seth Ellis received his BA from Yale University, and his MFA from Columbia University; he is currently assistant professor of digital design in the Department of Art at the University of North Carolina at Greensboro. His artwork has exhibited nationally, and he has been a designer and website developer since 1996. His work is primarily an exploration of visual text, often, but not always, in narrative. The final form of these projects is usually physical—digital prints and artist's books—but the process behind them uses dynamic structures and computer programming to determine the shape and nature of both image and text.

The Alchemical Body: Descriptions of the Body as the Body

Seth Ellis
University of North Carolina, Greenville

Abstract

This paper addresses the subject of my own recent artwork, the disjunction between two opposing historical models of anatomical observation: modern, objective, scientific analysis of the body as organism, and pre-modern, subjective interpretation of the body as a locus of meaning and allegory. The interior of the body becomes either a series of alien landscapes in which we can no longer locate ourselves, or the site of continuing narratives that bear a purely allegorical relationship to the larger world. The conflation of these two modes of observation creates a rich vein upon which to draw, to comment upon our modern relationships to the body.

Problem

> In what way is the body an idea, and the idea bodily? In what way can probing one extend the other? "How is it that the body thinks itself?"[1]
> *—Stelarc*

> "The eye is like a mirror, and the visible object is like the thing reflected in the mirror."
> *– ibn Sena (Avicenna), early 11th century*[2]

The initial problem is posed by Stelarc, an Australia-based performance artist who allows his own body to be manipulated and controlled by machine. Stelarc's work, like much digital art focusing on the postmodern, extended, decentralized body, focuses on the extensions—on external technology and how our bodies interact with it—rather than on our bodies in isolation as systems of biological relationships. But the biological body itself has been decentralized and expanded, and is therefore increasingly incomprehensible to us. My concern here is not with how we think about the body, or how the body acts upon, interacts with, and is acted upon by our new decentralized, technological world; it is specifically with how we *see* the body—how we view, literally, the interior of our biological self.

The very idea of a single biological "self" extended over the species, rather than the individual selves of discrete organisms, is a place to start. The single self was a theoretical model that allowed biologists to describe the human body as a single entity, with characteristics and mechanics that extended across the species. This self has now come under fire, by theorists and by artists such as Stelarc, who claim that cyborg-like technologies are making our bodies extended, decentralized, and thus helplessly individual. But the single biological self has never really existed. (Stelarc himself makes this point when he says, "We fear the involuntary and we are becoming increasingly automated and extended. But we fear what we have always been and what we have already become—Zombies and Cyborgs."[3] Even in human bodies in which technology has not intervened, individual differences have always rendered us distinct from each other. The biological self is a fiction, and its component parts—organs, muscles, and nerves—are characters in a narrative devised to enable us to understand physical reality. This fiction predates modern scientific rationalism, and has at various times taken part in different narrative functions—allegorical, analytical, and moral—depending on circumstance.

New scientific knowledge of the body forces us to think about the body in new ways, but they are ways to which most of us don't have access. DNA sequences, for instance, are a meaningless code to us as thinking beings; we cannot recognize an individual by looking at his or her code. Even the technologically unaltered body has changed in our sight, both because we observe it through technological mediation and because we conceive of it scientifically and rationally. Microscopic photography of a macrophage deep within the bloodstream is merely an extension of early modern anatomical observation and analysis—emptied of human narrative and of the tropes of narrative such as allegory. As our technical knowledge expands, an increasing amount of conceptual space is opened that could contain narrative—that is, a meaningful way for us as thinking beings to understand the interior actions of the body—but doesn't.

By contrast, descriptive anatomy of the medieval and early modern periods analyzed the body literally as a microcosmic echo of the larger universe; for instance, there were serious attempts to locate the physical location of the soul, or of Aristotle's *communis sensus*, the "common sense" in which all perceptions came together into a coherent picture of the world. Thus anatomy described not just bodily mechanics, but our relationship to the macrocosm. This is also, more famously, the basis of alchemy, which has been called superstition, mysticism, and a forerunner of modern science, and is in fact all those things at once. In alchemy, physical description and spiritual meaning are indivisible; the physical transmutation of lead into gold echoes both physical and spiritual transformation in the alchemist. More

1 Stelarc in a 1992 interview, quoted in Brian Massumi, *Parables for the Virtual: Movement, Affect, Sensation* (Durham, N.C.: Duke University Press, 2002), 90. See also Stelarc's website, www.stelarc.va.com.au.

2 Avicenna, *A Treatise on the Canon of Medicine of Avicenna*, trans. O. Cameron Gruner (New York: AMS Press, 1973), 236.

3 Stelarc, http://www.stelarc.va.com.au/index2.html. This use of the term "cyborg" is of course indebted to Donna Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century," in *Simians, Cyborgs and Women: The Reinvention of Nature* (New York; Routledge, 1991), pp.149-181. The text of the article is available online at: www.stanford.edu/dept/HPS/Haraway/CyborgManifesto.html.

The biological self is a fiction, and its component parts—organs, muscles, and nerves—are characters in a narrative devised to enable us to understand physical reality.

lately, our understanding of science is that it has become objective, but our understanding *of our understanding* has become subjective and psychoanalytic. On this shifting ground, symbolic science—transcendental anatomy, so to speak—has been relegated to superstition or to poetic imagery; but that very shift has made the literary tradition of medieval natural history a deep and rich vein upon which to draw, to comment on our modern relationships to our body, and to the larger world.

An interim step in this shift in the scientific imaging of the body can be found in the works of early modern anatomists such as, most especially, Andreas Vesalius, whose 1543 work *On the Fabric of the Human Body* is now famous not only for being the first encyclopedic compendium of real anatomical information, but for couching its highly analytic imagery in a series of disturbingly realistic poses. The uncanny nature of these skeletons and *écorchés*—flayed bodies opened to expose their inner workings—has been described by many writers, most famously Roger Caillois in "At the Heart of the Fantastic":

> In principle, no images had a greater obligation to be strictly realistic, since in this field inventiveness would be criminal and dangerous…Yet these very figures nevertheless invite us to fantasize. With extreme economy of expression, they both conceal and reveal a mystery—discreet, ambiguous, and tenacious…Whom do they think they are fooling by affecting to engage in intelligent activity, or by displaying such shocking detachment?[4]

In any case, they are dedicated to demonstrating the inanity of death…[and] we are left to wonder how it is that such illustrations, whose chief virtue is their precision, nevertheless contain more mystery than the most delirious fantasies of Hieronymous Bosch. For my part, I return to the notion that this insistent form of the fantastic arises not from some exterior source, but from something intrinsic to the human condition: from a contradiction that bears on the very nature of life, and that appears, momentarily, to succeed in erasing the line separating life from death.[5]

I disagree with Caillois; the contradiction is not between life and death, but between life and itself—our inner life as mental beings and the exterior observation of the mechanics of life. It's impossible for us to imagine that these images are images of us, in the present tense. This is why, to me, the écorchés are more disturbing than the skeletons: they are more involved with life. Even mobile, posing skeletons are indicative only of death.

I am interested in the questions posed by the work of Stelarc and others precisely because my own work is displayed, in its final form, in the most traditional of media: ink marks on paper. I am a "digital" artist, but only as an end-user: I use commercially available software in the ways made possible by the software developers, no more; I make a conscious effort to produce my finished work in "casual" media (that is, reproducible prints and books) that can be distributed and experienced without reliance on a particular event or context. In *Kunstler's Anatomy,* my current project, I have created virtual 3D models of internal anatomy, and mapped descriptive text to these forms so that they seem to be made entirely out of words.[6]

I am curious about the meaning and affect carried by these textual images. The models are based on real anatomy, and presented in a style vaguely reminiscent of anatomical diagrams, but the final images are abstracted nearly to the point of unrecognizability; what affect these images have as anatomy comes not from the models themselves—few viewers would recognize even a very faithful model of, for instance, the spleen—but from the presentation. The forms seem generically anatomical, and so the viewer trusts me when I label them as specific organs. This has freed my text to wander from physical description into more fantastical language. A realistic model of a vein becomes the *kiveris* vein, which medieval anatomists hypothesized was specific to women; it carried milk, thought to be formed from semen, from the womb to the breasts. To medieval anatomists, this was a literal description, based nonetheless on moral and social assumptions; to me, drawing on this literature, this anatomical fiction becomes a way to

4 What Caillois is doing here, as a rhetorical device, is imparting agency to the écorchés themselves, when what is more important is to consider the agenda of the illustrator, who, presumably, was considering the perspective of the viewer. "Who do they think they are fooling" is not the question; who do they think is watching is, and even more, how are they watching? What makes these poses an apparent necessity? What made them seem necessary was the very thing, I think, that in fact makes them alienating.

5 Roger Caillois, "Au coeur du fantastique," *Cohérences aventureuses* (Paris: Gallimard, 1965), quoted and translated in Amy J. Ransom, *The Feminine As Fantastic in the Conte Fantastique: Visions of the Other* (New York: Peter Lang, 1995), 10.

6 More images from this project can be seen at www.sethellis.org/kunstler.

comment not just on our increasing distance from our postmodern, dissociated bodies, but on the distance we have always had from the interior of our bodies.

The text I write is visually broken up by the act of applying it to the models, and becomes legible but unreadable; it acts as image rather than message-bearing signal. The importance of the text is not the meaning it bears, but that it seems to bear meaning. Associations arise from the linking of dissociated texts. My contention in my work is that this is at the heart of our relationship towards the physical perception of our bodies as well. Medieval anatomy forced narrative upon our internal organs; though the breadth and detail of current scientific knowledge makes it increasingly impossible to do so, the urge is with us still. As technical knowledge of biology increases, our conventional understanding of the body decreases; we are left with fragmented information and assumptions out of which to fashion some kind of understanding. The search for a mysterious organ that would allow us to understand the mysteries of our lives—a parallel of the alchemist's search for the Elixir of Life—becomes the basis of my fictional anatomy, through the character of the obscure philosopher, and my fictional stand-in, Kunstler.

Image List

1. Sense, 2005. Digital print, 13x22"
2. Approaching the Brain, 2006. Digital print, 20x30"
3. The Transmission of Fluid, 2006. Digital print, 4x6.5"

keywords
interactive narrative, cinema, narrative dramatic structure, beat, emotion, objective, decision, event

Lori Ingle

Currently an independent filmmaker and assistant professor, Lori Ingle has over fifteen years of editorial experience; her credits include the feature films “Assassins”, “‘Til There Was You”, “Jack Frost”, and the Academy Award Winning film, “As Good As It Gets.” Ingle has produced and directed short films that have screened in over 17 international film festivals. Her directorial credits include the one-hour PBS special “The Call of Story, An American Renaissance.” Ingle teaches Directing, Foundations of Story, Cinematic Expression and Interactive Writing in the Film Division of the School of Film and Digital Media at the University of Central Florida.

The Continuum of Audience Interactivity from Narrative Dramatic Cinema to Computed Interactive Narrative Drama (CIND): Focusing on the Writer

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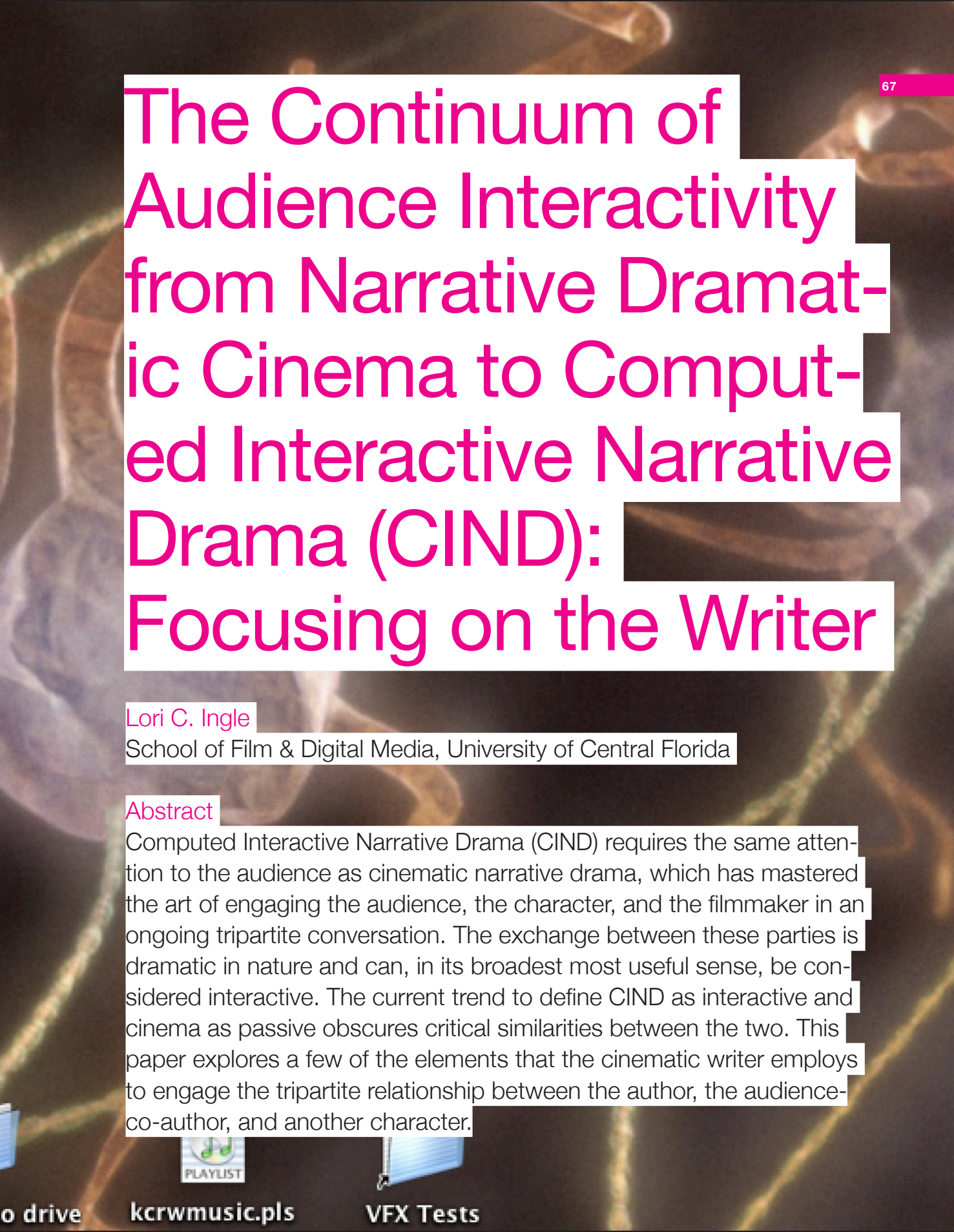
Abstract

Computed Interactive Narrative Drama (CIND) requires the same attention to the audience as cinematic narrative drama, which has mastered the art of engaging the audience, the character, and the filmmaker in an ongoing tripartite conversation. The exchange between these parties is dramatic in nature and can, in its broadest most useful sense, be considered interactive. The current trend to define CIND as interactive and cinema as passive obscures critical similarities between the two. This paper explores a few of the elements that the cinematic writer employs to engage the tripartite relationship between the author, the audience-co-author, and another character.



Introduction

There is a continuum of audience interactivity between Narrative Dramatic Cinema and Computed Interactive Narrative Drama (CIND). The current trend to define CIND as interactive and cinema as passive obscures critical similarities between the two. There is nothing passive about cinema. On the contrary, it is a highly active and re-active form of experience. Broadly speaking, this high level of activity can be thought of as interaction with the crafting of the narrative.

The human mind never stops searching for meaning and logic. This incessant activity of the brain makes the audience a co-author that searches for two elements critical both in life and in narrative drama: credibility and meaning. Cinematic artists control the narrative decisions that weave credibility and meaning into their work by anticipating the audience's inner-speech and manipulating it with attention to detail. This paper will focus on a few techniques used by cinema writers to help guide inner speech toward meaning, thus making the artist and audience interactive co-authors. Subsequent papers will address some of the techniques used by cinema directors, actors, and editors.

First, a few definitions need to be offered. Alexander Mackendrick notes that the word "narrative" implies things being in sequence: one situation followed by a subsequent situation. The word 'dramatic' implies doing or being done to, an action or reaction. Narrative dramatic structure (a story) therefore depends on the connections of cause-and-effect."[1] Chris Crawford gives us his definition of interactivity, "A cyclic process between two or more active agents in which each agent alternately listens, thinks, and speaks."[2] Both CIND and cinema have in common the cyclic nature of narrative dramatic structure. The agents involved in both include the obvious "on-screen" characters, but also the artist-author and the audience-co-author.

Credibility

In both cinematic and computed dramatic narrative, the audience asks: Is the situation plausible and understandable? Are the actions and reactions of the characters believable? In cinema, by laying well-crafted stories up against personal experience, the audience fills in the gaps, asks further questions, and looks for more clues in an attempt to make sense of the narrative world: "She must be frustrated to snap at her husband like that. Why is she so angry?" If the story is badly crafted, lacks clarity, and has lapses in logic, the inner speech is doubtful: "What? That doesn't make sense, I don't get it." The co-authoring audience is critical to the success of credibility. Discussed in this paper are some of the writing elements that control credibility through consistency, clarity, and narrative logic.

To maintain credibility and interest, the story design in CIND must present situations that build logic specific to the decisions and confidence of the co-author: a shy co-author needs support, a bold co-author needs reaction that is specific and consequential. Both the co-author and the characters surrounding the co-author in CIND need the dramatic narrative attention from the writing elements used in cinema, because the co-author is curious about the other characters, "Why did she do this to me?" and is evaluating his own options, "How do I choose between these two?"

Meaning

If a story is well crafted, the co-author's inner dialog accepts the credibility of the supplied world and begins to expect answers to questions about life. Artists can always rely on the human condition to seek answers to such questions as, "Am I alone in this?" and "Is there a better way to get what I want?" When the audience cheers for a character's decision and attempt toward a goal, the artist-author has them hooked: "That's an impossible decision, what would I do? I never would have thought of that!" and "Do it, do it!" or "Don't do it!" The key to success in both cinema and CIND comes from treating the audience as an interactive, co-authoring, part of the story and from directing the inner speech with credibility and meaning.

In CIND, the co-author's inner speech continues to cheer on and question other characters' decisions, but the speech is also more introspectively personal: "I'm scared; I don't want to mess this up!" Mistakes become as important as they are in our real lives causing us to learn something very specific about ourselves, "I am ineffective" or if properly setup, "I can speak my mind and the world doesn't fall apart." If the artist-author is careful and works for credibility, the story design, and perhaps even the narrative engine, can be built to ultimately lead the co-author to great personal meaning.

1 Alexander Mackendrik, *On Film-Making, An Introduction to the Craft of the Director,* ed. Paul Cronin (New York: Faber and Faber Limited, 2004).

2 Chris Crawford, *Chris Crawford on Interactive Storytelling* (Berkeley: New Riders, 2005).

Listening to the Audience

In cinema, every aspect of the filmmaking process must take up the responsibility for listening to the audience and attending to detail: writer, director, production designer, actor, editor, sound designer, and composer. With each decision made, the cinematic artist asks and tests countless questions on the audience's behalf during the making of a film. Not every audience is created equal, so not every answer is the same: Teenage males respond very differently than middle-aged women; Inner speech of the specific target audience must be considered.

The credibility of these choices is tested constantly throughout the cinematic process. As each successive filmmaking role (writer, director, production designer, actor, editor, sound designer, and composer) picks up the baton of creation, they initially perform the role of audience in judging the honesty, logic, and impact of the narrative.

The key to success in both cinema and CIND comes from treating the audience as an interactive, co-authoring, part of the story and from directing the inner speech with credibility and meaning.

Once each of these cinematic artists have had a chance to question previous layers and to add their own layers of creation (as guided by a director), the film is then screened for a larger, less artistically informed audience in a test called a preview. Usually, a dozen preview screenings can capture the success or failure of a given film's credibility and ability to invoke meaning. And ultimately, the marketplace becomes the largest test of an audience's interactive experience of a film.

With CIND, the artist-authors must also work with the co-author's endlessly judging inner speech to maintain credibility because the question will no doubt be asked, "Is this decision real or contrived?" More critical however, is the need for CIND authors to listen carefully to the meaning that co-authors will make out of a narrative moment. The co-author's *agency*, which is "the satisfying power to take meaningful action and see the results of our decisions and choices,"[3] brings a psychological responsibility to the artist-author's work in CIND. As a film editor and filmmaker for the past fifteen years, I have painstakingly studied and applied control over the narrative moment in order to generate meaning for the audience. I have seen a single film frame change the meaning of a moment from one of devastation to one that is wry. More recently, while teaching Interactive Writing, I witnessed the collapse of an audience-co-author into a fetal position of fear. Therefore, I do not believe that it is hyperbolic to state that technologically advanced CIND will so profoundly affect individuals personally that great care must be taken to protect the audiences' mental and emotional states. Jeff Wirth created the Interactive Performance Lab[4] at the University of Central Florida to explore *intimate interactive performance* (IIP), a more personalized form of improvisational theater in which audience members are expected to play active roles in the story. "IIP places individuals at the center of the stories, giving them a substantial ability to impact the course of the experience."[5] Critical to the success of intimate interactive performance is the degree to which the participant is willing to engage the experience. One of the techniques to support the audience member in this process is *stroking*, which means to give positive reinforcement to the audience for his/her *offer*, the term used to describe anything that a person says or does that becomes an opportunity to create the next element of the story.[6] Another technique is to provide a *buddy* to journey with the audience. With this character, Wirth is able to give guidance and friendship to the participant to ease fear or discomfort.[7] In Wirth's lab, not only is the focus on exploring how to support, guide, read, and evoke audience behaviors in intimate interactive performance, but also a major goal has been established to search for techniques that maintain the health and well being of the audience during such intimate experiences.

3 Janet H. Murray, *Hamlet on the Holodeck, The Future of Narrative in Cyberspace* (Cambridge: MIT Press, 2001).

4 Jeff Wirth, *iPLAY* (See http://www.cas.ucf.edu/iplay).

5 Jeff Wirth et al., "The Orlando Game: An Experimental Intimate Interactive Performance," *SFDM Tech Report UCF-DM-2005.1.* (2005).

