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Hybridizing Learning, Performing Interdisciplinarity: Teaching Digitally in a Posthuman Age

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ABSTRACT

This paper discusses how Southern California serves as a site of regional advantage for developing new hybridized forms of interdisciplinary pedagogy, because networks of educators in higher education are connected by local hubs created by intercampus working groups, multidisciplinary institutes funded by government agencies, and philanthropic organizations that fund projects that encourage implementation of instructional technologies that radically re-imagine curricula, student interaction, and the spaces and interfaces of learning. It describes ten trends in interdisciplinary pedagogy and case studies from four college campuses that show how these trends are being manifested.

Categories and Subject Descriptors

H.5.1 [**Information Interfaces and Presentation**]: Artificial, Augmented, and Virtual Realities

General Terms

Design, Human Factors.

Keywords

Instructional technology, data visualization, interface design, interdisciplinary pedagogy

1. INTRODUCTION

Several interdisciplinary courses are currently taught in the Southern California region that use virtual worlds, caves, HIPer walls, visualization portals, participatory screen systems, information visualization software, rich media publishing systems, teleconferencing, 3-D modeling labs and light stages, digital editing bays, machinima, videogames, robotics, and even paper prototyping. In this way, the local area of the DAC conference may serve as a milieu of innovation in which encounters can take place between colleagues pursuing similarly experimental interdisciplinary digital pedagogies in an instructional testbed of what AnnaLee Saxenian has in the context of other high-tech development practices called "regional advantage" [24].

These classes that combine media theory with multimedia or database design and production not only trouble the assigned hierarchical roles of the classroom situation but also disrupt norms about disciplinarity that institutions may hold dear, particularly as

students and learners perform knowledge work that appeals to the broader public.

Although many examples of interdisciplinary pedagogy come from studio art or computer science programs that combine art and science paradigms of *technê* rather than *epistêmê*, there are also a number of notable local efforts in the "digital humanities" that bring students and teachers from many departments and majors together from disciplines traditionally associated with print culture and the classical trivium.

For example, archeology and architecture students have explored a life-sized computer-generated 3-D model of ancient Rome in a visualization portal as part of their professional training, creative writing students have used a 3-D cave to move words around in an immersive composition in the same space used by biology students, and rhetoric students tour a "Virtual Guantánamo" and visit a representation of Dante's *Inferno* in *Second Life* guided by the avatars of the artists and architects who created these structures before returning to the home island for their class to experiment with building rhetorical landscapes for themselves.

2. TEN PEDAGOGICAL TRENDS

In Southern California, there has been a wide-ranging discussion about pedagogical philosophy, which has involved interrogation of the epistemologies, logics, ethics, politics, aesthetics, and even metaphysics of teaching. As people, ideas, and forms of hardware and software circulate between regional campuses, theoretical discussions about teaching have explored topics from the following ten areas:

Playable Simulations differ from conventional computer models that depict change over time in that users can alter inputs to learn how different influences, factors, or catalysts may play a role in the outcomes that a given system generates and represents. In higher education, computational media have been developed for visualizing solutions to a number of problems – and ways that cascading failures can be anticipated – in research areas that range from climate science to international relations. Like traditional role-playing games, students can study the interactions between different physical, biological, psychological, political, cultural, or national actors by experimenting with different combinations of inputs and forming hypotheses about causality.

Procedural Literacy Events encourage students to figure out underlying rule sets through experience rather than through

didactic delivery and direct instruction. By experimenting with different algorithms at work in a digital representation, students can see how a set of implicit rules can be made explicit or vice versa. For example, using computer programs that are created by researchers in artificial life, students can see how patterns of segregation can unfold in urban neighborhoods. Like the literacy events described by Shirley Brice Heath that take place within print cultures, in which "oral performance surrounding a written piece of material" is a key component of membership in an educated community [12], procedural literacy events in which students deduce the rule at work in a given system collectively can be profoundly social, as they are discovered in group work.

Database Mash-Ups enable new forms of data mining in educational contexts as students work with more than one database at a time. A general pedagogical mash-up culture has been promulgated in recent years by a number of corporate software providers who would like to encourage educators to use products that are simultaneously open and proprietary, such as Keyhole Markup Language (KML) from Google, and by government entities that are encouraging the use of completely open applications programming interfaces (API) technologies to make complicated and very large data sets about the federal budget, national demographics, transportation records, or biodiversity more easily usable by the public.