6 Jeff Wirth, *Interactive Acting* (Fall Creek, Fall Creek Press, 1994).

7 Jeff Wirth, Interview with author, December 15, 2005.

The Cinematic Writer Attends to Detail

The cinematic writer actually "listens" to the audience by considering the credibility that the audience will judge when he or she chooses the ordinary and special world of the story, the characters that journey through it, the inner and outer problems those characters face, and every other element found in a dramatic story. Volumes can be written about the many techniques the writer uses to achieve cinematic credibility and meaning. This paper explores the elements of the narrative "beat" and the effect those fundamentals have on the character. A detailed example will be analyzed to show how the inner speech of a co-author can be influenced by the attention of the artist-author.

The Beat: Emotions, Objectives, Decisions, Events

"A beat is an exchange of behavior in action/reaction. Beat by Beat these changing behaviors shape the turning of a scene."[8] Although beats are widely thought of as the smallest building blocks in dramatic narrative, there are in fact four elements in a given beat or moment: emotion, objective, decision, and event (new information or new event). Charles Jehlinger, who taught acting from before the turn of the century until the 1950's to such a range of talents as Cecil B. DeMille and Robert Redford, identified two of these smaller elements and the two principles that govern them. Jehlinger states that every character has only one emotion and one objective in any given moment. The principles he teaches are: "we must stay with one objective and one emotion until something occurs to change it" and that "only two things can 'occur' to change objectives and emotions: new information or an event. We do not change for any other reason…. The objective is the conscious intent of the character…. The emotion is any feeling large enough to change your life or destroy it."[9] The event, a form of new information, can be considered an event only if it causes the emotion and/or the objective of the character to change. Once the emotion and/or objective change, a decision is then made. Decisions are defined as a choice between irreconcilable goods or the lesser of two evils.[10] Armed with the decision, the character acts, creating a new piece of information or new event that ideally operates as an obstacle for the other character. Actions and reactions are simply new pieces of information or new events intended as obstacles for the other character. This volley continues through the moments until there is a significant change in the focus, which then defines the next beat.

Real people actually operate with multiple emotions and objectives. However, dramatic narrative must depart from reality and narrow the spectrum visible to the audience, because only one emotion and one objective can be clearly communicated to a co-author at any given time. Mixed emotions cannot be acted or edited with clarity. To achieve the desired sense of internal conflict, the writer (actor, director, editor) chooses an emotion that is at odds with the objective. For example, a wife having trouble with her marriage could serve her objective *to save my marriage* by choosing to dress attractively and offer her husband drinks. She tells herself that her husband is a fine man, a good father to their children, that she loves him; but even now as he kisses her, she feels *disgust*. She has no idea why. If the scene is crafted this way, the audience would sense her inner struggle and interpret it as mixed emotions or a love-hate relationship, but the actress would still be feeling only the single emotion, disgust.[11]

A grid is useful for breaking down the moment. The following is a modified version based on the diagram offered by Don Richardson, a student of Charles Jehlinger.[12] To fully map the moment, the decision/event and the degree columns have been added. Dividing the decision from the event works best for actor, director, and editor to make sure that the "decision" is not lost in the reveal to the co-author. For writing purposes, keeping them together works fine.

The degree column enables the writer to track, on a scale of one to ten, the intensity of any element: emotion, objective, decision, event, or audience's empathy. The writer is able to create an arc of audience experience and tension that ebbs and flows: sometimes rising slowly to a sudden burst, sometimes exploding immediately and then relaxing and recovering. Measuring the degree is useful at this micro-level of dramatic narrative, and can be helpful at the macro-level as well.

From 1996 to 1998, I was fortunate enough to work as Associate Editor with James L. Brooks on his film *As Good As It Gets*.[13] Brooks' passion for detail and uncanny ability to listen to the unspoken inner speech of the audience makes his film an ideal focus for this paper.

8 Robert McKee, *Story, Substance, Structure, Style and the Principles of Screenwriting* (New York: HarperCollins Publishers, 1997).
9 Don Richardson, *Acting without Agony, An Alternative to the Method* (Needham Heights, Allyn and Bacon, Inc., 1994).
10 Mckee, Story.
11 Richardson, *Acting without Agony.*
12 Richardson, *Acting without Agony.*
13 James L. Brooks, *As Good As It Gets* (Culver City: TriStar Pictures, 1998).

Beat #	Char A Emotion	Char A Objective	Decision/ Event	Char B Emotion	Char B Objective	Decision/ Event	Degree
1							
2							
3							

Table 1 Moment Breakdown

Melvin Udall, a novelist who suffers from obsessive-compulsive disorder (OCD), finds life difficult and threatening. OCD is a psychiatric disorder characterized by obsessive thoughts and compulsive behavior. Melvin exemplifies a typical behavior for those suffering from OCD in the opening scenes of the film: a continual washing of the hands prompted by a feeling of uncleanliness. To combat his disorder, Melvin has learned to follow a precise routine and to intimidate a path through people with enough linguistic absurdity and cruelty that his days are bearable, albeit cumbersome and lonesome. Carol Connelly, Melvin's waitress, has been made into one of the elements in his obsessive breakfast habit, so that on a practical level, he cannot keep his routine without her: his usual breakfast at his usual table, served by his usual waitress. As a piece of his norm, Carol has made a small crack in his intense barrier, offering Melvin a touch of humanity, edgy enough to be palatable. Bearing the "I can do anything" spirit that comes from being a single-mother, she is confident, and even proud, of her ability to handle Melvin with humor. However, Carol has one Achilles heel: her very sick child. The following beat breakdown tracks Melvin and Carol through their first scene in the film. Melvin accidentally trips on her weakness during a teasing banter and nearly loses his permission to return to the restaurant.

This breakdown is based on the script. The breakdown for the final cut of the film is much more detailed, including many subtle moments within the beats, as found by Jack Nicholson, Helen Hunt, Jim Brooks, and Richard Marks (Editor). These additional creative decisions that truly create credibility are discussed in the papers that follow within this series. In this case, the assigned degree measures co-author interactivity and investment.

Notice that an internal conflict appears to exist within Melvin between the emotional choice of *fear* and the objective *to keep my routine*. The film establishes before this scene that Melvin cannot keep his routine unless he is angry and aggressive. Melvin must achieve the same goal, but from an awkward, unpracticed place of fear and timidity. This new emotional space creates an unusual decision for him, *to back down*. Melvin appears to the audience to be a complicated character full of mixed emotions.

As Good As It Gets: Cinematic Credibility

The interactive inner speech can quickly turn negative against the story if subtle detail is not attended to diligently. "Ouch, that was vicious—no one would say that! It doesn't make any sense. I don't buy it." Successive beats, such as in the above scene, are full of credibility challenges.

Melvin: Melvin's character and back-story[14] is a delicate balancing act throughout the entire film. Too much venom, and we will hate him; not enough rancor and we will doubt that he suffers under the control of OCD. In this scene, we get a chance to see the complexity of the OCD barriers, giving us a sense of history. Everyone here dislikes him, except Carol, who has become integral to his routine, as has the table, the plastic cutlery, and the breakfast order. *Stakes* are what the hero stands to gain or lose in the adventure.[15] We see the stakes for Melvin when this scene reveals his routine. His emotion and objective, noted in the beat breakdown and made clear in the script, reveals the strength of the stakes. When Brooks wrote the bitter exchange between Melvin and Carol about death and Carol's son, "and it certainly sounds like your son will [die]" the level of cruelty had to be balanced by Melvin's vulnerability and the bantering relationship he has clearly, in the past, created with Carol. He gets our empathy: "What a complicated life he leads. No wonder he's crabby."

Carol: With her emotion clearly transitioning from "confident" to "stunned," we have clarity about the stakes and

14 McKee defines back-story "as the set of significant events that occurred in the characters' past that the writer can use to build his story's progressions" (McKee, 1997).

15 Christopher Vogler, *The Writer's Journey, Mythic Structure for Writers* (Studio City, Michael Wiese Productions, 1998).

Beat #	Melvin Emotion	Melvin Objective	Decision/ Event	Patron's Emotion	Patron's Objective	Decision/ Event	Audience Inner Speech	Degree
1	Determined	To get my table	Insult patrons noses	Shocked Carol Emotion	To get away from Melvin Carol Objective	Leave the restaurant	"Wonder what he's going do? I didn't see that coming! I can't believe he just said that! Wonder what I would do if someone said that to me? Leave, Good idea."	5
2	Self-satisfied	To Eat	Sits Down at the Table	Confident	To handle Melvin	Banters lightly with him.	"She's definitely in control. She is humoring him. Clever. I should try that!"	3
3	Encouraged		He banters back "Sure sounds like your son will [die]"	Stunned		She stops talking, moving.	"Oh that was mean and nasty! Doesn't he know to hold it in when it's important? I guess he feels safe with her."	7
	Timid	To keep his routine	Hides behind wiping his knife	Devastated		Carol threatens Melvin, "if you ever mention my son again, you'll never eat here again"	"Wow, yeah, he'd better back off. Go girl, you give it to him!"	9
4	Fear		He backs down, nodding.		To calm down	She gets his order.	"He submitted! He's really trapped by his OCD. That must be pretty tough. I kinda feel for him."	5

Table 2 Moment Breakdown of a scene from *As Good As It Gets*

we believe the moment. Carol's character is served by the setup Brooks provided in the earlier part of the scene. The word *setup* means, "to layer in knowledge."[16] Her calm, no nonsense handling of Melvin, as well as the other waitresses, tells us that she is cool under fire, capable of handling difficult situations, and sort of proud of her abilities, hence her objective "to handle him." The payoff comes when Melvin crosses the line with her. *Payoff* means, to finally deliver the full meaning of "that knowledge to the audience."[17] We might have asked: "Why isn't she just throwing him out? Why put up with it?" But instead we ask: "Wow, how is she going to competently handle this now?" Additionally, the conversation about her son at the opening of the scene is critical to setting up her vulnerability. Without it, we would have responded to her threat saying: "Hmm, she's a protective parent" rather than the more accurate "He hit the nerve of a single mother struggling with a sick son, big mistake." When we are in sync with a character, we can find meaning.

As Good As It Gets: Cinematic Meaning

The meaning behind any moment fully depends on the established credibility. The inner speech turns from doubt and confusion to problem solving. With emotional empathy, these turn to positive declarations of meaning and hope, both toward the character and ourselves. We, the co-authors, are pulled into the highest level of identification, and that creates personal introspection.

Melvin: Melvin's fear of Carol's threat gives us the greatest empathy for him as yet in the film. The meaning is clear and the menace of OCD is apparent: He is trapped. Without the restaurant, the table, the cutlery, and Carol, his world would be turned upside down. He must make a decision, and it is terrifying. Melvin must let down his considerable guard and acknowledge the choice in front of him. He is not going to be able to change the subject as he has done earlier in the film with other characters. Our inner speech reflects Melvin's pain: "Oh this is messed up. He put his foot in it and he's about to lose it all. I hate it when I say the wrong thing. I have no idea how to get out of it and I feel like a moron. I guess I'm not alone."

Carol: Melvin's damaging words stab at Carol's efforts to deal with her life and her son. Brooks sets Carol up as a woman who constantly talks about her son, his health, his reactions to her dating, and how he is so amazing. These are the sentiments of a woman struggling to keep control of a potentially dangerous and out of control situation. Self-absorption and adoration for her son are her understandable vices. Melvin cuts to the core of what she has become, belittling her, and flippantly throwing the death of her son, her greatest fear, into the mix. Our inner speech catches all of this: "Okay, that was brutal… sure she's a little full of her own life, but look at what she has to deal with! I lose it when someone insults me. How is she staying calm?"

Decisions made by characters in narrative drama are measured against our own tendencies, and regardless of the different specific meanings that come from our individual perspective, the creative work is a success because the characters are drawn with credible back-stories, problems, emotions, objectives, decisions, and actions. Within the world that is created, the logic must be consistent even if it differs from the co-author's experience. The inner speech may read: "I wouldn't do that, but I can see how that character might." Our interactive inner speech is driven to question, understand, and if possible, learn.

The CIND Writer Attends to Detail

Cinema has found its elements and principles organically over time, and while the stories in some cases are certainly bettered by the codification, the production of work has not had to wait for it. However, because CIND must capture the appropriate generalizations with rules that govern a wide range of narrative situations, it requires, by definition, a codification of these principles and elements before we can even begin to create the engine, let alone the project. While on this journey, much of what cinema has discovered, and continues to discover, can offer direction.

"A data-driven storytelling engine would require two major sections: a mass of data and a means of assembling that data into a story in response to the player's actions."[18] The agency of all characters and the crafting of code require that the CIND writers think in terms of process. McKee notes that "to plot means to navigate through the dangerous terrain of story and when confronted by a dozen branching possibilities to choose the correct path. Plot is the writer's choice of events and their design in time."[19] In CIND, plot is the writer's and the co-writer's choice. Crawford suggests that we use a *metaplot* which is "something like a plot, only it is specified by rules, not events. … Story is data, but storytelling is process. … That storyteller might be called an engine, a system, or an agent, but the term most commonly used is drama manager."[20]

16 McKee, *Story*.
17 McKee, *Story*.

18 Crawford, *Interactive Storytelling*.
19 McKee, *Story*.
20 Crawford, *Interactive Storytelling*.

"The construct at the core of their system is called a beat. A beat is what I call an Event; it is a single dramatic atom, although it is expressed as a sequence of audiovisual steps."

The Drama Manager

Crawford believes that a drama manager must listen, think, and then speak. "The drama manager must monitor the story's progress. This step is simple listening." Developing dramatic interpretations of the events, a drama manager must then determine how the story should progress. And finally, the drama manager needs to translate "its determinations into some form that will actually change the story world in a manner that helps the story evolve in the desired direction."[21] Finding a mathematical relationship between the cause and the effect and expressing that in a simple mathematical formula addresses anything that can be quantified. However, "an interactive storyteller need not achieve perfection of mathematical description; getting close enough for dramatic fidelity is all that's required."[22] Sometimes the same is true in cinematic narrative drama. For example, behind an objective is motivation. "Think through to a solid understanding of motive, but at the same time leave some mystery around the whys, … room for the audience to use its own life experience to enhance your character in its imagination."[23] Story mirrors life. We as humans are used to not fully understanding the motivation behind a certain person's behavior. And yet, McKee also notes, "Somehow we must lead the audience to interpret the inner life from outer behavior."[24] The exchanges we experience with each other everyday are where we get clues to the mystery of another's motivation. We expect the fidelity of response to be specific: we do something, the other person responds with an emotional tone and an action that hints at a reason. Jehlinger provides us the answer. He has found the basic elements needed in dramatic cinema to provide clarity to the audience about what is happening: "we must stay with one objective and one emotion until something occurs to change it" and "only two things can 'occur' to change objectives and emotions: new information or an event. We do not change for any other reason."[25] This is the data with which the story manager must work.

21 Crawford, *Interactive Storytelling*.
22 Crawford, *Interactive Storytelling*.

23 McKee, *Story*.
24 McKee, *Story*.
25 Richardson, *Acting Without Agony*.

The Data

The drama manager relies on small units of data, often described as atomic in nature. The most outstanding example of CIND thus far is *Façade*, created by Michael Mateas and Andrew Stern. A *joint dialog behavior (jdb)*, "Façade's atomic unit of dramatic action (and closer to the canonical beat of dramatic writing) consists of a tightly coordinated, dramatic exchange of 1 to 5 lines of dialog. A beat's jdbs are organized around a common narrative goal, such as a brief conflict about a topic" or the need to transition in or out of the beat.[26] While joint dialog behaviors, like stepping stones, enable the narrative flow within a beat from one exchange to the next, they are implicitly, not explicitly, driven by two of Jehlinger's smaller atomic units of drama, the emotion and objective of the character. Mateas and Stern note that "Façade is not generating sentences," but that it is certainly generating sequences.[27] Perhaps Jehlinger's work is a step toward being able to generate those sentences, because for the audience to understand what is happening, the elements need to be handled by the artist-author and experienced by the audience-co-author as separate, distinct parts: emotion, objective, event, new emotion, new objective, and decision followed by an action, which becomes another event.

Event

Crawford describes Mateas' and Stern's work. "The construct at the core of their system is called a beat. A beat is what I call an Event; it is a single dramatic atom, although it is expressed as a sequence of audiovisual steps."[28] Classically, an event is an occurrence, especially one that is particularly significant. According to Jehlinger, an event can be only considered an event if it causes the emotion and/or the objective of the character to change. Once the emotion and/or objective have changed based on that event, the character does something; they act, creating an event for another character to respond to, hence the action/reaction that McKee refers to in his definition of a beat: "a beat is an exchange of behavior in action/reaction."[29]

We know that the word verb is used to show that an action is taking place. Crawford describes his work as Verb Thinking. "Verb Thinking…is central to understanding interactivity. The answer to the classic question 'What does the user DO?' is 'The user does Verbs'."[30] Verb thinking also drives dramatic cinema, creating conflict, change, and meaning. "Nothing moves forward in a story except through conflict"[31] and "The secret of all drama is difficulty."[32] Indeed the power offered by the scene in *As Good As It Gets* is found in the very struggle with which Melvin and Carol must wrestle during their interaction. "Event means change."[33] It is not enough to think of verbs (events), as simply action. That action must create change, or the moment is not dramatic. Whether watching a cinematic version or participating in an interactive version of our example scene, the events that Melvin and Carol create for each other are subtle, but they still create change. "Story events are meaningful….Story design…lays bare the network of chain-linked causalities that when understood, gives life meaning."[34] The changes brought on by each event raise the stakes and reveal meaning to anyone involved, the characters and the audience. Events must always create conflict and meaning for the protagonist, which in the most personalized version of CIND, will be the audience.

Objective

"The objective is the conscious intent of the character … (it) must always be difficult to attain."[35] Crawford folds the concept into behavior and uses the *intrinsic variable* in his personality model as motivation: "The personality model mirrors the behavioral universe of the story world…. Five broad types of variables could be used in a personality model: *intrinsic, mood, volatility, accordance,* and *relationship.* The first type includes the *intrinsic* personality traits associated with any character: greed, lust, pride, and so forth. The second type, *mood,* includes the variable emotional states people are subject to, such as anger or joy; these personality traits change with time. *Volatility* variables govern the readiness with which mood variables can change; *accordance* variables govern the readiness with which relationships change. The last variable type includes the *relationships* each actor has with all the others."[36] The broad nature of motivation from the personality model, and more specifically, the intrinsic variable, relates more closely with the dramatic concept of the *spine.*

In cinematic narrative drama, the *inner problem* and the *outer problem* work to provide motivation by creating

26 Michael Mateas and Andrew Stern, "Structuring Content in the Façade Interactive Drama Architecture" (paper presented at the annual Artificial Intelligence and Interactive Digital Entertainment (AIIDE), Los Angeles, California, June 2005).
27 Ibid.
28 Crawford, *Interactive Storytelling.*
29 McKee, *Story.*
30 Crawford, *Interactive Storytelling.*
31 McKee, *Story.*
32 Richardson, *Acting Without Agony.*
33 McKee, *Story.*
34 McKee, *Story.*
35 Richardson, *Acting Without Agony.*
36 Crawford, *Interactive Storytelling.*

the *super-objective* or the *spine.* The inner problem "is a personality flaw or a moral dilemma to work out."[37] The outer problem is the trouble foisted upon the character by outside forces; for example, the need to save a family member or the need to escape a bad situation. Another way to think about these two would be to consider them desires; the *unconscious desire* is the *subconscious need* that the character is unaware of and is self-contradictory in nature, and the *conscious desire* for the character is the need or goal of which they are aware. The *spine* or *super-objective* of the story is the deep desire in and effort by the character to restore the balance of life. If the character has no unconscious desire, then the conscious desire becomes the spine. However, an unconscious desire (inner problem) is always more powerful as the spine. The spine broadly defines the arc of change that the character goes through during the story. However, it is the specific details of the journey that progresses the story forward. These are found in the smaller objectives. In drama, there are *beat objectives, scene objectives, sequence (of scenes) objectives*, and *act objectives.* Each of these objectives is the conscious goal that drives that part of the narrative; each smaller objective must serve the intention of the next larger objective.

Jehlinger's work gives us the ability to access the smallest objective, without which the story would lack credibility and meaning. Drama managers need to be built with the fine grain motivation of the moment, in addition to the larger motivations of the spine.

Emotion

"The second type [of personality model variable], mood, includes the variable emotional states people are subject to, such as anger or joy; these personality traits change with time. Mood spontaneously diminishes. No matter how angry you become, the passage of time will surely diminish that anger…. The storytelling engine, therefore, must examine each actor's mood at regular intervals and relax it toward zero."[38] Jehlinger approaches emotion differently. The emotion is intended to help motivate and to communicate empathy, credibility, and meaning. The emotion should stay alive until something occurs to change it. This makes the emotion meaningful. We get to see the transition from one to the other. That gives us clues to the motivation of the character.

The behavior that Crawford describes, the diminishing over time, sounds more like McKee's thoughts about feeling. Jehlinger states "emotions are feelings large enough to change your life or destroy it."[39] He means the *big* ones, such as anxiety, bewilderment, contempt, curiosity, defiance, desire, disgust, embarrassment, fear, and frustration. McKee states that emotion is a relatively short-term, energetic experience that peaks, burns, and then is over. Although, unlike Jehlinger, he does not state what would cause the burnout, he does note that feeling is not emotion. McKee believes that feeling is a long-term pervasive background that colors whole days, weeks, and even years. In this context, feeling operates more like an inner problem or unconscious desire.

Decision

"The user should be able to make lots of dramatically interesting decisions. How do you generate enough interesting decisions? How do you pare away the boring decisions? The interactive story world must present the player with decisions that hang on a razor's edge, decisions that could readily go either way."[40] McKee agrees, "True choice is dilemma. [So] the choice between good and evil or between right and wrong is no choice at all." Rather, the choice should be between irreconcilable goods or the lesser of two evils.[41] Additionally, the true self "is revealed in the choices a human being makes under pressure: the greater the pressure, the deeper the revelation, the truer the choice is to the character's essential nature. Choices made when nothing is at risk mean little."[42] So the goal of dramatic narrative in both CIND and cinema is to build situations where the decisions become incrementally more and more difficult. Decisions such as these can exist within beats, scenes, sequences, and acts.