Network Epistemologies assume that relationships between objects of study are complex and cannot be simply characterized by one-way cause and effect relationships or Bloomian models of influence. Of course, Mark C. Taylor was ridiculed when he proposed in the editorial pages of the *New York Times* that conventional academic departments should be abolished and the academy should be reorganized around "zones of inquiry" such as "Mind, Body, Law, Information, Networks, Language, Space, Time, Media, Money, Life and Water" [25]. But universities can not continue to resist what Manuel Castells has called "the rise of the network society" [4] and what Albert-László Barabási has characterized as a correction to science's long history of reductionism [3].

Object-Oriented Reasoning assumes that older taxonomic models of knowledge are less viable in the digital age, because the task of interpreting scholarly objects of study is less about cataloguing elements into fixed categories and more about attaching metadata that does not preclude other kinds of organizational and interpretive schemes. Following Bruno Latour and philosopher Graham Harman, who has asserted Latour's importance in metaphysics [10], a number of academics are teaching in ways that foreground object-oriented reasoning, which has been expressed at the popular level as what David Weinberger has described as an "everything is miscellaneous" approach to categorizing knowledge [28].

Information Aesthetics interrogates how representation and abstraction have been used traditionally in the visual arts and also builds on work being done in information design and data visualization. Research projects oriented around pattern recognition may use open-source collaboratively authored data mining and data visualization tools to ask new scholarly questions that would not have been possible with the material generated only by traditional text encoding initiatives. As Franco Moretti proposes in *Graphs, Maps, Trees*, students of literary history who are willing to attend to "the explanation of general structures over the interpretation of individual texts" can better understand the unstable sites of literary production that are "halfway between the social *doxa* and the individual voice" [22]. Learners generate content that reflects a stylized reality of numerical extrapolations by engaging with code practices that go beyond the highly scripted charts and graphs that are part of the default Microsoft Office package to use visualization tools that show fluid relationships and very large data sets. For example, initiatives such as the MONK Workbench allow graduate students in English literature to see clusters of lexical choices that might otherwise be invisible in a conventional reading of a literary text.

Tactical Media takes advantage of the availability and flexibility of new digital tools and Internet venues for user-generated content, along with the vulnerability of traditional one-to-many forms of print and broadcast media, to publicize politically or culturally subversive parodies, hoaxes, hacks, DIY projects, or other unauthorized appropriations of branded products from the mainstream culture industry. Rather than be shielded from public audiences behind ivy walls or ivory towers, students in courses with instruction in tactical media are encouraged to participate in (and critique) a larger economy of attention in which the standard procedures of passive consumption are to be ignored and any exploits found are to be capitalized upon [17]. For example, at Pitzer College, students have competed to compose YouTube videos that earn over a million views, and then they deconstruct the makings of potentially viral content. At the same time thy have been encouraged to explore "NicheTube" and the counterpublics that spaces for alternative politics and socialities offer [14].

Digital Rhetorics not only interrogate the relationship between technological affordances and techniques of persuasion but also consider the embodiment and occasionality of electronic speech acts – as well as conditions of distance and asynchrony – that shape contemporary rhetorical situations. Richard Lanham has suggested that such rhetorics have created a crisis for the traditional structures of universities as public institutions of knowledge that depend on maintaining existing hierarchies of power and systems of exclusion. Lanham argues that these new rhetorics also present a "fictionalized modeling" that characterizes a range of "real" simulations both inside and outside of academia [15]. Faculty associated with "computers and composition" or "computers and writing" have a long history as early adopters of instructional technology with professional associations that go back to the nineteen-eighties and nineties. In this body of criticism, software development, gaming, and practices associated with social computing are treated rhetorically, and specific audiences, purposes, acts, actors, and agents can be explored and appropriated for new use.