The Beat: Final Thought

The choices other characters make in CIND are only clear to the co-author if the emotions and objectives remain active until other emotions or objectives take their place. The system might also feel more responsive and direct to the co-author if the drama manager changes the assumed emotion and objective from the co-author only after the co-author acts.

37 Vogler, *Writer's Journey.*
38 Crawford, *Interactive Storytelling.*

39 Richardson, *Acting Without Agony.*
40 Crawford, *Interactive Storytelling*
41 McKee, *Story*
42 McKee, *Story*

Conclusion

The audience has always held a co-authorship role with art. The artist can choose to ignore the inner speech of co-authorship and create an inconsiderate work or can choose to listen using all available and previously discovered methods. Defining the elements and principles of dramatic narrative has taken over one hundred years in cinema, and the task is far from complete. However, since CIND requires codification for programming, the choice to rely on cinema when designing drama managers will help considerably to reduce the workload.

This paper is the first of a series of papers I am writing that work with the final cut of the first restaurant scene in *As Good As It Gets*, addressing the nuances of credibility and meaning in more detail. The purpose of this series is to raise the awareness of and a dialog about the co-author's inner speech and its manipulation in cinema, with the hope of beginning the delicate, intricate work of finding credibility and meaning in CIND.

References

Brooks, James L., dir. *As Good As It Gets.* Los Angeles: TriStar Pictures, 1998.

Crawford, Chris. *Chris Crawford on Interactive Storytelling.* Berkeley: New Riders, 2005.

Mackendrick, Alexander. Paul Cronin, ed. *On Film-making, An Introduction to the Craft of the Director.* New York: Faber and Faber Limited, 2004.

Mateas, Michael and Andrew Stern. "Structuring Content in the Façade Interactive Drama Architecture." Paper presented at annual Artificial Intelligence and Interactive Digital Entertainment (AIIDE) Conference, Los Angeles, California, June 2005.

McKee, Robert. *Story: Substance, Structure, Style, and the Principles of Screenwriting.* New York: ReganBooks, an Imprint of HarperCollins Publishers, 1997.

Murray, Janet. *Hamlet on the Holodeck.* Cambridge: MIT Press, 2001.

Richardson, Don. *Acting Without Agony,* An Alternative to the Method. Needham Heights: Allyn and Bacon, Inc., A Pearson Education Company, 1994.

Vogler, Christopher. *The Writer's Journey: Mythic Structure for Writers*. Studio City: Michael Wiese Productions, 1998.

Wirth, Jeff. *Interactive Acting.* Fall Creek: Fall Creek Press, 1994.

Wirth, Jeff, Kenneth Ingraham, and Michael J. Moshell. "The Orlando Game: An Experimental Intimate Interactive Performance." Tech Report UCF-DM-2005.1. School of Film and Digital Media, University of Central Florida (2005)

Wirth, Jeff. *iPLAY*. See http://www.cas.ucf.edu/iplay. (July 1, 2006).

keywords

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Video Games as Learning Tools for Project Management

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Abstract

In this paper, we begin by discussing some of the statistics that reveal electronic gaming's place as a major force in today's economy. We next discuss two of the major problems involved with the usage of video games as a tool for teaching and learning in digital media: the issues of inconsistency and complexity. Gee's pioneering work *What Video Games Have to Teach Us About Learning and Literacy*[1] is used both to establish some principles of gaming that transcend these problems and to present a unique medium with which to examine the nature of digital media and its principles and tools. We apply and expand upon Gee's work to suggest specific ways in which video games can be used to teach digital media students project management skills, and we speculate as to how this might be done within several different genres of games. We conclude with a brief case study of our experiences in working with digital media students to build a video game useful for teaching fourth graders about African-American history (specifically, about the Underground Railroad).

1 James Paul Gee, *What Video Games Have to Teach Us About Learning and Literacy.* (New York: Palgrave Macmillan, 2003).

Why Video Games?

It is not surprising that the Entertainment Software Association (ESA)–formerly the Interactive Digital Software Association (IDSA)–aggressively advertises the popularity of electronic gaming in society. Within their yearly publication on gaming demographics, the organization includes this quote from *USA Today* writer Kevin Maney:

if you're over 35, chances are you view video games as, at best, an occasional distraction… If you're under 35, games are a major entertainment and a part of life. In that sense, they are similar to what rock 'n' roll meant to boomers.[2]

All one needs to do to witness the phenomenal popularity of video games is wander inside the home of a young adult and take a look at the television's peripheral connections. Chances are, you'll find attached one or more gaming consoles (a Playstation2 or Gamecube, or perhaps even an Xbox 360) and an accompanying assortment of popular gaming titles. If not a console platform, there is likely a computer nearby with access to game titles in PC or Macintosh format. Gee notes that "the video-game industry makes as much money or more money each year than the film industry."[3] Seventy-five percent of heads of households play some type of electronic game, with the average gamer's age being 30 (up one year from 2004), and the largest segment of gamers (43%) being between the ages of 18 and 49.[4] From these figures, it is evident that a large number of the students filling seats in college classrooms have at least some experience in electronic gaming, and that they are likely to be open-minded toward teaching methods that take advantage of digital gaming or digital gaming techniques.

Even the gender inequity seems to be gradually decreasing, as the latest figures from the ESA reveal that 55% of gamers are male and 43% are female, a set of statistics that suggests the dearth of female gamers may no longer be a problem in future years. The increasing percentage of female gamers shows that this discourse community–what Gee might describe as a macro-level *affinity group*–seems to be gradually fighting for equilibrium, and the ESA also notes that "women over the age of 18 represent a greater portion of the game-playing population (28%) than boys from ages 6 to 17 (21%)."[5] Furthermore, female gamers are not confined to a single gaming genre as some have speculated; Carr's (2005) examination of gaming at an all-girls state school in the UK found that female gamers enjoyed playing not only "God-games" or simulation games like *The Sims*, but also other types of sports and fighting games previously thought to be the domain of male gamers only.[6] These games included such titles as *Tony Hawk's Pro Skater 4* and *Dead or Alive 3*. Carr notes, "To attribute gaming tastes directly, solely, or primarily to an individual subject's gender is to risk underestimating the complexities of both identity and preference."[7] Both the increasing numbers of female gamers and the wide breadth of interest for these gamers provide hope that digital games may in fact offer a means for better engaging and teaching both male and female students in the digital media classroom.

While the market penetration of gaming makes for a convincing argument for the popularity of games, it does nothing to suggest that these games are well-suited for non-entertainment functions such as teaching. In terms of connecting gaming with the classroom, we now have at least a small base of materials from which to draw ideas and frameworks for pedagogy and assessment. Much has been written about the potential of video games for teaching and learning in the 21st century.[8] The journal *Simulation & Gaming* recently devoted two entire issues to a special symposium on video gaming and learning.[9] While these

2 Entertainment Software Association. "2005 Sales, Demographics and Usage Data: Essential Facts about the Computer and Video Game Industry." *Entertainment Software Association* (2005), http://www.theesa.com/files/2005EssentialFacts.pdf. (February 28, 2006).

3 James Paul Gee, *What Video Games Have to Teach Us About Learning and Literacy.* (New York: Palgrave Macmillan, 2003), 6.

4 Entertainment Software Association. "2005 Sales, Demographics and Usage Data: Essential Facts about the Computer and Video Game Industry." *Entertainment Software Association* (2005), http://www.theesa.com/files/2005EssentialFacts.pdf. (February 28, 2006).

5 Ibid.

6 Diane Carr, "Contexts, Gaming Pleasures, and Gendered Preferences." *Simulation & Gaming* **36**, no. 4 (2005): 464-82.

7 Ibid., 479.

8 Marc Prensky, *Digital Game-Based Learning*. (New York: McGraw-Hill, 2001); James Paul Gee. *What Video Games Have to Teach Us About Learning and Literacy.* (New York: Palgrave Macmillan, 2003); Nick DeKanter, "Gaming Redefines Interactivity for Learning." *TechTrends: Linking Research & Practice to Improve Learning* 49, no. 3 (2005): 26-31; Suzanne de Castell and Jennifer Jenson. «Paying Attention to Attention: New Economies for Learning.» *Educational Theory* 54, no. 4 (2004): 381-97.

9 David Myers, "Guest Editorial: Video Games: Issues in Research and Learning." *Simulation & Gaming* 36, no. 4 (2005): 442-46.

sources are a great start, much of the discussion so far has been focused on the potential of the medium rather than on concrete examples that connect gaming technology to pedagogy.[10]

Proponents of gaming in the classroom claim that gaming solutions can be successful because they better address the learning patterns and multimodal[11] competencies of those growing up with entertainment and communication technologies such as iPods, BlackBerry devices, PDAs, and multimedia phones. These devices now infiltrate all parts of the data-driven culture in which we find ourselves immersed, from home to school and work environments; de Castell and Jenson label this new type of atmosphere as an "attentional economy."[12] In this type of environment, engaging and sustaining students' attention is a primary objective. Fortunately, gamers are cultivating skillsets that are compatible with this type of economy. As Dekanter notes, "the elements of interactive game playing–adaptivity, competition, communication–are becoming the traits of successful students and workers."[13] The task for instructors is now to try and harness these interactive skills and competencies and focus them into directions more useful for classroom learning.

The Problems of Inconsistency and Complexity

When considering the problems involved with using digital game technologies as tools for instruction, it is possible to divide those problems into two groups: problems that take place during the construction of games (i.e., design issues) and problems that take place during the playing of games (i.e., runtime issues). In the former, there is the potential to correct or improve educational video games either by a) following sound design practices and reapplying the elements of existing video game architectures, or b) developing new gaming architectures that can support educational games from the ground up. In the latter, during runtime, there is little opportunity to implement technology changes, but it *is* useful to acknowledge the complex social, cultural, and cognitive processes that are engaged when a player is interacting in virtual space. These forces can contribute to experiential inequities and inconsistent gameplay patterns that result in two different players from two different affinity groups having very different perspectives on a single game. There is plenty of literature that verifies the inequities of video game technologies and examines the stereotypical, cultural, or aggressive implications of digital gameplay.[14]

One significant problem with the notion of using gaming as a pedagogical tool during design is related to the inconsistency of the medium. As Apperley explains, the general feature of interactivity is not enough to unite video games of

Proponents of gaming in the classroom claim that gaming solutions can be successful because they better address the learning patterns and multimodal competencies of those growing up with entertainment and communication technologies such as iPods, BlackBerry devices, PDAs, and multimedia phones.

10 James Paul Gee, *What Video Games Have to Teach Us About Learning and Literacy.* (New York: Palgrave Macmillan, 2003), 9.

11 Multimodal refers to the practice of using combined modes of sound, imagery, or text.

12 Suzanne de Castell and Jennifer Jenson, "Paying Attention to Attention: New Economies for Learning." *Educational Theory* 54, no. 4 (2004): 381.

13 Nick DeKanter. "Gaming Redefines Interactivity for Learning." *TechTrends: Linking Research & Practice to Improve Learning* 49, no. 3 (2005): 28.

14 Nicholas L. Carnagey and Craig A. Anderson. "The Effects of Reward and Punishment in Violent Video Games on Aggressive Affect, Cognition, and Behavior." *Psychological Science* 16, no. 11 (2005): 882-89; John Colwell and Makiko Kato. "Video Game Play in British and Japanese Adolescents." *Simulation & Gaming* 36, no. 4 (2005): 518-30; Committee on Commerce, Science, and Transportation. *The Impact of Interactive Violence on Children*, One Hundred Sixth Congress, Second, 2000.

all makes and models under one common umbrella.[15] As opposed to a textbook, for example, where commonalities such as structural and organizational entities (e.g., tables of contents, page numbers, title pages, and covers) are generally shared from one book to the next, video games have no such consistency, particularly in regard to aesthetics and visual look and feel. From one game to another, it is common to have completely redefined notions of gameplay, graphical fidelity, problem-solving strategies, scoring, collaborative play, and so forth. While genres of games may share some consistency in this regard, even within a specific domain of video games–first person shooters or real time strategy games, for example–there will undoubtedly be some variation to the ways in which a player interacts with the medium and its virtual components. Of course, this is often also precisely what makes video games so exciting and engaging for their players. Variations in gameplay, story, and mechanics have led to innovations and creative applications of programming and multimedia that transform certain games from mediocre market performers to blockbuster selling titles with dedicated groups of fans. Nonetheless, this inconsistency presents a challenge for those wishing to make use of structured lesson plans within a gaming environment.

Apperley argues for a move towards the study of what he calls the "nonrepresentational" characteristics of video games–those characteristics (primarily interactivity) that are not centered on the visual aesthetics of the medium. Specifically, he proposes the creation of "a more nuanced, meaningful, and critical vocabulary for discussing video games; one that can perceive the underlying common characteristics of games that might otherwise be regarded as entirely dissimilar if judged solely on representation."[16] While this task is undoubtedly a formidable undertaking, his idea is laudable; creating a standardized means for discussing the intricate differences in various types of interaction, for example, would do much to assist educators and designers during the construction of game-based scenarios and new media learning environments. Furthermore, a repository of sound design guidelines could be used to weed out problematic or inconsistent gameplay scenarios—if ninety-nine percent of users pick up objects in a virtual world using the same type of controller interactions, then it is probably safe to say that a significant change to this procedure is likely to be frustrating or confusing to a player. In our current state of affairs, a lack of commonality at both the macro (gaming in general as a medium) and micro (gaming as composed of game genres) level poses problems for the effective use of video games as pedagogical tools.

Modding games, while still a complicated process, simplifies the task of game development enough so that even college students unfamiliar with programming or 3-D modeling can learn to create a video game environment over the course of several weeks.

An equally troublesome characteristic of modern video games is that of complexity. Video games are complex and complicated by nature; the hardware generally has only very limited resources available and the software must be as efficient as possible in order to achieve the fast frame rates and the photorealistic fidelity that modern players demand and crave. In addition to these technical complexities, the production of a bestselling video game is a massive undertaking. The game *Gun* (2005), designed and developed by the game studio Neversoft, lists hundreds of names in its production credits, representing professionals from producers and art directors to voiceover actors and quality assurance employees. On the backend, video games often possess a million lines of programming code or more and can cost millions of dollars to produce,

15 Thomas H. Apperly. "Genre and Game Studies: Toward a Critical Approach to Video Game Genres." *Simulation & Gaming* 37, no. 1 (2006): 6-23.

16 Thomas H. Apperly. "Genre and Game Studies: Toward a Critical Approach to Video Game Genres." *Simulation & Gaming* 37, no. 1 (2006): 7.

market, and distribute.[17] To create a video game that has entertainment-quality graphics, story, audio, and gameplay, then, is no small endeavor.

Fortunately, there have been several attempts at creating open source game design engines that allow developers to extend core sets of functional code in new directions based on their needs and desired outcomes. These engines generally include the core functionality necessary for the creation of a 3-D navigable environment, and implement methods for dealing with physics, object collisions, and the importing of art objects and models. One online collection provides information on over 240 such 3-D engines each with its own set of features and custom tools.[18] Other popular engines such as *Ogre3D*, *Delta3D*, and *Panda3D* have been applied to specialized areas such as academia or the military.

In addition to open source engines, another option for minimizing the complexity of game development is to use an engine packaged with a commercial video game such as *Half Life* or *Neverwinter Nights*. Rather than using this engine within the context of the original game, though, the idea is to use the existing engine to support new gameplay possibilities. To support this feature, commercial game developers often create toolsets that allow players to create their own environments, characters, dialog, and art–giving way to a new breed of game players known as game modifiers or more often simply "modders." Modding games, while still a complicated process, simplifies the task of game development enough so that even college students unfamiliar with programming or 3-D modeling can learn to create a video game environment over the course of several weeks. Modders design their environments to contain different types of items, gadgets, "characters, enemies, modes, textures, levels, and story lines" that may be useful for any given learning environment.[19] An example of this process using a modded addition for *Neverwinter Nights* and an Underground Railroad narrative is explained in greater detail in the latter half of this paper.

17 Entertainment Software Association. "2005 Sales, Demographics and Usage Data: Essential Facts about the Computer and Video Game Industry." Entertainment Software Association (2005), http://www.theesa.com/files/2005EssentialFacts.pdf. (February 28, 2006).

18 Devmaster.net. "3d Engines Database." (2005), http://www.devmaster.net/engines/list.php. (February 28, 2006).

19 Wikipedia. "Mod (Computer Gaming)." Wikipedia: The Free Encyclopedia (2006), http://en.wikipedia.org/wiki/Mod_(computer_gaming). (February 28, 2006).

Learning by Designing

Given the problems of inconsistency and complexity discussed above, applying game design techniques to digital media coursework can be a challenging task. Perhaps a step in the right direction is to focus on those production-oriented aspects of game design that are relevant to specific areas of digital media curriculum rather than trying to adapt gaming conventions to an entire (and admittedly amorphous and emerging) discipline. This task involves applying one of Gee's core learning principles. Gee's *design principle* is described as "learning about and coming to appreciate design and design principles."[20] For instance, in courses requiring students to learn about interactivity, it can be worthwhile for students to implement interactivity first in a CD-ROM environment, then in an Internet environment, and finally in a gaming environment, thus roughly mimicking the evolution of interactivity in industry.[21] Given the same source of content, then, a student would be able to observe the ways in which the user experience changes as a viewer/browser/player is given increasing amounts of control over their environment and the digital "objects" that exist within that environment.

In this paper, we choose to consider the ways in which gaming can augment learning outcomes in project management courses. When given production tasks, digital media students generally have a wealth of technologies available with which to capture their raw materials and record the types of direct world observations useful for their projects. They may take advantage of three-dimensional art and computer modeling programs, or choose instead to capture audio or video through digital recording devices. They may develop digital stories through scriptable narrative tools and design online environments using Internet scripting languages. They may decide to use multiple software programs to propel a new idea from its initial conception to its final launch. It is very easy for students to become sidetracked when making these technological decisions and when building these complex framing mechanisms, and they may lose sight of the more important goal, which is often the facilitating of an interaction between an author and an audience.

When students are asked to produce *and* to teach something using their product, though, the choices they make in

20 James Paul Gee. *What Video Games Have to Teach Us About Learning and Literacy.* (New York: Palgrave Macmillan, 2003), 207.

21 Nick DeKanter. "Gaming Redefines Interactivity for Learning." *TechTrends: Linking Research & Practice to Improve Learning* 49, no. 3 (2005): 26.

the selection of raw materials become at least as important as the tools they use to capture and manipulate those materials. Furthermore, by building a product that is used to teach others about selected subjects or concepts, the students themselves are likely to retain this information for a longer period of time than they would simply sitting in a classroom listening to a lecture. In fact, the Learning Pyramid model of interactive learning retention rates associates a straightforward lecture with only a 5% retention rate, while a situation in which a learner teaches others about a concept or uses the concept immediately warrants a 90% retention rate.[22]

Far from being singularly useful, these project management skills learned in electronic game design are also relevant to the objectives of many other types of digital media courses. For example, in a writing for media or technologically-enhanced communications course, an instructor might introduce students to proposal writing, scheduling, resource management, collaborative teamwork, and presentation skills. By asking small groups of students to work throughout the semester and build a single "level" or "scene" of a moddable video game, they would have the opportunity to learn about many of these topics in great detail, while at the same time building up valuable interpersonal and rhetorical skills. A final presentation on the group's accomplishments would further connect the project to curricular goals.

An even easier way to connect general students to digital media coursework through gaming, though, is to simply ask them to play their favorite games for X number of hours as a homework assignment and then use this experiential exercise as a device to drive in-class reflection or discussion about a lecture topic. In this type of situation, relatively little up-front planning is necessary, and there are no complicated programs to install or freeware modding tools to download. In the next section of this paper, we discuss similar ways in which playing games can be used to generate new ideas and thoughts about project management in a multimodal environment.

Learning by Playing

As the video game industry is necessarily highly secretive and competitive, the lessons learned from the industry often must come from the end user perspective. In other words: what can we learn from *playing* the games rather than from studying the process of video game development? Gee's text *What Video Games Have to Teach Us About Learning and Literacy* asks this very question, and even provides an answer. Gee claims that something useful can be learned from all types of video games, whether these games are massively-multiplayer online role-playing games like *World of Warcraft*, Gamecube simulation games like *Pikmin*, or even the globally ubiquitous first-person shooter games like *Halo 2*. In addition, Gee's work has reignited interest in educational gaming technologies, though the term "edutainment" has in recent years been replaced with the more politically pleasing phrase "serious gaming."[23] Furthermore, notions of "serious gaming" have led to what some have called "serious play."[24] The idea here is perhaps to ease some of the tension and frustration normally present with certain types of learning. As McLuhan notes, "both games and technologies are counter-irritants, or ways of adjusting to the stress of the specialized actions that occur in any social group."[25] In didactic social interactions, games can be even more useful, as they both alleviate the stress of learning and facilitate certain types of social interactions also involved in pedagogy. Though McLuhan at this point was not writing about electronic games, his arguments are equally applicable to those games that are designed to unfold in virtual environments.

"both games and technologies are counter-irritants, or ways of adjusting to the stress of the specialized actions that occur in any social group."

22 Nick DeKanter. "Gaming Redefines Interactivity for Learning." *TechTrends: Linking Research & Practice to Improve Learning* 49, no. 3 (2005): 27.

23 Ben Sawyer. "Serious Games: Improving Public Policy through Game-Based Learning and Simulation." Foresight and Governance Project, Woodrow Wilson International Center for Scholars (2002), http://www.seriousgames.org/images/seriousarticle.pdf. (June 24, 2006)

24 Suzanne de Castell and Jennifer Jenson. "Paying Attention to Attention: New Economies for Learning." *Educational Theory* 54, no. 4 (2004): 384.

25 Marshall McLuhan. *Understanding Media: The Extensions of Man*. (New York: McGraw-Hill, 1965), 235.

Serious play has also had consequences in other fields, such as linguistics and literary theory. For instance, Derrida used the concept of "play" in his writing and analyses of literature in order to formulate new ideas about the construction and meaning of language and written expression.[26] For digital media students, play might instead lead to new ideas about optimizing project workflows or creating new juxtapositions of narrative and media. In either case, though, play can be thought of as a generative tool leading to new ideas and outcomes rather than as a purely entertainment-oriented activity in pursuit of relaxation.

To support our notion of serious play as a tool for project management, we expand upon Gee's 36 core learning-principles and add three more principles relevant to what we call "runtime project management" in the field of digital media. We call these principles the *Interactive Learning Principle*, the *Attention-to-Detail Principle*, and the *Ethics Principle*. For each of these three principles, we discuss example projects that depend upon the skills cultivated by these types of learning. Next, we discuss and critique particular video games with which students can study, develop, and hone these skills.

1. The Interactive Learning Principle

Crawford defines interactivity as "a cyclic process between two or more active agents in which each agent alternately listens, thinks, and speaks."[27] Using this definition and a metaphorical interpretation of what it means to *listen*, *think*, and *speak*, we can assess the quality of interaction by determining how well a virtual system can continue to engage a user's attention in order to sustain interest in a virtual environment. In a video game, this equates to keeping the player playing for as long as possible. In successful video games like the *Ratchet and Clank* series for the Playstation 2, certain innovative techniques have been developed in order to keep the user interested and immersed in virtual space. Many of these techniques are directly applicable to the world of media project management, and include concepts such as:

1. Forward-thinking design: How do you design products that allow the user to visualize additional interactivity once certain operations have been completed? For instance, video games like *Ratchet and Clank* will show additional areas of each level that the user will be unable to access until they have collected certain items or solved certain puzzles. How can such techniques encourage a longer interaction?

2. Cooperative and collaborative media design: How can multiple team members work together to devise a world in which complex sensory experiences such as hearing (ambient sound and music), sight (3-D graphics and photorealistic environments), and touch (interactive gameplay) function as a single, cohesive unit? How can they plan projects so that each member of the team has an overall vision of the product rather than segmented and isolationist perspectives that encourage last minute work plans? Such complex design calls for improvements in communication in all phases of the project cycle.

3. Distraction and misdirection through narrative: The earliest Playstation games included long load times during which a progress bar would slowly creep across a user's screen as the next environment was loaded into memory. More modern games such as *Ratchet and Clank* instead use dynamic loading technologies in which the next environment is gradually loaded into memory as the player progresses. In addition, cutscenes of video can be used to advance the storyline for a video as the next environment loads. These sleight of hand techniques are often used to sustain immersion while still initializing the necessary technological processes of loading data and preparing the system for the next set of gameplay requirements.

In addition to the *Interactive Learning Principle*, other runtime characteristics related to project management include useful phenomena we describe as the *Attention to Detail Principle* and the *Ethics Principle*. Examples of these principles are given below.

2. The Attention to Detail Principle

Zork, which is an interactive computer game of the earliest variety (the game is text only), encouraged players to cultivate a precise yet simplistic vocabulary when communicating with the game and directing the actions of the virtual player. While lacking in the sophisticated graphical fidelity that modern games possess, *Zork* nonetheless demonstrates many of the characteristics of current video games: goal-driven gameplay, competition with virtual avatars (one example would be the thief, who would periodically appear in the game solely to relieve the player of prized possessions), and human/computer interactions. As interactivity was established through text only, a suitable level of detail was necessary to advance the player from one location to another. The instruction "give the jewel encrusted egg

26 Jacques Derrida. *Of Grammatology.* 1st American ed. (Baltimore: Johns Hopkins University Press, 1997).

27 Chris Crawford. *On Interactive Storytelling.* (Berkeley, CA: New Riders Games, 2005), 29.

to the thief," for example, might be more successful than "give jewel to thief." While *Zork*'s designer's did a fine job of making the language parser flexible enough to understand several variations of common commands, in certain situations, a precise level of detail was required in order for the player to meet a goal or advance in the game. With modern games now impressively grounded in high-fidelity graphics, such attention to detail is cultivated in other ways. An analysis of these types of games might permit an instructor to communicate the importance of detail to digital media students when other methods are unsuccessful.

3. The Ethics Principle

Like simulation, gaming can also provide a safe environment in which to experiment with ethics or to discuss ethical situations. In project management especially, students will often find themselves in situations where their personal beliefs about ethics will generate action in one direction or another.

The ethical decisions made by game designers can provide one such entry point for discussions of ethics. A simple though somewhat silly example can be found in a cartoon-like sports game such as *Mario Golf*. *Mario Golf* is a golf simulation for the Nintendo Gamecube. In this game, a player is permitted to taunt other players during multiplayer game with mild insults and annoying phrases that are built into the character's repertoire. Is such a design encouraging unethical behavior, or is it simply making the game more enjoyable for other players during their periods of inactivity? The fact that a non-active player's ability to taunt ceases when the active player begins their backswing reveals that the game's designers do draw a line at some point in order to encourage what we might call virtual sportsmanship. Massively multiplayer online games also routinely provide opportunity for unethical behaviors; economic issues such as the management of virtual capital (buying or selling money on the Internet) and the existence of virtual outsourcing (paying other people to build up the attributes of your character, often referred to as "farming")[28] are only two such examples.

Example: A Brief Case Study of Synthetic Learning

For a more concrete example of using game design experiences to build project management competencies, we can consider the creation of a "modded" video game that was built to teach fourth graders about African-American history and the Underground Railroad. The game, dubbed the "Carol Mundy Video Game," incorporates digitized artifacts from local (Orlando) historian Carol Mundy's private collection.[29] The goal in this project was to create what we describe as a Synthetic Learning Game, or SLG, in order to a) teach college-level digital media students about project management at design time, and b) teach primary school students about history and culture at runtime. Fourth grade is also a significant grade level for this type of game technology; as Gee notes, the transition from the first three years of elementary school (where students are primarily learning to read in a general sense) to the fourth year (where reading becomes focused in particular subject areas) can be particularly difficult, even leading to what has been known as the "fourth-grade slump."[30]

We describe SLGs as digital-media based environments that provide deliberate, well-managed synthetic experiences as means for enhancing learning and performance. We are using the term synthetic learning environments (SLEs) to describe such systems, and seek to generate knowledge that leads to their optimization in both design and implementation. Any synthetic learning environment depends on a rich source of content material from which to populate the environment and create relevant learning challenges. For example, organizations such as the *Federation of American Scientists* (FAS) are working to forge relationships between universities, museums, government agencies, and private developers in order to both optimize creative applications of game technologies *and* enable access to unique collections of source materials. *Discover Babylon*, a game designed to expand public understanding of Mesopotamia's contributions to organized society, is only one such project currently being developed.[31]

In the case of the Carol Mundy Video Game, we were fortunate to have access to a large collection of unique content (newspapers, books, land deeds, audio recordings, dolls, and household objects, for example) that could be digitized for use in the game. This particular content collection provides a unique look into the lives and histories of Central Florida life from the 1720s to the 1970s, and is one that Carol Mundy was hoping to make accessible to the general public, particularly to those schoolchildren learning about

28 James Lee. "Wage Slaves." 1Up.com (July 5, 2005), http://www.1up.com/do/feature?cld=3141815. (June 30, 2006).

29 Steven M. Fiore et al. "Developing Games-Based Learning Environments for the Humanities." (Paper presented to the Metro Orlando Urban League, Orlando, FL, December, 2006).

30 James Paul Gee. *What Video Games Have to Teach Us About Learning and Literacy.* (New York: Palgrave Macmillan, 2003), 17.

31 Federation of American Scientists. "Discover Babylon." (2005), http://www.discoverbabylon.org/. (June 30, 2006).

Obviously, examples of games requiring attention to detail or games presenting ethical dilemmas are easy to find in contemporary best-selling games…but challenging students to find their own examples of these learning principles from their own favorite games is perhaps an interesting exercise in and of itself.

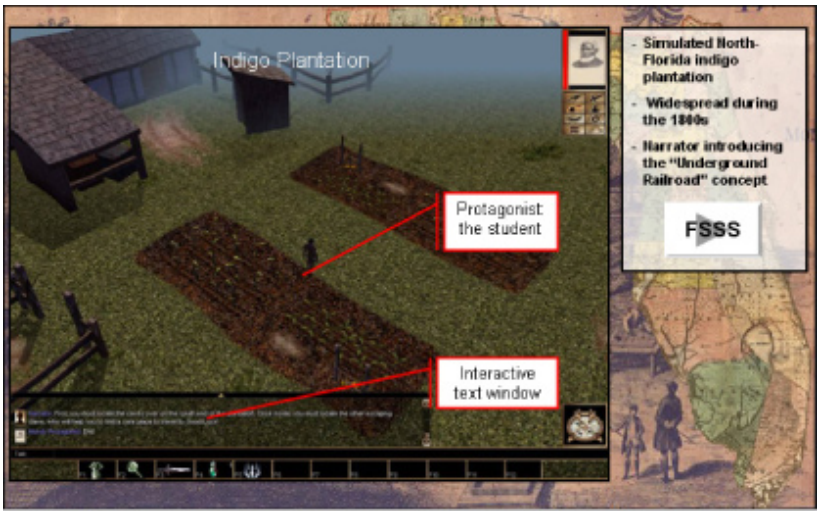

Figure 1 Mundy Game Opening

Figure 2 FSSS Benchmarks

Figure 3 Level Layout for Mundy Game

African-American history and culture. Access to her special collection of historical materials was enabled through her African American History Education and Culture (AAHEC) organization.[32]

This SLG project was funded by UCF's Institute for Simulation and Training as part of a collaboration between UCF's Cognitive Sciences program and the School of Film and Digital Media. This in-house grant provided enough funding[33] to support the development of a single level that included targeted learning materials and digitized artifacts from Ms. Mundy's collection. This effort supported the development of a demonstration version of a story-driven learning game used for research in finding new ways to teach children about African-American culture and history using video game technology. Our goal was to create a compelling introduction to the Underground Railroad using existing commercial off-the-shelf (COTS) technology for role-playing computer games. The collaborative and multidisciplinary efforts involved with this development process contributed to the formation of the Partnership for Research on Synthetic Environments (PROSE) lab, which was formed to continue the study of synthetic learning in various environments.[34]

The first opportunities for learning for the digital media students involved in this project materialized immediately. As we had previously developed a rough timeline and schedule for the production of the game, we were able to use the existing scheduling documents as tools for instruction. As one example, we asked students to analyze and critique the Gantt chart constructed for the grant as an initial exercise, and to explain how this type of chart is useful for working on complicated projects (Table 1). Following this, students were then asked to *follow* the chart as we entered a fairly aggressive production schedule.

A screenshot of this game–the story begins on a North Florida indigo plantation–is shown in Figure 1. The initial task given to the player is to escape from this plantation and find freedom to the north. The player is given background information about their task and environment through the use of an interactive text window placed at the bottom of the screen. Connections to appropriate fourth-grade standards are then made by tying into specific benchmarks from the curriculum, in this case the Florida Sunshine State Standards for history (see Figure 2).

While the game in and of itself is interesting, what is more pertinent to the topic of this paper is the way in which the creation of this game inspired university students to become better project managers and team leaders. Though the head designer for the project was in fact a Human Factors doctoral student, digital media students were involved in many aspects of the game's production, from synthesizing original digital music to developing storylines, programming dialog, and scripting gameplay interactions.

As these students worked with the mod tools available to them in this particular toolset, they began to think about things like interaction and resource management in entirely new ways. For instance, rather than thinking about interaction in the general terms of a human interacting with a machine, they began to understand interaction in more specific terms as they were tasked with creating interactive dialog and trigger-driven responses for the characters in their environment. In addition, they began to see resource management strategies as an essential part of the design process; certain models, textures, and maps were only able to be used in certain situations, and considerations like the density of characters or objects in a scene were critical to both the dramatic and interactive success of a given level or scene. Even the mapping of locations within the game provided an opportunity to teach students about the importance of goal-directed project management and the use of milestones within a project schedule (Figure 3).

Conclusion: Implications for the Digital Media Classroom

In this article, we examined only a few of the properties of computer and console games that make these technologies so compelling and interesting for teaching and learning situations. By discussing a use for gaming in a particular context, though, we hope to have shown how a focused application of gaming technologies can be useful as a means for engaging and exciting students about even seemingly bland topics like project management. Many other possibilities remain, from using games as simulators for universities, training, and hospitals (already being done) to using them as vehicles for environmental policy or for peace activism, as Crookall suggests might be a worthy

32 Carol Mundy. "African American History Education and Culture." (2005), http://www.mundyhr.com/. (June 30, 2006).

33 Around $6,000.00 for the prototype module. The entire amount was used to fund a graduate tuition waiver, so we maintain that the process could also be done for little or no cost, though an advanced undergraduate would likely be needed to facilitate and guide the production process.

34 Partnership for Research on Synthetic Experience. "PROSE Team Overview." (2005), http://www.cas.ucf.edu/create/technology_prose.php. (June 30, 2006).

Plan of Work Tasking	Weeks from Start											
	2	4	6	8	10	12	14	16	18	20	22	24
Task 1. Review Mundy artifacts												
Task 2a. dentify History Sunshine State Standards												
Task 2b. Identify African American Culture Sunshine State Standards												
Task 3. Identify modifiable COTS												
Task 4. Develop storyline for use in prototype SLG												
Task 5. Modify COTS via integration with artifacts and storyline												
Task 6. Develop challenge activities to facilitate learning processes												
Task 7. Incorporate challenge activities into prototype SLG												

Table 1 Gantt Chart

pursuit. [35] By using games as a tool for learning during both design and play phases, it is possible to produce flexible outcomes for two very different categories of learning materials. Design time is an ideal opportunity to learn about the actual practice of project management, while runtime provides a perfect time to reflect and discuss the outcomes made possible by good project management strategies and open lines of communication within a team.

The technological and rhetorical depth of this medium is what makes it so exciting, but this technological and textual complexity also makes it a dangerous and volatile entity capable of producing more distraction and entropy than genuine improvements in learning and retention. By considering video games as both texts (subjects of critical analysis) and technologies (subjects of technical analysis) we can begin to uncover the potential of these digital juggernauts as classroom aids and as motivational tools for learning about digital media theories and techniques. Indeed, if we are to survive in what de Castell and Jenson describe as an attentional economy, then we can imagine no greater and more widely-accepted form of currency for technologically literate students than that of the video game.

35 David Crookall. "Guest Editorial: Video Games: Issues in Research and Learning, Part 1." *Simulation & Gaming* 36, no. 4 (2005): 437-39.

Works Cited

Apperly, Thomas H. "Genre and Game Studies: Toward a Critical Approach to Video Game Genres." *Simulation & Gaming* 37, no. 1 (2006): 6-23.

Carnagey, Nicholas L., and Craig A. Anderson. "The Effects of Reward and Punishment in Violent Video Games on Aggressive Affect, Cognition, and Behavior." *Psychological Science* 16, no. 11 (2005): 882-89.

Carr, Diane. "Contexts, Gaming Pleasures, and Gendered Preferences." *Simulation & Gaming* 36, no. 4 (2005): 464-82.

Colwell, John, and Makiko Kato. "Video Game Play in British and Japanese Adolescents." *Simulation & Gaming* 36, no. 4 (2005): 518-30.

Committee on Commerce, Science, and Transportation. *The Impact of Interactive Violence on Children*, One Hundred Sixth Congress, Second, 2000.

Crawford, Chris. *On Interactive Storytelling*. Berkeley, CA: New Riders Games, 2005.

Crookall, David. "Guest Editorial: Video Games: Issues in Research and Learning, Part 1." *Simulation & Gaming* 36, no. 4 (2005): 437-39.

de Castell, Suzanne, and Jennifer Jenson. «Paying Attention to Attention: New Economies for Learning.» *Educational Theory* 54, no. 4 (2004): 381-97.

DeKanter, Nick. "Gaming Redefines Interactivity for Learning." *TechTrends: Linking Research & Practice to Improve Learning* 49, no. 3 (2005): 26-31.

Derrida, Jacques. *Of Grammatology*. 1st American ed. Baltimore: Johns Hopkins University Press, 1997.

Devmaster.net. “3d Engines Database.” (2005), http://www.devmaster.net/engines/list.php. (February 28, 2006).

Entertainment Software Association. “2005 Sales, Demographics and Usage Data: Essential Facts about the Computer and Video Game Industry.” Entertainment Software Association (2005), http://www.theesa.com/files/2005EssentialFacts.pdf. (February 28, 2006).

Federation of American Scientists. “Discover Babylon.” (2005), http://www.discoverbabylon.org/. (June 30, 2006).

Fiore, Steven M., Rudy McDaniel, Adams Greenwood-Ericksen, Sandro Scielzo, Alicia Sanchez, Janis A. Cannon-Bowers, and Carol Mundy. “Developing Games-based Learning Environments for the Humanities.” (Paper presented to the Metro Orlando Urban League, Orlando, FL, December, 2006).

Gee, James Paul. *What Video Games Have to Teach Us About Learning and Literacy*. New York: Palgrave Macmillan, 2003.

Gillespie, Thom. “Grand Theft Auto, the Video Game Everyone Loves to Hate, Allows Ethics and Morality Lessons.” Technos: Quarterly for Education and Technology (Winter 2002), http://www.findarticles.com/p/articles/mi_m0HKV/is_4_11/ai_97297270. (June 30, 2006).

Lee, James. “Wage Slaves.” 1Up.com (July 5, 2005), http://www.1up.com/do/feature?cId=3141815. (June 30, 2006).

McLuhan, Marshall. *Understanding Media: The Extensions of Man*. New York: McGraw-Hill, 1965.

Mundy, Carol. “African American History Education and Culture.” (2005), http://www.mundyhr.com/. (June 30, 2006).

Myers, David. “Guest Editorial: Video Games: Issues in Research and Learning.” *Simulation & Gaming* 36, no. 4 (2005): 442-46.

Partnership for Research on Synthetic Experience. “PROSE Team Overview.” (2005), http://www.cas.ucf.edu/create/technology_prose.php. (June 30, 2006).

Prensky, Marc. *Digital Game-Based Learning*. New York: McGraw-Hill, 2001.

Sawyer, Ben. 2002. Serious Games: Improving Public Policy through Game-Based Learning and Simulation. Foresight and Governance Project, Woodrow Wilson International Center for Scholars, http://www.seriousgames.org/images/seriousarticle.pdf. (June 24, 2006).

Wikipedia. “Mod (Computer Gaming).” *WikiPedia: The Free Encyclopedia* (2006), http://en.wikipedia.org/wiki/Mod_(computer_gaming). (February 28, 2006).

keywords

serious games, serious game design, game design, instructional strategies, instructional design, design formalism, educational rubric

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A Case for a Formal Design Paradigm for Serious Games

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Abstract

We are witnessing a mad rush to pour educational content into games in an ad hoc manner in hopes that players are motivated to learn simply because the content is housed inside a game. A failure to base serious game design on well-established learning theories as proposed by well-respected educators like Robert Gagné and James Keller, increases the risk of the game failing to meet its intended educational goals, yielding a player base who is entertained, but who have not acquired new skills or knowledge. Well-developed video games certainly engage players, but games designated as educational are not always based on sound educational principles and theories, thereby potentially losing power as an educational tool. We contend that if content learning is to take place as a result of playing serious games, a new design paradigm must be developed. We also contend that educational effectiveness needs to be integrated as a goal from the start of the design process and that sound educational practices need to be formally incorporated into all serious games.

Introduction

Serious games have become an educational trend. While we agree with James Gee[1] that learning always takes place in well-constructed games, we contend that if content learning is to take place as a result of playing serious games, a new design paradigm must be developed. We also contend that educational effectiveness needs to be integrated as a goal from the start of the design process and that sound educational practices need to be formally incorporated into all serious games.

We are witnessing a mad rush to pour educational content into games or to use games in the classroom in an inappropriate and ad hoc manner in hopes that players are motivated to learn simply because the content is housed inside a game. A failure to base serious game design on well-established and practical instructional theories as proposed by well-respected educators like Robert Gagne and James Keller increases the risk of the game failing to meet its intended educational goals, yielding a player base who is entertained but who has not acquired new skills or knowledge. Well-developed video games certainly engage players, but games designated as *educational* are not always based on sound educational principles and theories, thereby potentially losing power as an pedagogical tool. If educational games are to succeed in being truly educational, a formal design paradigm that embraces both didactic and good design principles needs to be integrated at the beginning of the process of building the games.

This paper calls for a systematic implementation of well-established and appropriate instructional principles into the design of serious games, ensuring that the conceptual framework for developing content, curriculum, and best practices are embedded at a fundamental level and with educational soundness as the underlying skeletal lynchpin. Such a paradigm allows an easier assessment and verification of educational effectiveness and should provide a common ground for game designers and educators to collaborate, to allow game designers to more effectively add educational content to games and, conversely, to allow educators to more effectively incorporate games into their curricula.

1 James Gee, *What Video Games Have To Teach Us About Learning and Literacy* (New York: Palgrave McMillan, 2003).

Which Theory to Put into Practice

Deciding on which educational or instructional theories to follow is complicated. There may be as many educational theories as there are learners. While certain aspects of how today's digital students learn have changed, the basic approaches to learning have not–especially for those things that students need to retain, such as the acquisition of literacy, meta-learning principles like basic numeric manipulation, science, social interaction, information mining, and communication. After an extensive search through the literature, we have found three theories that appear to most closely align with generally accepted game design principles: Keller's ARCS Motivational Model, Gagne's Events of Instruction, and Bloom's Taxonomy. In this paper, we will review all three and analyze them against current game design 'best practices' in an attempt to codify and cross-reference the best of both into a unique design rubric specifically conceived for serious games.

Educational research builds the foundation for the development of sound instructional strategies. Similarly, in order to enhance learning, each new educational game should be based on learning theory and educational research. Educators have shown that the use of instructional theories has been shown to enhance learning and increase motivation and student achievement. Which theory you use depends on what you want to teach, how you want to teach it, and to whom you are teaching. The latter is very important because today's digital students learn differently from previous generations and they are motivated in ways that are atypical to traditional ways of thinking. The question is how do we make the leap between learning theory and serious games in order to increase the efficacy of the medium and to empower students who are motivated by different means and who think, perceive, and learn differently?

Robert Gagne, a psychologist, educator, and instructional theorist is known for his contributions in the area of cognition and instructional theory. Instructional theory looks to understand under what conditions learning takes place. Gagne was very influential in the development and design of formal instructional systems, which borrow many of the principles of systems design (analysis, design, development, implementation, and evaluation), and materials and initiatives commonly used in training for inventory and logistics support for the military.

Gagne's instructional theory has three major components. The first component was based on a taxonomy or

classification of learning outcomes.[2] He recognized that learners must go through a hierarchy of skills from simple to complex and identified five areas of learning outcomes he felt were crucial to successful learning; they are cognitive strategies, verbal information, intellectual skills, motor skills, and attitudes. Second, he proposed that particular internal and external conditions must be met in the instructional cycle for achieving the desired learning outcomes. Different types of learning require a variety of conditions that are appropriately matched to the particular learner and can effectively bring about the outcome of learning. In others words, instructional designers must match strategies to the interactive instructional conditions found in the game environment. Third, he developed what he labeled the *Nine Events of Instruction* that serve as a guide for developing and delivering a unit or units of instruction.

Gagne's Events of Instruction

In his book, *The Conditions of Learning*, Robert Gagne[3] identified nine mental conditions for learning (known as Events of Instruction). Gagne sought to understand what processes were necessary for individuals to internalize what is being taught. Gagne developed three principles that he considered essential for successful instruction:

- Providing instruction on the set of component tasks that build toward a final task
- Ensuring that each component task is mastered
- Sequencing the component tasks to ensure optimal transfer to the final task[4]

For example, a teacher must teach phonics, the basic form of literacy, or alphabet recognition in order for students to then read words. Only after students learn to interpret or read words, can they then learn to read a sentence, and then two sentences, and then a paragraph, and so on. Gagne's skill-building hierarchies fit very well into the increasing level of challenge model already followed in successful serious game design and that they easily lend themselves to become the basis for standard practice.

Careful preparation must take place so that learning is optimal and instruction can be broken down into meticulously designed lessons. Gagne believed that a variety of internal and external conditions must be present for learning to occur and he also believed that learning results in observable behavior. The internal conditions can be described as situations that include attention, motivation, and recall. The external conditions are the factors surrounding a person, such as timing and place. The observable behavior is the result of the internal process of learning. As per Gagne there are nine events that stimulate the processes required for learning to take place and be effective. According to Gagne's theory, employing these sequenced steps would assure that the learner mastered the desired content and learning objectives. Gagne's framework has been modified for a variety of educational settings. These adaptations became the foundations for multimedia authoring software programs like Linkway, HyperStudio, and HyperCard during the late 1980s and early1990s. We feel this framework would also be a perfect fit in the development and design of serious games.

The Nine Events of Instruction that Gagne believed all instructional strategies and lessons should include:

1. Gain the learners attention
2. Inform the learners of the objectives
3. Stimulate recall of prior learning
4. Present stimulus or lesson
5. Provide learning guidance and instruction
6. Elicit performance
7. Provide feedback
8. Assess performance
9. Enhance retention and transfer

Following this research, Benjamin Bloom,[5] also an educational psychologist, conducted research in student learning. Bloom and other psychologists sought to classify learning behaviors to understand better how knowledge is gained. Bloom classified learning into three domains: cognitive, affective, and psychomotor. Bloom defined the cognitive domain as a student's intellectual level–that is, what a student knows and how they organize ideas, opinions, and thoughts. Bloom explained the affective domain as a student's emotions, interests, attitude, attention, and awareness. Lastly, he categorized the psychomotor domain as one that includes a student's motor skills and physical

2 Marcy P. Driscoll, *Psychology of Learning for Instruction*, 3rd ed. (New York: Allyn & Bacon, 2005).
3 Robert Gagne, *The Conditions of Learning,* 4th ed. (New York: Holt, Rinehart & Winston, 1985).
4 Gary B. Shelley et al., *Teachers Discovering Computers: Integrating Technology and Digital Media in the Classroom*, 4th ed. (Boston, MA: Course Technology, 2006).

5 Benjamin S. Bloom, *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain* (New York: David McKay Co Inc, 1956); David R. Krathwohl. Benjamin S. Bloom, and Barbara M. Bertram, *Taxonomy of Educational Objectives, The Classification of Educational Goals. Handbook II: Affective* Domain (New York: David McKay Co., Inc., 1974).

Competency	Skills
Knowledge	Learner can recall information.
Comprehension	Learner can explain and predict.
Application	Learner can solve problems and use information.
Analysis	Learner can see patterns or concepts and organizational structure may be understood.
Synthesis	Leaner can build a structure, put parts together to form a whole, with emphasis on creating a new meaning or structure.
Evaluation	Learner can compare and make judgments about the value of ideas or materials.

Figure 2. Bloom's Taxonomy

abilities. All of these domains can overlap in learning activities and are integrated throughout learning experiences.

Bloom was determined to develop a practical means for classifying curriculum goals and learning objectives. Many educators continue to develop curriculum goals, learning objectives, and specific learning activities with these three domains in mind. Educators are responsible for planning curriculum activities that support what students already should know (anchored instruction) and what they should learn (extending the learning experience). Educators create their instructional methods based on state standards, learning objectives, and learning theories. Teachers often organize skills they want students to acquire using a scaffolding effect from simple to complex. Within the cognitive domain, Bloom identified six levels that can be used to acquire knowledge about a topic. The levels move from simple to complex and are designed to increase a student's comprehension. These levels commonly are referred to as Bloom's Taxonomy (see Figure 2).

Many teachers may not realize they are creating instructional lessons and plans that only challenge students range within the first two levels. For instance, if students are learning about computers and then are asked to name only the parts and describe what they do, the activity has stayed in the Knowledge and Comprehension levels. If students are asked to propose how computers have changed their lives, the assignment has moved to the Analysis level.

The taxonomy provides a useful structure in which to categorize learning and strategize learning, since educators generally characteristically develop questions and lessons with particular level in mind. Developing game content, questions, and levels of inquiry using a taxonomy or hierarchy such as this that is based on appropriate instructional theory creates a new paradigm for instructional game design that benefits from instructional theory.

Bloom's Taxonomy has been linked to mastery learning,[6] which is defined as a model for learning in which students continue to gain information and knowledge, working through activities, content or teacher instruction only after they have mastered the content of the previous lessons, activities, and/or modules. Bloom demonstrated through his research that all students can learn a subject given sufficient time and motivation. According to Bloom, the critical ingredient is changing instructional methods by providing ample time and proper feedback so students can master the content.

Keller's ARCS Model

One of the shortcomings of many instructional theories is that they begin with an assumption that the learner is already generally ready to learn and/or is already motivated to learn specific content. Motivation is a necessary but insufficient condition needed to ensure that learners actually learn something. Even the most sophisticated instructional program will fail if students are not motivated. Without a desire to learn, retention, let alone any other level of learning, is unlikely to occur. Instructional designers must strive to motivate learners so that they learn new skills and transfer them to newly acquired knowledge (that is Gagne's ninth event of instruction: enhance retention and transfer).

6 James H. Block, *Mastery Learning: Theory and Practice* (New York: Holt, Rinehart & Winston, 1971). David Levine, *Improving Student Achievement Through Mastery Learning Programs* (San Francisco: Jossey-Bass, 1985).

James Keller, another educational psychologist who was a contemporary and colleague of Robert Gagne at Florida State University, devised a motivational model based on a synthesis of existing research on psychological motivation.[7] The ARCS model relies on four foundational categories applied to the design of instructional activities: Attention, Relevance, Confidence/Challenge, and Satisfaction/Success.

Attention: The first aspect relates to gaining and keeping the learner's attention. Strategies include initiating the instructional event with some sort of sensory stimuli, through an inquiry arousal (i.e., a series of thought provoking questions), and/or variability (such as varying the kinds of media or inquiry-based activities used). Much debate about motivation and attention throughout the twentieth century[8] surrounded the concept of arousal and its relationship to limited capacities[9] and cognitive load[10].

Relevance: Simply put, learners need to be able to understand implicitly how the activity relates to their current situation, and/or to them personally. This is the first step in most instructional design models that rely on an understanding of learner attributes as a part of the analysis process.

Confidence/Challenge: This fundamentally paves the way for learners to feel that it is worth it to put forth a good faith effort into participating in the activity. However, the activity cannot be perceived as either too hard or too easy. If learners believe they are, somehow, incapable of achieving the objectives or that they will be wasting their time because it will take too long, or, conversely, that the challenge is beneath them, their motivation will most assuredly decrease.

Satisfaction/Success: Learners must attain some type of satisfaction or reward from the learning experience. Attribution Theory[11] contends that learners must also be able to attribute successful completion of the activity from their own efforts. Judging success is a subjective evaluation that can be as simple as being happily entertained or enjoying a sense of achievement or accomplishment. *Attribution* plays a role in what Bandura[12] referred to as *self-efficacy*–a person's belief about his or her own capabilities to produce the intended effect. Being self-assured as to one's accomplishments is directly tied to whether the learner can attribute that success to one's own efforts and their ability to find their newly learned skills can be applied in other areas. Satisfaction can also be promoted through external rewards in the form of a passing grade, a high score relative to others, or a reaction by another person or mediated agent.

Keller never intended for his model to stand apart as a separate system for instructional design, but one that would

7 John M. Keller, "Motivational Design of Instruction," in *Instructional Design Theories and Models: An Overview of Their Current Status*, ed. Charles M. Reigeluth (New York: Lawrence Erlbaum, 1983), 383-434; John M. Keller, "Using the ARCS process in CBI and Distance Education," in *Motivation in Teaching and Learning: New Directions for Teaching and Learning*, ed. Michael Theall (San Francisco: Jossey-Bass, 1998); John M. Keller "Motivational Design of Instruction," in *Instructional Design Theories and Models: An Overview of Their Current Status,* ed. Charles M. Reigeluth (New York: Lawrence Erlbaum, 1983), 383-434; John M. Keller and Thomas W. Kopp, "Application of the ARCS Model to Motivational Design," in *Instructional Theories in Action: Lessons Illustrating Selected Theories,* ed. Charles. M. Reigeluth, (New York: Lawrence Erlbaum, 1987), 289 - 320.

8 Glenda A. Gunter and Robert F. Kenny, "Video in the Classroom: Learning Objects or Objects of Learning?" (paper presented at Annual convention, Association for Educational Communications and Technology, Chicago, Illinois, October, 2004); Robert F. Kenny and Glenda A. Gunter, "Digital Booktalk: Pairing Books with Potential Readers" (paper presented at Association for Educational Communications and Technology, Chicago, Illinois, October, 2004). Robert. F. Kenny. *Teaching Television in a Digital World: Integrating Media Literacy,* 4th ed. (Westport, CT: Libraries Unlimited, 2004); Glenda A. Gunter and Robert F. Kenny, "Thinking Out of the Hexagon—Digital Media in the Classroom" (paper presented at the annual convention of Association for Educational Communications and Technology, Orlando, Florida., November. 2005); Robert F. Kenny and Glenda A. Gunter, "Literacy Through the Arts" (paper presented at the annual Conference of Association for Educational Communications and Technology, Orlando, Florida, November, 2005); Robert M Yerkes, and James D. Dodson, "The Relationship of Strength and Stimulus to Rapidity of Habit Formation," *Journal of Neurological Psychology* 18 (1908): 459-82.

9 Dolf Zillman "Television Viewing and Psychological Arousal," in *Responding to the Screen: Reception and Reaction Processes,* ed James. Z. Bryant (Hillsdale, NJ: Lawrence Erlbaum Associates, 1991), 103-133; Dolf Zillman and Hans Brosius, *Exemplification in Communication* (Mahwah, NJ: Lawrence Erlbaum Associates, 2000).

10 James Sweller. *Instructional Design in Technical Areas* (Camberwell, Victoria, Australia: Acer Press, 1999).

11 Bernard Weiner, *Achievement Motivation and Attribution Theory* (Morristown, N.J.: General Learning Press, 1974); Bernard Weiner, *Human Motivation* (New York: Holt, Rinehart & Winston, 1980); Bernard Weiner, *An Attributional Theory of Motivation and Emotion* (New York: Springer-Verlag, 1986).

12 Albert Bandura, *Social Foundations of Thought and Action* (Englewood Cliffs, NJ: Prentice-Hall, 1986).

be incorporated in accordance with instructional models and history such as Gagne's Events of Instruction[13] which makes a cross-reference to Gagne a fairly straight-forward task (see Figure 3 below).

Keller's model attempted to fill a glaring hole that reduced the effectiveness of most educational theories. Most educational theories overlook the fact that there is no assurance that a student may be generally motivated to learn but may not be motivated to learn the specific instructional content introduced by an educational activity. Further, instructional designers cannot assume they understand the learners' motivation. To analyze needs, the designer should understand how to encourage students to come to the same conclusions as to the values, interests, motivation, and content as set by the learning objectives of a particular lesson. Over the years, many follow-on strategies have been developed to turn Keller's model into practice.

Dempsey and Johnson[14] proposed using a rubric when applying the ARCS model to select and analyze games they were developing. Their scale (see Figure 3) adds practical application to the theoretical foundations proposed by Keller:

Karoulis & Dmetriadis[15] discussed certain aspects of the ARCS model and proposed adhering to it in any educational activity. Most of these characteristics can be correlated directly into serious game design and can serve as a measurable and objective design and development checklist for serious game developers. These features are referred to as *representations* in the literature and provide practical applications and implementations of Keller's theoretical construct.[16]

Among the representations are:

- Arousing one's curiosity and interest
- A perception that accomplishing something is personally important
- Being able to relate the activity to a highly desired goal
- Expecting to be ultimately successful
- The compatibility to anticipated goals
- Content/concepts are easy to understand
- Opportunity to create something personal
- Layered/scaffolded challenges
- Challenging the imagination by creating a fantasy (extrinsic & intrinsic)
- Timely and accurate feedback (formative & summative)
- Perceived ability to control one's own destiny
- Pattern recognition (cognitive modeling)
- The perception of freedom
- Establishing a reward system
- Relating and applying the activity to the learner's real world context
- Fidelity in graphics design

It would seem that the correct and appropriate manipulation of any of the above attributes can lead to an enhanced motivation on the part of the learner for the educational activity.

Harlow classified two broad motivational categories that have been applied to instructional activities that also cor-

13 Robert Gagne, *The Conditions of Learning,* 4th ed. (New York: Holt, Rinehart & Winston, 1985). Robert Gagne, *Instructional Technology Foundations* (Hillsdale, NJ: Lawrence Erlbaum, 1987). Robert Gagne, Linda Briggs, and William Wager, *Principles of Instructional Design,* 4th ed. (New York, Holt, Rinehart and Winston, 1992).

14 John V. Dempsey and Robert B. Johnson, "The Development of an ARCS Gaming Scale," *Journal of Instructional Psychology,* 25, 4 (1998): 215-221.

15 Athanasis Karoulis and Savvas Demetriadis, "Motivation and Representation in Educational Games,"in, *Interaction Between Learner's Internal and External Representations in Multimedia Environment, State-of-the-Art Report,* ed. Stavros Demetriadis. (Kaleidoscope NoE, D21-1-1, 2004), 296-312.

16 Shaaron Ainsworth and Nancy VanLabeke, "Multiple Forms of Dynamic Representation," *Learning and Instruction,* 14, 3 (2004): 241-255: Diana I. Cordova and Mark R. Lepper, "Intrinsic Motivation and the Process of Learning: Beneficial Effects of Contextualization, Personalization, and Choice," *Journal of Educational Psychology,* 88, 4 (1996): 715-730; Thomas W. Malone, "What Makes Things Fun to Learn? A Study of Intrinsically Motivating Computer Games," *Technical Report* (Palo Alto, California: Xerox Palo Alto Research Center, 1980a); Thomas W. Malone, "What Makes Things Fun to Learn? Heuristics for Designing Instructional Computer Games," (proceedings of the 3rd ACM SIGSMALL symposium and the first SIGPC symposium on Small systems, Palo Alto, California, 1980b): 162-169; Jette Van der Meij and T. de Jong, "Examples of Using Multiple Representations,".in *Interaction Between Learner's Internal and External Representations in Multimedia Environment, State-of-the-Art Report,* ed. Savvas Demetriadis (Kaleidoscope NoE, D21-1-1, 2004): 66-80.

Major Category	Sub-category	Instructional Questions
Attention	Perceptual Arousal Inquiry Arousal Variability	1. What can I do to capture their interest? 2. How can I stimulate an attitude of inquiry? 3. How can I maintain their attention?
Relevance	Goal Orientation Motive Matching Familiarity	1. How can I best meet my learner's needs? (Do I know their needs?) 2. How and when can I provide my learners with appropriate choices, responsibilities and influences? 3. How can I tie the instruction to the learners' experiences?
Confidence/ Challenge	Learning Requirements Success Opportunities Personal Control	1. How can I assist in building a positive expectation for success? 2. How will the learning experience support or enhance the students' beliefs in their competence? 3. How will the learners clearly know their success is based upon their efforts and abilities?
Satisfaction/ Success	Natural Consequences Positive Consequences Equity	1. How can I provide meaningful opportunities for learners to use their newly-acquired knowledge/skill? 2. What will provide reinforcement to the learners' successes? 3. How can I assist the students in anchoring a positive feeling about their accomplishments?

relate to serious game design: process and reward.[17] Process comprises the actual participation in any activity, such

Figure 3 Major Categories and Subcategories of Keller's ARCS Model[18]

as the enjoying interaction and interface with the media, enjoying the increasing level of expertise, immersing and suspending the disbelief, taking pleasure in the mechanics of interacting with that content, and feeling satisfaction or success through gains from the process of interacting. The reward may be intrinsic or extrinsic, be applied at the completion of participation, and set the stage for further engagement.

RETAIN: A Design Model for Serious Games

Game design can be defined as the formal methods for the specification and planning of content and features for video games. The goal of these methods is to maintain intellectual control of the elements of the development process that lead to an immersive and entertaining game (e.g., to create a roadmap that describes the implementation).

Many assume that incorporating educational content into a video game will automatically succeed, both in achieving a fun game and in meeting educational goals. More to the point, many educators claim that a video game can provide the motivation required for learning simply because it is a video game. This is a new instance of the same error that Keller set out to correct. In terms of video games, while players may generally be motivated towards playing video games, there is no assurance that that they are motivated to learn what the game is proposing to teach. Further, it is a mistake to assume that all video games are motivating and fun.

In the game industry, a conservative estimate of the odds of any particular game design getting a green light for development and release are one in a thousand. The implication is that the other nine hundred and ninety nine games are found lacking in the attributes that lead to a successful game. While it is true that the metrics for success in the game industry are monetary, these metrics are a reflection of the game's motivational power to engage players. In other words, only one in one thousand game designs are motivating and of those that are found to be motivating, many still wither on the vine. Therefore, the assumption that a game will succeed due to its innate nature is fallacious.

17 David Harlow, "Games as an Educational Tool," Gamedev.net (2004). http://www.gamedev.net/reference/articles/article2082.asp (February 24, 2006).

18 John V. Dempsey and Robert B. Johnson, "The Development of an ARCS Gaming Scale," *Journal of Instructional Psychology,* 25, 4 (1998): 215-221.

Similarly, many game designers and educators alike assume that learning always occurs in successful games. This may be true at a vacuous level, but one must ask: What is the relevance of learning that orcs have thirty-seven hit points more than hobgoblins? What is the relevance of learning how to defeat *über* sub-boss number seventeen in the big fight scene? More to the point, one must question how relevant, targeted learning may be included in video games without interfering with the game's entertaining content.

James Gee[19] suggests that thirty-six meta-learning principles are found in all games (serious or otherwise). Similar to Kiefaber's[20] arguments that gaming is inherently social, Gee proposes that playing games can be closely linked with building relationships and social hierarchies. Games are really social activities to the extent that the game itself often becomes secondary to the social experience. Gee also suggests that, when asked, most gamers will tell you that the main enjoyment they gain out of playing a game is the ability to become immersed in a world that they have a hand in creating, providing a sense of self-control and self-determination.

What is the relevance of learning that orcs have thirty-seven hit points more than hobgoblins?

The idea that interacting with media is inherently a social activity is not new. In the mid 1990s, Reeves and Nast[21] developed a series of research-based propositions to support notions of the social aspects of interacting with new media. If interfacing with computers and other media can be likened to interacting with people, then it follows that developing an instructional design basis for games can be likened to designing instructional activities for learners.

19 James Gee, *What Video Games Have to Teach Us About Learning and Literacy* (New York: Palgrave McMillan, 2003).
20 Matt Kiefaber. *Implications of Online Gaming.* (1998). http://www.units.muohio.edu/psybersite/cyberspace/onlinegames/index.shtml, (February 24, 2006).
21 Byron Reeves and Clifford Nast, *The Media Equation: How People Treat Computers, Television, and New Media Like Real People and Places* (Palo Alto, California: Center for the Study of Language, 1996).

The problem centers on deciding which learning theory to follow, as there certainly are as many theories around as there are learners.

Serious game design, then, is the formal methods for the specification and planning of both educational and fun content and features that support both the game play and educational goals of serious video games. The goal of serious game design is similar in nature to that of entertainment games, but is more complex, in that not only must one maintain intellectual control of the design elements that lead to a fun and engaging game, but one must also plan instructional elements that lead to a fun, engaging, and *educational* game experience. To be sure, instructional strategies and learning theories must be included in these formal methods.

More to the point, one must question how relevant, targeted learning may be included in video games without interfering with the game's entertaining content.

As Rouse[22] states, there are as many methods for producing a game design as there are game designers. However, these methods derive from the fundamental principles that are ubiquitous to games: suspension of disbelief, increasing dramatic tension, semiotics, system theory, software engineering, interactivity, engagement, and choice design. These strategies also describe the fundamental principles required to support an educational game, however, the methods based on these principles require an expanded focus.

In order to create an educationally successful game, one must define the game's (or designer's) focus, that is, the essence of what the game is about[23] at the beginning of the game design process. For a serious game, this need does not diminish. The focus frames the game's semiot-

22 Richard Rouse, *Game Design: Theory and Practice* (Plano, TX: Wordware Publishing, Inc., 2001).
23 Ibid.

ics and provides the context for the design. For serious games, however, this designer's focus is necessary but insufficient. In addition to the designer's focus, a didactic focus is required for serious game design. To wit, one must know the semiotics and context for the entertainment the game is to provide and the semiotics and context for the education the game is to provide.

Salen & Zimmerman[24] define play as the navigation of a suite of choices (i.e., decisions), where each decision leads to an action that has a discernable outcome and therefore game design boils down to the process of creating a set of critical choices that reinforce the focus of the game and communicate to the player how to advance the game. This visualization goes to the root of designing interaction.

The Multivalent Model of Interactivity establishes four modes of interactivity as related to games[25]. These modes are: Cognitive Interactivity (the psychological, emotional, and intellectual engagement of the player), Functional Interactivity (the structural interactions with material components of the system), Explicit Interactivity (participation with designed choices), and Beyond-the-Object Interactivity, (the participation in the culture of the game outside the direct experience of game play). While many entertainment games are successful targeting only the functional, explicit, and beyond-the-object modes of interactivity, serious game also require designs that support cognitive interactivity

In instructional design, the application of an instructional strategy as described by researchers like Gagne, Keller, and Bloom supports cognitive interactivity. Therefore, in serious game design, an application of an instructional strategy will enable cognitive interactivity as well.

The Relevance Engagement Translation Assimilation Immersion Naturalization (RETAIN) model for serious game design is an apposite use of Gagne's Events of Instruction, Keller's ARCS model and the scaffolding principle found in Bloom's Taxonomy. Given the fact that Gagne's Nine Events were the result of work performed while studying simulation as a tool of education, it follows that the events have a natural application in video game structure. Keller's ARCS model can be similarly adapted to design of game events or encounters. Bloom's Taxonomy can be applied to enhance retention and transfer in the game context.

A subset of the Events of Instruction already occurs in game design. However, it does not appear that an equivalent in Common Game Elements for entertainment games (as shown in Figure 4) exists for the third Event of Instruction (stimulate recall) or the ninth event (retention and transfer) that keeps the spirit of Gagne's work. The other seven Instructional Events all have corresponding Game Element complements. As with the set of fundamental principles of game design described above, some of these common game elements require an expanded focus in serious game

Gagne's Nine Events	Keller's ARCS Model	Common Game Elements
Gain Attention	Attention	Scenario exposition
Inform of Objectives		Problem Setup
Stimulate Recall	Relevance	No existing game equivalent
Present Stimulus / Lesson		Offer Challenge / Choice
Provide Learner Guidance	Confidence / Challenge	Provide Direction
Elicit Performance		Elicit Action / Decision
Provide Feedback	Satisfaction / Success	Discernable Outcome
Assess Performance		Success / Failure screens
Retention and Transfer		No existing game equivalent

Figure 4 Comparing Gagne's Events of Instruction, Keller's ARCS Model, and common game design elements

24 Katie Salen and Eric Zimmerman, *Rules of Play: Game Design Fundamentals* (Cambridge, MA: The MIT Pres, 2004).
25 Ibid.

design, but the similarity between the instructional models and the game elements is a strong argument for the adoption of these three strategies in serious games.

A mapping to Keller's ARCS model is more complete on its face, but to capture the spirit of Keller's model as a model of motivation for learning, some expansion of existing elements must occur. In an entertainment-based video game, the player's attention can be gained via traditional game elements (e.g., a dramatic hook, increasing tension, cutscenes, and/or music). In the design of a serious game, however, simply gaining the player's attention is insufficient. The scenario exposition and problem setup must be expanded to include some type of advanced organizer[26] to introduce relevant, educational content for the lesson.

A distinction of the relevance category of Keller's model that is often lost in translation is that the activity must be relevant to the learner and be relevant to previous instructional events. Continuity of information flow is a critical part of Gagne's events of instruction. A serious game design must take into consideration both of these concepts, especially as it relates to providing relevance to previously learned concepts from previous attempts to play the game.

The challenge provided by a video game must be attainable, just as in Keller's ARCS model. In fact, given player's expectations[27] and the concept of meaningful play as defined by Salen and Zimmerman[28] it is arguable that there is no difference between the requirements of the Challenge category of the ARCS model, Gagne's Events Five and Six, and the tenets of game design. Therefore assimilation of these principles into serious game design is unnecessary–they are already there.

The same argument may be extended to the Success category of the ARCS model with the exception that any player failures in the pedagogic realm must include attribution to the player and assistance in overcoming the shortfall. That is to say, players they should not believe they were unable to succeed in a given didactic task merely because the game "cheated" or otherwise blocked their success. As attribution is definitely a necessary prerequisite for eventual success and confidence, self-efficacy plays a very important role.[29]

26 David Ausubel, *The Psychology of Meaningful Verbal Learning* (New York: Grune & Stratton, 1963).
27 Richard Rouse, Game Design: *Theory and Practice* (Plano, TX: Wordware Publishing, Inc., 2001).
28 Katie Salen and Eric Zimmerman, *Rules of Play: Game Design Fundamentals* (Cambridge, MA: The MIT Pres, 2004).
29 Albert Bandura, *Social Learning Theory* (New York: General Learning Press, 1971).

Gagne's Nine Events of Instruction are traditionally used to describe an individual lesson, but these events can be used to describe a curriculum as a whole. When used to describe a curriculum, the presentation of the lesson activity can be expanded to include multiple lessons, each described by the nine events. In this manner, Gagne's Events of Instruction describe both a successful game and individual units of game play (i.e., the game as a whole and the levels that compose the game). Thus a formal structure for serious game design emerges:

> Provide a Game Focus / Hook—describe the essence of the game and provide an entry point for game play
> Provide a Didactic Focus-define the subject matter to be taught during game play and provide an entry point for instruction
> Provide references to beyond-the-object reference sources which inform the pedagogic content development for the game
> Introduce a Game Progression (via units of game play—levels, modes, etc.)-define the game units as described below
> Define the critical path[30] for game play and didactic resolution
> Define pedagogic elements to be used
> Describe how formative feedback will be distributed during each unit of game play
> Describe how summative evaluation[31] will be distributed during each unit of game play (per individual lesson) and at the conclusion of game play (per the curriculum as a whole)
> Describe how replay will be encouraging to assist in retention and to remediate shortcomings

Similarly, a formal structure of game unit design in serious games:

30 Critical Path is a project management term that relates to a series of tasks that must finish on time and in a specific order so that the entire project is able to complete on correctly and on schedule. Each task in a critical path is known as a critical task.
31 Formative feedback and summative evaluation are both educational terms that describe the content and timing of the feedback given to a student. Formative feedback differs from summative evaluation in many ways. Formative is information gathered for the purpose of improving performance during the process of learning. For example, a teacher may provide corrective feedback during a golf lesson in order for the student to take corrective action. Summative evaluation normally refers to final determination as to whether the student has passed (i.e., met the requirements of) the lesson after all instruction has completed.

- Scenario Exposition (Unit focus)-describe the essence of the game unit and how it is important to the game progression
- Didactic Exposition (Lesson focus)-describe the essence of the lesson and how it is important to the curriculum progression
- Describe the use of backleading, cutscenes, and flashback techniques to bring to mind previous game unit's and lessons, and the use of scaffolding to reinforce retention and transfer of previous lessons to future learning experiences
- Develop the Scenario's Crisis-describe the critical path from the start of the unit to the crisis and describe the resolution of the crisis. Include both game play elements and didactic elements and evaluate their fit to one another
- Provide direction necessary for the resolution of the game unit and the lesson
- Elicit decisions/Create actions-describe how decision making will be elicited during game play and how these choices will instruct and advance the game
- Provide discernable outcomes to each decision and action that support both the didactic and designer's focus
- Provide a summary of performance at the end of the game unit that includes proper attribution for shortfalls and successes. Include descriptions of how remediation will be implemented for failed tasks
- Describe the use of scaffolding in subsequent game units to reinforce the lessons offered in this game unit

Additionally, Gagne's Events of Instruction and Keller's ARCS model should be used in a proactive manner to create game encounters or game events within serious games. Salen & Zimmerman[32] speak of creating designed choices for the player on the game's critical path. The act of creating designed choices resolves into five steps:

- Knowing the state of the game at the outset of the choice
- Determining how the choice will be communicated to the player
- Extrapolating how the player will arrive at his choice
- Determining what the consequences of the decision will be
- Determining how the results will be communicated to the player

These five steps fit nicely within events one through seven of Gagne's Events of Instruction and likewise to Relevance, Confidence and Success in the ARCS model. Therefore, expanding the method for creating designed choices:

- Create a situation that will gain the player's attention via dramatic elements
- Describe the upcoming choice in detail to ensure that the intent of a didactic choice is communicated
- Know the state of the game at the outset of the didactic choice, and further, know the state of the instruction. Additionally, ensure that the placement of this choice is properly scaffolded with other choices
- Determine how the didactic choice will be presented in the context of the game and determine the learning objectives that will be satisfied by this choice
- Extrapolate how the player will arrive at his choice and provide learner guidance during the course of the choice to assist in the acquisition of knowledge
- Determine the consequences of each didactic choice and their impact on the instruction
- Determine how to best assist the player in attribution of the outcomes of these didactic choices and how to assist the player in learning from mistakes
- Describe how the choice affects assessment with regard to learning objectives and describe how this assessment will be communicated to the player
- Describe the linkage of this choice to other choices that will reinforce the lesson and test the transfer of knowledge

Of course, these instructional strategies should also be used as a self-check for serious game design. The design itself should be reviewed to ensure it follows Gagne's Nine Events and Keller's ARCS model. Additionally, the structure of the game progression should be verified against Bloom's Mastery Level theory to ensure players have the opportunity to master the basics before being asked to perform advanced tasks. This practice will help to ensure success and the feeling by players that the learning objectives are possible to achieve. At the same time, learner/players can develop intellectual skills as they progress through different levels.

Conclusions and Future Work

Why not consider the game environment as a learning tool when students are learning about complex concepts? We submit that if instructional strategies are applied concurrent to content development in game design students would quickly adapt to the process of learning and actually enjoy the conditions under which they learned the concepts. Because the RETAIN Model is based on established, well-known, and well-studied instructional design theories, such as Gagne's Nine Events of Instruction, Keller's ARCS Motivational Model, and Bloom's Taxonomy that are embedded

32 Katie Salen and Eric Zimmerman, *Rules of Play: Game Design Fundamentals* (Cambridge, MA: The MIT Pres, 2004).

during the design and construction of the games, better opportunities to teach content to digital, game playing students emerge.

In the future, we intend to further develop this paradigm into a design process for content that ties meta-learning principles and focused learning principles to content development and that allows these principles to be used as assessment tools for evaluation of serious game designs prior to their implementation. While we believe that Gee and his colleagues have successfully demonstrated that games have been very effective in enhancing high-level cognition and learning, much of what Gee is working with is in the affective learning domain. We contend that if content learning is to also take place as a result of playing serious games, the game design must encompass all three learning domains: cognitive, affective and psychomotor, and intend to continue to refine the RETAIN model with explicit methods in this regard. Of course, additional research that evaluates the application of the proposed paradigm to serious game design is called for in the future.

References

Ainsworth, Shaaron and VanLabeke, Nancy. "Multiple Forms of Dynamic Representation". *Learning and Instruction*, 14,3 (2004): 241-255.

Ausubel, David. *The Psychology of Meaningful Verbal Learning*. New York: Grune & Stratton, 1963.

Bandura, Albert. *Social Learning Theory*. New York: General Learning Press, 1971.

Bandura, Albert. *Social Foundations of Thought and Action*. Englewood Cliffs, NJ: Prentice-Hall, 1986.

Block, James H. *Mastery Learning: Theory and Practice.* New York: Holt, Rinehart & Winston, 1971.

Bloom, Benjamin S. *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain.* New York: David McKay Co Inc, 1956.

Cordova, Diana I. and Lepper, Mark R. "Intrinsic Motivation and the Process of Learning: Beneficial Effects of Contextualization, Personalization, and Choice". *Journal of Educational Psychology*, 88, 4 (1996): 715-730.

Dempsey, John V. and Johnson, Robert B. "The Development of an ARCS Gaming Scale". *Journal of Instructional Psychology*, 25, 4 (1998): 215-221.

Driscoll, Marcy P. *Psychology Of Learning For Instruction,* 3rd ed. New York: Allyn & Bacon: 2005.

Gagne, Robert. *The Conditions of Learning*, 4th ed. New York: Holt, Rinehart & Winston, 1985.

Gagne, Robert. *Instructional Technology Foundations*. Hillsdale, NJ: Lawrence Erlbaum, 1987.

Gagne, Robert, Briggs, Linda and Wager, William. *Principles of Instructional Design*, 4th ed.. New York, Holt, Rinehart and Winston, 1992.

Gee, James P. Gee. What Video Games Have To Teach Us About Learning and Literacy. New York: Palgrave McMillan, 2003.

Gunter, Glenda A. and Kenny, Robert F. "Video in the Classroom: Learning Objects or Objects of Learning?" Paper presented at Association for Educational Communications and Technology, Chicago, Illinois, October, 2004.

Gunter, Glenda A. and Kenny, Robert F. "Thinking Out of the Hexagon - Digital Media in the Classroom". Paper presented at the annual convention of Association for Educational Communications and Technology, Orlando, Florida, November, 2005.

Harlow, David. *Games As an Educational Tool*. (2004). http://www.gamedev.net/reference/articles/article2082.asp (February 24, 2006).

Karoulis, Athanasis and Demetriadis, Savvas. "Motivation And Representation in Educational Games". In *Interaction Between Learner's Internal and External Representations in Multimedia Environment, State-Of-The-Art Report*, edited by Savvas Demetriadis. Kaleidoscope NoE, D21-1-1 (2004): 296-312.

Keller, John M. "Using the ARCS Process in CBI and Distance Education" In *Motivation in Teaching and Learning: New Directions for Teaching and Learning,* edited by. Michael Theall (San Francisco: Jossey-Bass,1998).

Keller, John M., and Kopp, Thomas W. "Application of the ARCS Model to Motivational Design" In *Instructional Theories in Action: Lessons Illustrating Selected Theories*. Edited by Charles. M. Reigeluth. New York: Lawrence Erlbaum, 1987, 289 - 320.

Keller, John, M. "Motivational Design of Instruction". In *Instructional Design Theories and Models: An Overview of Their Current Status.* Edited by Charles M. Reigeluth, New York: Lawrence Erlbaum, 1983, 383-434.

Kenny, Robert F. *Teaching Television in a Digital World: Integrating Media Literacy*, 4th ed., Westport, CT: Libraries Unlimited, 2004.

Kenny, Robert F. and Gunter, Glenda A. "Digital Booktalk: Pairing Books with Potential Readers". Paper presented at Association for Educational Communications and Technology, Chicago, Illinois, October, 2004.

Kenny, Robert F. and Glenda A. Gunter, Glenda A. "Literacy Through the Arts". Paper presented at the annual Conference of Association for Educational Communications and Technology, Orlando, November, Florida, 2005.

Kiefaber, Matt. *Implications of Online Gaming*. (1998). http://www.units.muohio.edu/psybersite/cyberspace/onlinegames/index.shtml, (February 24, 2006).

Krathwohl, David R., Bloom, Benjamin S., and Bertram, Barbara M. *Taxonomy of Educational Objectives, the Classification of Educational Goals. Handbook II: Affective domain.* New York: David McKay Co., Inc., 1974.

Levine, David. *Improving Student Achievement Through Mastery Learning Programs*. San Francisco: Jossey-Bass, 1985.

Malone, Thomas. W.. "What Makes Things Fun to Learn? A Study of Intrinsically Motivating Computer Games". *Technical Report.* (Palo Alto, California: Xerox Palo Alto Research Center, 1980a).

Malone, Thomas W. “What Makes Things Fun to Learn? Heuristics for Designing Instructional Computer Games”. (proceedings of the 3rd ACM SIGSMALL symposium and the first SIGPC symposium on Small systems, Palo Alto, California, 1980b), 162 – 169.

Prensky, Marc. “Digital Game-Based Learning”. *Computers in Entertainment*, 1,1 (2003).

Reeves, Byron and Nast, Clifford. *The Media Equation: How People Treat Computers, Television, and New Media Like Real People and Places*. Palo Alto, California: Center for the Study of Language, 1996.

Rouse, Richard. *Game Design Theory and Practice*, Plano, TX: Wordware Publishing, Inc., 2001.

Salen, Katie and Zimmerman, Eric. *Rules of Play: Game Design Fundamentals*, Cambridge, MA: The MIT Pres, 2004.

Shelley, Gary B., Cashman, Thomas J., Gunter, Randolph E., and Gunter, Glenda A. *Teachers Discovering Computers: Integrating Technology And Digital Media in the Classroom,* 4th ed. Boston, MA: Course Technology, 2006.

Sweller, James. *Instructional Design in Technical areas*, Camberwell, Victoria, Australia: Acer Press, 1999.

Van der Meij, Jette and de Jong, T. “Examples of Using Multiple Representations”. In *Interaction Between Learner’s Internal and External Representations in Multimedia Environment, State-Of-The-Art Report*. Edited by Savvas Demetriadis, Kaleidoscope NoE, D21-1-1, 2004, 66-80.

Walker, Henry M. “Do Computer Games Have A Role in the Computing Classroom?” *Inroads-The SIGCSE Bulletin*, 35, 4 (2003): 18-20.

Weiner, Bernard. *Achievement Motivation and Attribution Theory*. Morristown, N.J.: General Learning Press, 1974.

Weiner, Bernard. *Human Motivation*. New York: Holt, Rinehart & Winston, 1980.

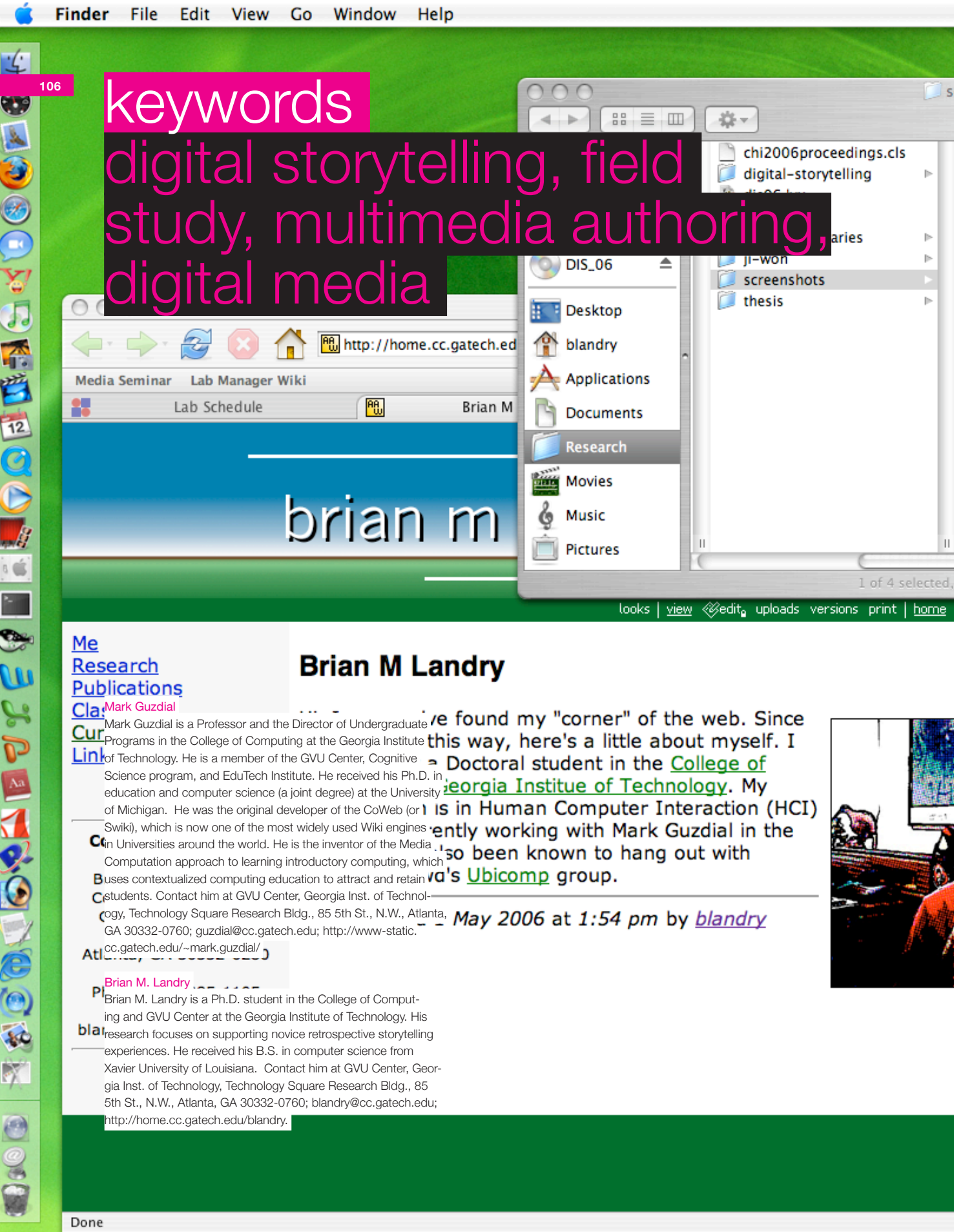
Weiner, Bernard. *An Attributional Theory of Motivation And Emotion*. New York: Springer-Verlag, 1986.

Yerkes, Robert M. and Dodson, James D. “The Relationship of Strength and Stimulus To Rapidity of Habit Formation”, *Journal of Neurological Psychology* 18 (1908): 459-82.

Zillman, Dolf. “Television Viewing and Psychological Arousal”. In *Responding to the Screen: Reception and Reaction Processes*. Edited by James. Z. Bryant . Hillsdale, NJ: Lawrence Erlbaum Associates, 1991, 103-133.

Zillman, Dolf. and Brosius, Hans. *Exemplification in Communication*. Mahwah, NJ: Lawrence Erlbaum Associates, 2000.

keywords
digital storytelling, field study, multimedia authoring, digital media



Learning from Human Support: Informing the Design of Personal Digital Story-Authoring Tools

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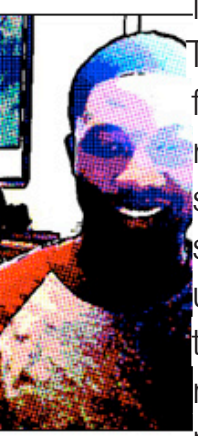
Abstract

Everyone has a personal story to tell. These stories are often captured in the photos and video we take to record and share our experiences. This paper examines the support mechanisms used by the Center for Digital Storytelling (CDS) to help everyday people unlock the stories captured in their images and video through the practice of digital storytelling. We conducted a field study of the digital storytelling workshop offered by CDS and discovered composing digital narratives using personal media requires a significant amount of storytelling and technical support. We present observed challenges (story development, content preparation, movie production, and process management) to creating digital narratives and then abstract a set of lessons learned from the human support CDS provides for creating personal narratives using digital media. We then consider how software designers might capitalize on our observations to provide similar support in software.



Introduction

Storytelling performs a critical function in society, serving as a "dialog between people, cultures, and times."[1] It began as an oral tradition, evolved into a written practice, and has now integrated digital media as "digital storytelling." Digital storytelling involves composing a narrative detailing a personal experience using personal digital media (e.g., photos and video) to illustrate the narrative. Digital storytelling presents everyday people with opportunities to engage in dialog with any audience about personal life experiences.

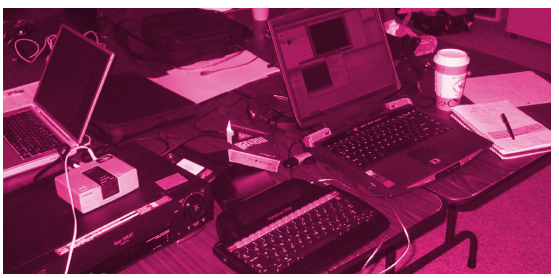


Figure 1 Workshop participants edit personal images in Adobe Photoshop in the CDS workshop.

Digital storytelling is a non-trivial task. It entails writing and recording a script, editing digital photos and video, and combining these media to present a coherent personal story. More importantly, digital storytelling involves critical reflection on personal life events to establish their meaning. Our motivation lies in providing support for critical reflection on personal life events thereby enabling people who lack the storytelling and technical experience to engage in digital storytelling. It is important to note that we are not focusing on the more commonly produced slideshow story, which can be created with many digital photo management tools. Composing digital narratives requires a more involved creation process and produces an output of greater production value. In the next section, we provide an example and description of a digital narrative to provide the reader with more detail.

This paper examines the *human* storytelling and technical support mechanisms provided by the Center for Digital Storytelling (CDS)—experts in digital narrative authoring—to understand how they enable everyday people to succeed at creating digital narratives. Lambert discusses the need for consumer-level digital literacy to "shape the technologies of tomorrow" and suggests digital storytelling as a possible catalyst.[2] We believe authoring digital narratives must become sufficiently easy for consumers before they can influence the design of technology.

The CDS workshop enables people of varying technical and writing abilities to create personal digital stories. We studied two digital storytelling workshops provided by CDS (see Figure 1) to understand how everyday people create digital stories in this structured workshop environment. In particular we were interested in learning what issues people encounter and how they are resolved. We chose CDS for the following three reasons:

- CDS teaches the skill of producing narratives about personal experiences using digital media
- Each participant leaves with a story to share with their intended audience
- The CDS workshop has been tried and tested for over 11 years and is modeled by other organizations providing digital storytelling services[3]

By observing these workshops and identifying the features that enable storytelling, we have uncovered worthwhile lessons that can inform the development of digital storytelling tools. We present these lessons and consider how the observed *human* support provided in the workshops could translate into digital storytelling *software* supports when appropriate. When translating *human* support into *software* support is not feasible, we consider how *software* might provide access to *human* support.

In the next section, we provide a more nuanced description of digital storytelling and examine an example. We then discuss related work and describe the CDS process. The following section presents the research methods we used to learn about challenges participants faced in the CDS workshop. We introduce a set of lessons abstracted from those challenges to inform digital story authoring tool design decisions. We then explore areas for extending support in currently available story authoring tools.

1 Krystina Madej, "Towards Digital Narrative for Children: From Education to Entertainment, a Historical Perspective," *Computing Entertainment* 1.1 (2003):12-12.

2 Joe Lambert, *Digital Storytelling: Capturing Lives, Creating Community* (Berkeley: Digital Diner Press, 2002).

3 For examples, see *Capture Wales Digital Storytelling*. http://www.bbc.co.uk/wales/capturewales/ (2005); Creative Narrations. http://www.creativenarrations.net/site/storybook/index.html, (2005).

Digital Storytelling Background

Before describing the CDS workshop and the study we conducted, we will more precisely define our notion of digital storytelling by presenting an example created in the CDS workshop. Consider the following excerpt from the personal digital narrative *MOMNOTMOM*:[4]

> "There's a picture of my mother that I always keep with me. It's a curious photo, because in most photos, I always imagine that people pose for the future, but in this time [pause], this moment [pause], this photograph [pause], I feel like my mom is searching for her past."

MOMNOTMOM relates the author's desire to know her mother in the roles prior to her birth. The story explores guilt the author experiences over the loss she thinks all mothers experience by having children. The author's images and video are set to music and synchronized with a voiceover creating an engaging presentation of her personal experience. *MOMNOTMOM* begins tightly focused on an image of a young lady gazing into a distant scenic landscape. As the author speaks, a guitar plays softly in the background and the view slowly zooms past the young lady into the landscape. The narration continues with the author affectionately describing her mother, the various roles she has played, and those she continues to play (i.e., girl, young woman, doctor, wife, and mother). The author uses an expressive photograph to depict her mother in each role. In the case of "wife," she uses a video clip instead. The story concludes: *"It's hard to imagine my mother as her own woman, but I think she is beginning to."*

MOMNOTMOM presents the meaning found in a series of the author's personal experiences through retrospective reflection. The digital artifacts (i.e., photos, video, and audio) used to illustrate the story bring this meaning to life for the viewer. It communicates multiple personal experiences of the author unified by the realization that her mother is reclaiming her identity as a woman. We are interested in this particular type of digital storytelling, as opposed to other forms, such as slideshow stories offered by personal media management tools (e.g., iPhoto and Adobe Photoshop Album). We do not discount the importance of these other forms; we simply find the study of digital narratives more engaging.

Personal digital stories like *MOMNOTMOM* often present cathartic moments in a person's life. Digital media allow us to convey those moments visually through personal images and video and aurally through the individuality of voice. Through the development of personal narratives, experiences are made meaningful.[5] Personal digital narratives help ascribe meaning to those personal experiences; however, they require more attention to writing and more technical skill to produce than slideshow stories.

Related Work

Our work focuses on providing support for critical reflection on personal life events through digital storytelling. Some researchers have uncovered the power of digital storytelling in educational and social domains. Others have focused on the development of multimedia story authoring tools. We explore works from both of these foci as well as commercial tools used for digital storytelling.

Uses of Digital Storytelling

The following works represent examples of digital storytelling in use. In each instance, human support was readily available. We seek to understand what level of support software can provide in the absence of human support.

While studying middle school students in an after-school program engaging in the practice of digital storytelling, Davis discovered that the construction of personal narratives in the digital medium could be used as a tool for personal development. As the students recalled life-changing experiences, students developed a clearer sense of self.[6]

Bailey et al. used digital storytelling in a school setting to promote technology and character education. By creating animated vignettes (or short stories) presenting situations involving moral and social issues, students learned to use technology and build character. While this work supports telling digital stories, the students' stories were fictional and they created the visual content during the authoring process.[7] In contrast, personal digital narratives present personal experiences and the authors typically use personal content captured before the authoring process. This work does however suggest a process model for supporting users navigating the digital storytelling process.

4 Soundarajan, Thenmozhi. *MOMNOTMOM.* 2005. http://www.storycenter.org/whatis.html.

5 Donald E. Polkinghorne, *Narrative Knowing and the Human Sciences* Albany: State University of New York, 1998

6 Alan Davis, "Co-Authoring Identity: Digital Storytelling in an Urban Middle School" THEN 1.1 (2004).

7 Brian P. Bailey, Sharon Y. Tettegah, and Terry J. Bradley. "Clover: Connecting Technology and Character Education Using Personally-Constructed Animated Vignettes" University of Illinois at Ubana-Champaign. http://www.cs.uiuc.edu/research/techreports.php?report=UIUCDCS-R-2005-2637, (2005).

Ellis and Bruckman used storytelling through digital media in the Palaver Tree project to support history education. Students contributed oral histories in digital form to an oral history database.[8] However, the stories created by students in this work were not personal and were not presented in video form. Similarly, used storytelling in the classroom to engage reluctant writers.[9]

Mazalek and Davenport recognized the ability of digital storytelling to provide a social and collaborative experience and leveraged a tangible computing technology to support communal exploration and development of digital stories.[10] Balabanovic et al., extended to digital photos the common practice of storytelling around print photos.[11] While their work supported ad hoc storytelling around digital photographs, we focus on supporting retrospective stories of life altering events illustrated by personal digital media.

Multimedia Authoring Tools

The Multimedia community has explored the development of authoring tools for multimedia documents and presentations.[12] Much of the research has focused on supporting professional authors and screenwriters in composing with digital media. Our work differs in our concern with supporting novices in the multimedia composition process. Multimedia-authoring tools assume a writing and video production competency typically found in professionals. Our focus is on supporting people lacking the domain and technical experience to engage in digital storytelling.

8 Jason B. Ellis, and Amy S. Bruckman, "Designing Palaver Tree Online: Supporting Social Roles in a Community of Oral History" (Paper presented at the SIGCHI conference on Human factors in computing systems, at Seattle, Washington, United States, 2001).

9 Tom Banaszewski, "Digital Storytelling Finds its Place in the Classroom," *Multimedia* Schools 9.1 (2002).

10 Ali Mazalek, and Glorianna Davenport, "A Tangible Platform for Documenting Experiences and Sharing Multimedia Stories" (Paper presented at the ACM SIGMM workshop on Experiential Telepresence, at Berkeley, California, 2003).

11 Marko Balabanovic, Lonny L. Chu, and Gregory J. Wolff, "Storytelling with Digital Photographs." (Paper presented at the SIGCHI conference on Human factors in computing systems, at The Hague, The Netherlands, 2000).

12 Brian P. Bailey, Joseph A. Konstan, and John V. Carlis, "DEMAIS: Designing Multimedia Applications with Interactive Storyboards" (Paper read at Proceedings of the ninth ACM international conference on Multimedia, at Ottawa, Canada, 2001); Naomi Friedlander, Ronald Baecker, Alan J. Rosenthal, and Eric Smith, "MAD: A Movie Authoring and Design System" (Paper presented at Conference companion on Human factors in computing systems: common ground, at Vancouver, British Columbia, Canada, 1996).

Commercial Tools for Digital Storytelling

Commercial video editing tools (e.g., iMovie and Windows Movie Maker) also make a similar assumption. While they support movie production and in some cases provide a simple interaction experience, many tools target professionals or assume proficiency in screenwriting and video production. In this paper, we show that supporting screenwriting (i.e., scriptwriting, character, and plot development, etc.) is necessary for everyday people to engage in personal digital storytelling.

Center for digital storytelling (CDS)

To set the context for our field study of the CDS process, we will provide more detail about the center and the process used to produce digital stories similar to *MOMNOT-MOM*. The Center for Digital Storytelling is an organization "dedicated to assisting people in using digital media to tell meaningful stories from their lives."[13] The Digital Storytelling Workshop is one vehicle for accomplishing this mission. Over the course of three days, typically between eight and fifteen people engage in roundtable discussions, creative writing, software tutorials, digital image manipulation, and movie production with the common goal of telling a personal story. CDS defines digital stories as three to five minute movies consisting of the author's images, video, and other media coordinated with a voiceover to tell a personally meaningful story. Story enhancements can include a soundtrack, image panning, and zooming effects.

CDS Workshop

The CDS workshop presents a process augmented by human support for telling stories with digital media using commercial tools. Experts in digital storytelling designed and facilitated the workshop, which provides a real world practice useful for informing the design of digital story authoring tools. Understanding this process sets the stage for exploring what human supports can and may be worth integrating into software.

One to two facilitators run the Digital Storytelling Workshop and one to two trained volunteers assist participants during the image editing and movie production stages of the workshops. The workshop begins with each participant providing a brief personal introduction and preview of the story they hope to tell. A workshop facilitator then lectures on the seven elements[14] defining a digital story using previ-

13 *Center for Digital Storytelling*. http://www.storycenter.org (2005).

14 Lambert, Joe. *Digital Storytelling: Capturing Lives, Creating Community.* Berkeley: Digital Diner Press, 2002.

ously created stories as illustrations. The seven elements are: point of view, dramatic question, emotional content, voiceover, soundtrack, economy and pacing. In general, the author should set the story's context for the viewer, build tension to a climax, and provide a resolution.

The workshop continues with the "story circle" where participants share their digital story concepts. The story circle focuses on developing story ideas before discussing digital content. Participants are encouraged to write a script prior to the workshop; however, in the workshops we observed participants' levels of preparation varied. As each person presents their story idea to the group, the other participants are encouraged to give feedback. The story circle fosters a sense of community, which plays an important role in the cultivation of each story.

With the feedback provided in the story circle, the participants begin writing or revising their scripts, which eventually become the voiceover for their digital stories. CDS sets the ideal script length limit at one page of text and an upper limit at 1 and one half pages in an effort to restrict the length of the movie produced to three to five minutes. Facilitators review each participant's draft and suggest improvements (e.g., by reorganizing the order of events). Once the script is complete, each participant records their own script thus creating a voiceover for their story.

In conjunction with the writing process, facilitators provide tutorials of Adobe Photoshop and Premiere to teach important technical skills for digital narrative creation. These skills included cropping, image touch-up and composition, and non-linear movie assembly. The tutorials provided support for a wide range of experience levels. Following the tutorials, participants begin preparing their content in Adobe Photoshop (e.g., fixing images and creating image compositions) for later assembly in Adobe Premiere.

Once their content is ready, each participant begins creating a "rough edit" in Adobe Premiere by combining the prepared media with the recorded voiceover. The workshop facilitators review each "rough edit" and suggest further improvements. Finally, participants add effects to enhance their stories. The workshop ends with a final viewing where a facilitator projects each participant's story onto a large screen and everyone in the workshop group views each story. Following the workshop, the facilitators engage in a post-production process to refine each story, export the final versions to a portable storage medium, and mail them to every participant.

Given our definition of personal digital storytelling and a description of the workshop we studied, we now describe the research methods we used to learn about digital storytelling in a human supported environment. We then present our findings and abstract a set of lessons to inform digital story-authoring tool design.

Methods: Studying human support

We surveyed and observed two separate workshops held in June and July of 2004, for a total of 18 workshop participants, two facilitators, and three trained volunteers. From this point, we will refer to workshop participants as simply participants. We will refer to volunteers as simply facilitators when we discuss support provided with image manipulation and video production tasks.

We used questionnaires to gather demographic information and assess the technical and digital media composition experience level of the participants. At the beginning of each workshop, we surveyed participants about their computer experiences, access to computers and media capture devices (e.g., video camera), familiarity with popular image and video editing tools, and media sharing habits. We also asked participants about their writing practices, hypothesizing that their practices might affect their ability to navigate the script-writing process.

The CDS workshop represents an opportunity to observe novice digital storytellers creating digital stories. This study allowed us to answer the following fundamental questions:

> During what part of the process do participants falter?
> What helps them over these hurdles?

By determining what obstacles exist in the authoring process and developing an understanding of what human support helps people through them, we can begin to think about how to realize human solutions in software. In instances where translating human support into software support is not feasible, we explore providing access to human support via software.

Workshop Demographics

The occupations of workshop participants varied (e.g., sales and product management), but most participants were educators. In total, the majority of participants were female (thirteen females, five males). From the questionnaires we found:

- *Twelve of eighteen participants reported having access to a digital camera. Five of the twelve having access to a digital camera considered themselves avid photographers.* Although participants may have been quite familiar with photography, having a distinct interest in photography was not sufficient and they still required help with digital story composition.
- *Eight of the participants reported sharing their media by creating a digital artifact.* The artifact typically took the form of pictures in an online album or PowerPoint slide show. However, no one reported creating a digital story prior to the workshop confirming that participants were new to digital storytelling.
- *Seven of the eighteen participants reported having previous experience with Adobe Photoshop and only two with Adobe Premiere.* Most participants were not only new to digital storytelling, but also new to the tools they used to create their digital story.
- *Slightly less than 50% of the participants reported engaging in writing (excluding email) more than twice a month.* Participants brought more writing experience to the workshop than we expected; however, in some cases writing was a requirement of the participant's occupation as opposed to personal fulfillment.

These findings suggest people seem to create simple artifacts using their media, but do not attempt productions resembling a digital narrative. We suspect lack of access and difficulties using currently available tools are major reasons. Our results from observing the workshop provide more insight into this issue.

Results

In addition to surveying participants, we observed participants during the story circle, while they prepared their content with Photoshop and composed their media with Premiere. We interacted with them while they worked as well as on breaks to determine when and how to provide support. We now discuss our observation of four classes of challenges in the digital storytelling process. Those challenges were with *story development*, *content preparation*, *movie production,* and *completion*.

Challenges in Story Development

The participants attended the CDS workshop to learn how to create digital narratives. A challenge for the participants was to learn, understand, and implement the elements of a digital story. The workshop began with a description of the digital storytelling form (i.e., the seven elements) endorsed by CDS. It is important to note that the CDS staff pre-determined the basic elements of the artifact—the participants would not be authoring a video game, for example, to tell their stories. Although CDS defined the form in advance, the participants still had to learn about the form and apply their understanding to create their story. To help participants understand how to create a digital story, facilitators demonstrated how to implement the form by analyzing previously produced stories.

By determining what obstacles exist in the authoring process and developing an understanding of what human support helps people through them, we can begin to think about how to realize human solutions in software.

Although pre-defining the form of the story may have provided participants with a starting point, participants still encountered a variety of obstacles. We observed the majority of participants express difficulty with selecting a specific topic as their focus. Feedback from the story circle and individual feedback from workshop facilitators seemed to help participants find this focus.

Similarly, we observed participants experience difficulty writing within the one page script limit. The workshop facilitators suggested the haiku as a metaphor to describe the level of conciseness participants should aim for when writing their scripts. Although, participants did not implement this as a strict guideline, it provided a useful analogy.

Challenges in Content Preparation

As we presented in the "Workshop Demographics" section, participants were largely unfamiliar with Adobe Photoshop and Adobe Premiere. Photoshop and Premiere are the primary digital media tools used in the workshop, thus presenting a technical challenge to participants. CDS anticipated this challenge and provided Adobe Photoshop and Premiere tutorials early in the workshop to provide

participants with example uses of the tools while they were still working on their scripts. Facilitators guided participants through basic image manipulation tasks such as resizing, cropping, and photo touch-up. Workshop facilitators demonstrated eight tools (e.g., lasso and clone stamp) and only those tools for accomplishing these tasks. This minimalist approach to teaching Photoshop allowed participants to focus more on their story and less on learning the tools.

Participants struggled with importing content from their devices and older non-digital storage media (e.g., videocassette). Participants requested assistance with connecting devices and transferring content to their workstation computers. The workshop facilitators often performed these tasks on behalf of participants. One participant described his frustration with importing content in terms of his previous experience with video editing: "I dabbled with videos on my PC but was very frustrated by inability to import video and then once I produced something and created an output file, I couldn't get any other PC to recognize the format."

In addition to performing difficult tasks for participants, the CDS staff used heuristics to answer common questions. For example, we observed participants ask what image format they should use when saving edited images (always using the PSD format was the answer). Facilitators also provided heuristics as "rules of thumb" to help participants avoid pitfalls common to novices. For example, facilitators instructed participants to record their script in segments to reduce the amount of re-recording needed to correct errors.

Challenges in Movie Production

During movie production, we witnessed participants struggle with using Premiere and implementing the visual portion of the story (e.g., economic use of images and pacing). Participants requested help with importing images and adding transitions to movies. By far, participants required the most assistance with adding effects to their movies. By the morning of the final day in both workshops, all major content (i.e., photos, video, and voiceover) had been imported and the rest of the day was dedicated to adding effects which consumed more time than any other activity involving Premiere.

Facilitators used heuristics again to aid students, but this time with the visual design of their story. For example, when selecting photos for their story, facilitators advised participants to use a particularly good photo to represent an idea versus a sequence of similar photos.

Challenges to Completion

The challenges to completion involved managing the process, overcoming obstacles with particular tools, and dealing with fear of incompletion. Communal support played a major role in enabling participants to complete their projects. Participants solicited feedback from one another. They also supported one another technically and emotionally. In the first workshop we observed, the group encouraged the first participant to record a voiceover as she left the room.

Workshop facilitators provided more structured support to help participants overcome the challenges to completion. An important part of authoring digital stories is careful time and process management. CDS defined the timeline participants followed and used a whiteboard to track their progress. To help participants take an organized approach to storing their content in the workstation file system, CDS provided a directory structure with descriptive names related to the process of creating a digital narrative (e.g., folders named "soundtrack" and "resized"). Participants simply duplicated and used the provided structure to manage their project content.

Facilitators also ensured participants completed the process by the end of day three by monitoring their progress and in extreme cases finishing the project with the direction of the participant. In addition, facilitators used a post-production process to refine the movies following the workshop.

Lessons Learned

From the challenges and observed support presented in the previous section, we have abstracted a set of lessons to aid digital narrative authoring tool designers in using our findings. The lessons address the obstacles participants encountered with both software and storytelling itself. In this section, we discuss those lessons in the context of strategies used in the CDS workshop. We then explore potential translations of the CDS strategies into software supports when possible. Our intent is not to directly apply the techniques from the workshop, but to transfer the spirit of the techniques into software when possible. We continue the discussion in the following section by exploring three particular areas (story development, collaboration, and process management) where currently available video editing tools could provide support for digital narrative composition.

Pre-defined story models and examples of effective use support story development

Understanding the digital narrative creation process is essential to digital storytelling. If workshop participants already understood how to create a digital narrative, the usefulness of attending a workshop would be arguable. As we described earlier, digital storytelling refers to a specific form defined by CDS. Having the form pre-defined removes the need for participants to define the type of artifact they will produce. Workshop facilitators helped participants understand the digital storytelling model through both principles (i.e., seven elements) and examples. The model and examples also served as a point of departure for the storytelling endeavor. They allowed participants to spend less time determining how to approach writing and more time writing. During the instructional portion of the workshop, a facilitator played previously produced digital stories highlighting how each implemented the seven elements. The following strategies eliminated the need for participants to select a form and allowed them to begin the process of implementing the form:

> Define the story form and its components in advance
> Demonstrate the usage of the form with visual and written examples

When people do not have access to the human support a workshop provides (e.g., after they leave or if they never attend one), where will storytellers obtain support for the story development process? Software could potentially come to the aid of storytellers by helping them understand the form and guide them in using it. Another question that arises is who defines the form. Because CDS has provided resources to outline and guide novice digital storytellers in the writing process, the responsibility of the software designer then becomes developing an experience that guides storytellers through the provided resources. Exploring successful examples could be a part of that guidance allowing storytellers to observe the form in use as opposed to proceeding with only a description. CDS not only described each of the seven elements, but also used example digital stories to highlight each element and show how and why each of the stories effectively implemented the seven elements.

Software could possibly emulate this human support by providing annotated story examples to present the importance of each story form component and demonstrate why the example is successful.

A pre-defined toolset for media manipulation and examples of effective use ease content preparation

This lesson addresses the "Challenges to Content Preparation." As we mentioned in the "Workshop Demographics" section, participants were largely unfamiliar with using Adobe Photoshop. Workshop facilitators addressed this issue by providing tutorials. The tutorials provided models for effective and appropriate use of various tools (e.g., clone stamp and magnetic lasso). It also provided participants with the opportunity to practice before working with their own media. We observed in the workshop that a large toolset is not necessary to produce a quality digital story. CDS included only a select number of tools in the tutorial and advised participants to stick to those. However, the tools introduced by facilitators still required technical expertise. CDS used the following strategies in the workshop to facilitate the creation of compelling stories while minimizing difficulty with tools:

> Define a limited toolset for implementing a story form
> Provide tutorials of the toolset in the context of appropriate usage scenarios

We noticed participants only spent time on the content preparation stage using the tools presented in the Adobe Photoshop tutorial. Limiting the toolset in digital story authoring tools could potentially allow novice digital storytellers to devote more time preparing their content rather than expending unnecessary effort on selecting tools. In the workshop, the facilitators could only suggest restrained tool use, but software designers have the opportunity to limit the total number of tools digital storytellers can access. A potential downfall of limiting the toolset is that it may limit the expressivity of the storyteller.

Carroll and Carrithers discuss the usage of "training wheels" in a user interface to help users become productive using an unfamiliar interface by limiting their options to only those

The notion of limiting the toolset raises the issue of how to select the tools and who selects them?

needed initially.[15] Similarly, digital storytellers might also benefit from a limited toolset (at least in the beginning). The notion of limiting the toolset raises the issue of how to select the tools and who selects them? We could look to experts in video production (CDS for digital storytelling in particular) to determine what toolset is sufficient. Alternatively, we could take an experimental approach similar to Carroll and Carrithers by observing digital story creation with varying numbers and types of tools enabled to determine the minimal number of tools needed to be most effective.

Along with defining a limited toolset, it is important to help digital storytellers understand when the use of a particular tool is appropriate to obtain a desired outcome. Even within a limited toolset, users may still have options for performing a particular task. Software should guide storytellers through how each tool works, the result it produces, and how the effect could be used in their story. For example, during the Adobe Photoshop tutorial, a workshop facilitator explored a number of tools for copying a segment of one image to another image, showing how each was not best for the task though they did ultimately work. The facilitator cited the last tool demonstrated as the appropriate tool and provided an explanation of its use. Likewise, software should seek to explain what tool is best for particular effects and rule out those that are sub-optimal.

Feedback increases story quality and eliminates software barriers

This lesson addresses challenges associated with story development, content preparation, and movie production. For these challenges, obtaining feedback from peer storytellers and workshop facilitators was a part of the solution. Feedback is useful for story development and difficulties encountered with technology. The story circle provided peer feedback during the writing process and facilitators provided individual attention during the writing, content preparation, and production processes. Participants also served as resources for one another with technical problems and story design decisions. This type of rich individual and communal interaction is vital to improving story quality. CDS used the following strategies to provide feedback to participants:

> Connect users with a support network of peer digital storytellers
> Connect users either directly with experts or with expert recommendations

The implementation of these strategies provided participants with access to two types of support: peer support and expert support. The story circle served as a support network of peer digital storytellers in the CDS workshop. It was particularly effective at providing each participant with targeted feedback and suggestions for improving their story. Workshop facilitators encouraged this network and components (e.g., story circle) of the workshop reinforced it. Participants were encouraged to help one another throughout the three-day process. Workshop facilitators also provided individual direction to each person. When these human supports are no longer available, how will digital storytellers obtain feedback on their work to increase the quality of their story?

Developing software capable of providing feedback similar to the human feedback provided in the story circle would be difficult to achieve. We suggest, however, using software as a vehicle to connect people versus a replacement for human support. When providing peer support, digital story tool designers should consider ways to connect digital storytellers to exchange ideas, request help, and obtain feedback.

One approach might be to provide communications tools (e.g., instant messaging) for soliciting feedback from within digital story authoring tools. Software could provide expert support in a similar manner via a forum where experts meet with digital storytellers seeking help.

In addition to connecting storytellers with experts, providing access to recommendations of experts also might help increase story quality. Workshop facilitators often provided suggestions for accomplishing various tasks (e.g., size all images to 720 X 480, the standard video resolution). Digital storytellers may benefit from having access to a list of expert suggestions and systematic instructions for accomplishing common tasks (e.g., cropping an image) provided in the context story composition. A drawback to this approach is the lack of interactive feedback. Storytellers seeking help are limited to the explanation the expert provides. The storyteller cannot request a better or different explanation from the expert through this method. In addition, digital storytellers can only obtain help with questions experts anticipated. Unanticipated questions would have to be handled through other means.

15 John M. Carroll, and Caroline Carrithers, "Training Wheels in a User Interface" *Communications of the ACM* 27.8 (1984):800-806.

Providing automated solutions is sufficient for addressing tasks not vital to producing a quality digital story.

The CDS staff handled some story development, content preparation, and movie production and completion tasks on behalf of participants. These tasks were not essential to improving story quality, but were a necessary part of the process. For example, some participants required help with transferring content from a camera or a non-digital storage medium (e.g., VHS) to their workstation computer. In addition to completing tasks for participants, workshop facilitators also provided heuristics for tasks completed by participants as a preventive measure and in answering questions. In the context of digital storytelling, we observed the following strategies used to help participants complete tasks not vital to creating a quality story:

- Provide abstractions for file organization and content management
- Provide heuristics for navigating each stage of the storytelling process
- Aid the transfer of content from the capture device to the computer
- Fine-tune the user's final cut of their digital story (post production)

We observed participants experience difficulty interacting with the file system of their workstation computer. The difficulty was with maintaining the link between the objects (e.g., images and soundtrack) being manipulated in the applications and their location in the file system. Participants were provided a directory structure tailored to the digital storytelling process to help with content organization and management. CDS used folder names to represent the different media that would need to be stored during the process (e.g., "resized images" and "soundtrack").

In software, it might be helpful to go even further by providing users with abstractions that allow media manipulation to occur without requiring accessing the file system. Although the directory structure helped with organization, we still noticed people having trouble determining where they saved their content (e.g., when they inadvertently saved resized images in the soundtrack folder).

Participants who brought their content on cameras or other storage media (e.g., Beta Max) required assistance in many cases just to connect devices and import the desired content. One participant's storytelling process involved a series of technologies to digitize her video stored in VHS format as shown in Figure 2. The CDS staff provided the equipment and expertise needed to accomplish this task. Software might assist digital storytellers in this regard by providing instructional videos demonstrating how to connect devices and to import content.

Figure 2 Series of technologies employed to digitize a participant's video

In many fields, experts develop a set of "tricks" as they become more efficient practitioners. Novice storytellers lack practical and repeated experience with authoring tools and thus lack a collection of these "tricks" making the process more difficult. Software might help users avoid the pitfalls of novice behavior (e.g., scanning photos one at a time versus scanning multiple photos at once and separating them using Photoshop) by providing a library of heuristics for users to consult when performing certain tasks.

Even though students created some very interesting pieces, we saw many cases where some fine-tuning was required to remove glitches in transitions and effects for example. There were also additional features participants desired to add to their stories. Workshop facilitators noted these requests and added the features after the workshop ended. The CDS staff also made final adjustments to each participant's story before mailing participants the final version. It may be unreasonable to expect software to perform design-oriented tasks (e.g., where to zoom into a photo) for the user; however, tasks that can be automated (e.g., resizing images) should be. One participant complained about the repetitive task of resizing images. She preferred a method to apply the same resizing criteria to all of her images with one action. Providing this type of support in software could ease the user's burden and potentially shorten the authoring process.

Clearly defining and managing the user's process in terms of progress, time and emotion facilitates completion

Although completion of the final story was a challenge for participants, they had little involvement in managing the process and time. Despite the participants' awareness of

the imposed time constraints of the workshop, the facilitators defined the process, set goals, and monitored the progress of the participants to meet those constraints. The importance of process management is evidenced by one participant's comment on their difficulty with software tools: "[the] interface [is] not clearly related to [the] process." We observed the following human support help users manage time and process in the workshop:

- Clearly define the different parts of the process
- Help with setting a timeline and goals for each part of the process
- Provide assistance with tracking progress
- Provide encouragement for making progress

In the first lesson, we discussed defining the form for users. This lesson concerns defining the process and helping the user navigate it. While digital story authoring tools should provide sufficient tools for assembling digital content, they should also provide support for managing the process. Outside of the workshop users are not guaranteed a forcing function for completing their story; therefore, it becomes important to think about how to help storytellers set goals and a timeline. In addition, the user must be kept aware of their progress.

In the CDS workshop, facilitators used a progress board and deadlines to keep people on track. It is also important to explore ways in which software can encourage storytellers to continue making progress without causing frustration. We might look to research in affective computing for direction.[16]

Another important challenge is helping users resume work on a story following a period away from the authoring process. It is unlikely that users will spend three consecutive eight-hour days authoring a story as participants did in the workshop. As a result, tools should help the user manage interruptions in the authoring process by helping them pick up where they left off. Work on the *Cook's Collage* and *Where Were We*[17] may provide some insight into helping users re-orient themselves to the storytelling process following a break.

Extending Support in Current Tools

Based on our field study, we believe that the workshop was successful in helping people produce a quality personal story from digital media. Several participants mentioned plans to continue working on their story following the workshop. One participant told us that she wanted to create a video for each of her children (her story was about her son). While a few cited they were confident they could repeat the process, many seemed to find the process more difficult than they anticipated. One participant described the experience as "nerve wrecking." Repeating the process would entail facing the challenges to story development, content preparation, movie production, and completion without the human support the CDS workshop provided.

In conversations with workshop facilitators, we discovered their belief that people will still need support when they attempt to repeat the process alone. We believe that people would find creating another story more difficult without the same level of support. In essence, storytellers would only have the experience they gained at the workshop and their digital media editing tools as support. A storyteller who has never been to the workshop faces a worse predicament and would only have the tools as support. In either case, the storyteller and tools bear the burden.

We decided to explore how much of the burden digital video editing tools assumed and how much more of the burden could be placed on the tools when appropriate. Recently, commercial software vendors have recognized the importance of digital media editing tools for everyday people (e.g., iLife and Adobe Elements Series); however, many tools (e.g., Final Cut) target users with some proficiency in screenwriting and movie production. As a result, many tools are great for movie making, but not for supporting novices in digital storytelling.

We selected iMovie as a representative of video editing tools for the average consumer to explore how support could be extended for digital storytelling. Most editing tools draw on the same set of metaphors (e.g., timeline, preview window, media gallery, and audio track recorder) for non-linear video editing. While we could have chosen a number of different tools (e.g., Windows Movie Maker and Adobe Premiere), we selected iMovie in particular for its tight integration with the other tools in the iLife series and its consumer-centric focus. We summarize the result of this

16 Rosiland W. Picard, *Affective Computing* (Cambridge: MIT Press, 2000).

17 Quan T. Tran, Gina Calcaterra, and Elizabeth D. Mynatt, "Cook's Collage: Deja Vu Display for a Home Kitchen." In *Home Oriented Informatics and Telematics.* (United Kingdom, 2005); Scott L. Minneman and Steven R. Harrison, "Where Were We: Making and Using Near-Synchronous, Pre-Narrative Video (paper presented at the first ACM international conference on Multimedia, at Anaheim, California, United States, 1993).

exploration in the following three sections on story development, collaboration, and process management; each section presents ways tools could provide more support, when possible, in the absence of human support.

Story Development

iMovie as well as other general-purpose movie-editing tools allow users to create a movie in many different forms (e.g., digital story, slideshow, etc.) and on many different scales (e.g., short story to full length film). While this makes the tool more flexible, the same flexibility decreases its usability where digital storytelling is concerned. While using software help pages, text manuals, and online resources may reduce the learning curve of digital media editing tools, they provide little to no support for story development. Without a focused idea, it becomes difficult to develop a good movie.[18] Video editing tools should invite forethought about story as well enable video production. By starting the workshop with a discussion of story ideas and creative writing, participants were able to develop a sense of direction before using Photoshop and Premiere. When the user no longer has human support, what will serve as the catalyst for defining the story?

While exploring media for inspiration is certainly a key part of digital storytelling, a path should be established for the storytelling endeavor even though that path is likely to change.

We might charge this responsibility to our tools. Current software tools should invite users to seriously think about the story they wish to tell, instead of allowing them to engage in the creation process without a clear sense of purpose. While exploring media for inspiration is certainly a key part of digital storytelling, a path should be established for the storytelling endeavor even though that path is likely to change. Tools for digital storytelling should not only enable us to manipulate our media, but also support the reason we choose to manipulate it in the first place.

Collaboration

Collaboration served to increase story quality and help participants through technical barriers. During the story circle, each participant received feedback and ideas for developing their story. Just as we (researchers) seek feedback for our own work to increase its quality, software should provide digital storytellers with access to feedback. iMovie supports no apparent means for collaborating with peer storytellers or experts and could benefit digital storytellers by providing a means to gather feedback through the tool.

Collaboration helped participants through technical barriers. While pairing a "how-to" manual[19] with help resources included with iMovie might provide some feedback on technical issues, this support is somewhat limited. It is not possible in this configuration to ask questions and get feedback on issues not covered in the resources.

While it may be possible to create digital stories without feedback on story development and technical issues, the quality of the story could diminish significantly without it. Manuals provide a limited form of feedback in terms of systematic instructions for accomplishing common tasks; however, interactive feedback is preferable.

Process Management

Frohlich, et al. discovered that people considered creating photo albums of pictures complex and time consuming.[20] We find from our observations that the same is true for the process of creating a digital story. In the workshop, effective time and process management contributed to the participants' successful completion of their stories. iMovie and similar video editing tools provide users with great features for completing a task, but they leave the process to users with little or no experience to negotiate. The workshop facilitators were effective at managing time, making the process clear and ensuring that users complete the process. Video editing tools should provide similar support.

18 Maxie D. Collier, *The ifilm Digital Video Filmmaker's Handbook* (Hollywood: Lone Eagle Publishing Company, 2001).

19 Such as Jim Heid, *The Macintosh iLife '04* (Berkeley: Peachpit Press, 2004).

20 David Frohlich, Allan Kuchinsky, Celine Pering, Abbe Don, and Steven Ariss, "Requirements for Photoware" (paper presented at the 2002 ACM conference on Computer supported cooperative work, at New Orleans, Louisiana, USA, 2002).

Conclusion

We have presented a study of a personal digital storytelling activity from which we abstracted a set of lessons to inform the design of tools for authoring personal digital stories. In particular, we focus on retrospective accounts of personal experiences using personal digital media. While the human approach to supporting this type of digital storytelling can be adapted to the ever-changing needs of the user, it can be costly. The CDS workshop required a sizable fee (approximately $500 US dollars) to participate and a significant time commitment (three eight-hour days). Optimally, a software package approximating the level of support the human approach provides is preferred. We suggest the use of the lessons presented here to explore the design of new digital story authoring tools. We believe enabling novice digital storytellers to create stories with maximum support while minimizing the per-story cost could lead to mass adoption of the form.

Digital storytelling is on the path to becoming a widely used form of expression. Communities of digital storytellers already exist[21] and are continually growing. Filling the gap in support to allow users to move from creating simple artifacts to producing stories that are more advanced is necessary to enable access to this desired form of expression.

References

Bailey, Brian P., Tettegah, Sharon Y., and Bradley, Terry J.. "Clover: Connecting Technology and Character Education Using Personally-Constructed Animated Vignettes" University of Illinois at Ubana-Champaign. http://www.cs.uiuc.edu/research/techreports.php?report=UIUCDCS-R-2005-2637, (2005).

Bailey, Brian P., Konstan, Joseph A., and Carlis, John V.. "DEMAIS: Designing Multimedia Applications with Interactive Storyboards." Paper read at Proceedings of the ninth ACM international conference on Multimedia, at Ottawa, Canada, 2001.

Balabanovic, Marko, Chu, Lonny L., and Wolff, Gregory J.. "Storytelling with Digital Photographs." Paper read at Proceedings of the SIGCHI conference on Human factors in computing systems, at The Hague, The Netherlands, 2000.

Banaszewski, Tom. "Digital Storytelling Finds its Place in the Classroom." *Multimedia Schools* 9.1 (2002).

Capture Wales Digital Storytelling. http://www.bbc.co.uk/wales/capturewales/ (2005).

Carroll, John M., and Carrithers, Caroline. "Training Wheels in a User Interface." *Communications of the ACM* 27.8 (1984):800-806.

Center for Digital Storytelling. http://www.storycenter.org (2005).

Collier, Maxie D. *The ifilm Digital Video Filmmaker's Handbook*. Hollywood: Lone Eagle Publishing Company, 2001.

Creative Narrations. http://www.creativenarrations.net/site/storybook/index.html, (2005).

Davis, Alan. "Co-Authoring Identity: Digital Storytelling in an Urban Middle School." *THEN* 1.1 (2004).

Ellis, Jason B., and Bruckman, Amy S.. "Designing Palaver Tree Online: Supporting Social Roles in a Community of Oral History." Paper read at Proceedings of the SIGCHI conference on Human factors in computing systems, at Seattle, Washington, United States, 2001.

Friedlander, Naomi, Baecker, Ronald, Rosenthal, Alan J., and Smith, Eric. "MAD: A Movie Authoring and Design System." Paper read at Conference companion on Human factors in computing systems: common ground, at Vancouver, British Columbia, Canada, 1996.

Frohlich, David, Kuchinsky, Allan, Pering, Celine, Don, Abbe, and Ariss, Steven. "Requirements for Photoware." Paper presented at the 2002 ACM conference on Computer supported cooperative work, at New Orleans, Louisiana, USA, 2002.

Heid, Jim. *The Macintosh iLife '04*. Berkeley: Peachpit Press, 2004.

Lambert, Joe. *Digital Storytelling: Capturing Lives, Creating Community*. Berkeley: Digital Diner Press, 2002.

Madej, Krystina. "Towards Digital Narrative for Children: From Education to Entertainment, a Historical Perspective." *Computing Entertainment* 1.1 (2003):12-12.

Mazalek, Ali, and Davenport, Glorianna. "A Tangible Platform for Documenting Experiences and Sharing Multimedia Stories." Paper presented at the ACM SIGMM workshop on Experiential Telepresence, at Berkeley, California, 2003.

Minneman, Scott L., and Harrison, Steven R.. "Where Were We: Making and Using Near-Synchronous, Pre-Narrative Video. Paper presented at the first ACM international conference on Multimedia, at Anaheim, California, United States, 1993).

Picard, Rosiland W. *Affective Computing*. Cambridge: MIT Press, 2000.

Polkinghorne, Donald E. *Narrative Knowing and the Human Sciences.* Albany: State University of New York, 1998.

Soundarajan, Thenmozhi. *MOMNOTMOM*. 2005. http://www.storycenter.org/whatis.html.

Tran, Quan T., Calcaterra, Gina, and Mynatt, Elizabeth D.. "Cook's Collage: Deja Vu Display for a Home Kitchen." In *Home Oriented Informatics and Telematics*. United Kingdom, 2005.

21 *Capture Wales Digital Storytelling* http://www.bbc.co.uk/wales/capturewales/ (2005); *Creative Narrations* http://www.creativenarrations.net/site/storybook/index.html, (2005).

colophon

The Journal of the International Digital Media and Arts Association is on the cusp of a new phase of growth and readership as founding Editor Conrad Gleber, assumes the position of the President of the iDMAa Board of Directors and passes the torch to the current Editor Michael Niederman. A complete overhaul of the design of the publication was necessary to both express the spirit of this transition and to meet the challenges ahead. This re-design of the *iDMAa Journal* is intended to embody the stimulating attitude of the present time period and to reflect on the diverse and exciting organization this journal represents.

The design concept for the *iDMAa Journal* utilizes a visual feature common to text in a computerized context: the selection box. The colored boxes that appear around text selected by a user can be found on computer operating systems throughout the world. By amplifying this ubiquitous motif, a strong and unifying aesthetic emerges that is at once commonplace and curiously unfamiliar. The brute force of this unremarkable effect can be quite dramatic when the selection box of the screen has been decontextualized by the surface of the printed page.

At the beginning of every essay in this issue of the *Journal* is a screen capture of the author's desktop. This arbitrary, yet subjective imagery provides a glimpse into the mind of the writer by presenting a casual (or studied) snapshot for the reader to see. What desktop image does the writer choose to look at everyday? How are the various folders arranged and what are their names? What files are hastily cluttering the public space of their screens? These mundane details have significance and reveal much about the one who placed them there. They are an intriguing backdrop for the carefully articulated academic essays that follow.

The typeface used is Helvetica Neue, which is based on the original Helvetica designed by Swiss type designer Max Miedinger in 1956. In 1983, the German type foundry D. Stempel AG redesigned and digitized the "Neue Helvetica" typeface for Linotype and made it a self-contained font family. When it was first released, Helvetica was heralded for its modern form and expressive strength, but it has since come to represent the essence of ubiquity through its nearly universal adoption as a default typeface on contemporary computer systems (in its pure or bastardized forms). It is Helvetica's rather distinctive commonality that I have chosen to embrace with this design.

I hope you enjoy the new incarnation of *The Journal of the International Digital Media and Arts Association,* as we build upon the successes of the past and find new form and relevance for the future.

Randall Hoyt, Design Editor
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Randall Hoyt is a communication designer/educator currently teaching at the University of Connecticut. Randall's vibrant studio practice encompasses screen-based and environmental design projects for national and international clients including The Museum of Money and Financial Institutions, American International Schools, American Institute of Architects and Yale University. Randall received his MFA from the Yale School of Art Graphic Design Program in 2001. Visit randallhoyt.com for more information.

Adobe InDesign CS2