Software Studies examines software as a cultural product that represents and performs a number of different historical, literary, philosophical, social, and political meanings. This interpretive activity seeks input from "computer scientists, artists, designers, cultural theorists, programmers, and others from a range of disciplines" to understand the "ways of thinking and doing" that are distinct to programming's own subcultures [8]. Software studies can direct students' attention to objects of study that range from individual sections in a line of code [20] to entire platforms for programming [21], and it argues that print culture, architecture, contemporary art, and the face-to-face social networking of knowledge workers cannot be apprehended without considering the role of both proprietary and open-source software

products, because of a principle of what Lev Manovich has called "transcoding" [19].

Critical Information Studies, the subject of a "manifesto" by Siva Vaidhyanathan, focuses on four areas: 1) "the abilities and liberties to use, revise, criticize, and manipulate cultural texts, images, ideas, and information;" 2) "the rights and abilities of users (or consumers or citizens) to alter the means and techniques through which cultural texts and information are rendered, displayed, and distributed;" 3) "the relationship among information control, property rights, technologies, and social norms;" and 4) "the cultural, political, social, and economic ramifications of global flows of culture and information" [27]. As Vaidhyanathan describes it, its subject matter could include "copyright policy, electronic voting, encryption, the state of libraries, the preservation of ancient cultural traditions, and markets for cultural production." Its interdisciplinary encounter is foregrounded by collaboration between "economists, sociologists, linguists, anthropologists, ethnomusicologists, communication scholars, lawyers, computer scientists, philosophers, and librarians" [27]. For example, the Critical Commons project at the University of Southern California is attempting to regain territory for fair use with an archive of digital video clips for teaching situations that emphasizes possible uses that are "transformative, culturally enriching and both legally and ethically defensible" [1].

Many of these pedagogical approaches could be understood as responses to a "posthuman" condition, one that N. Katherine Hayles argues does not preclude embodiment, situatedness, mediation, enframement, or connections with material and messy infrastructures [11]. For Hayles, when the Enlightenment subject is no longer privileged, the actors in question are hardly the hyper-rationalized abstractions of disembodied technological imaginaries and technocratic dreams.

3. TOPOGRAPHY AND TOPOI: UCLA

At the University of California, Los Angeles, a group funded by the MacArthur Foundation, many of whom have also participated in the year-long 2008-2009 digital humanities public seminar sponsored by the Mellon Foundation, have used the metaphors of geography and urbanism to develop new schemes for what they call "geo-temporal argumentation" and forms of teaching and scholarship that provide alternatives to the "single-authored, fixed, discrete, and print publications" [13] that characterize the conventional textbook and the scholarly monograph.

By focusing on the "digital city" as a theme for learning rather than the more self-reflexive trope of the "digital campus," Hypercities affiliated students are urged to adopt an attitude toward "making things public," which encourages civic engagement through the figure of *res publica* [16]. Many of the Hypercities interfaces are designed to eventually accommodate collective histories of community narratives and to use mobile devices and smart objects to engage learners who are situated at the human scale in the urban landscape.

One of the original projects built by the UCLA contingent was Todd Presner's Hypermedia Berlin which attempts to present the "densely layered architectural, social, political, and cultural palimpsests" [23] of the traditional cultural and political center of Germany by presenting both traditional landmarks that represent hubs of social and economic activity and the dynamic networks of civic mobility and the transportation of goods, such as the

railroad, which have shaped conditions of modernity in the city both spatially and temporally.

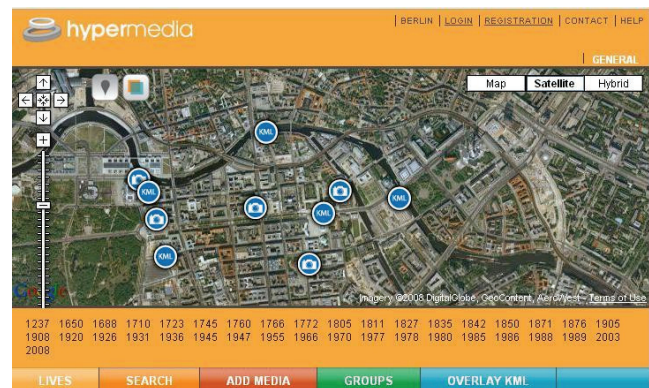**Figure 1. Hypercities Mobile Media Tour**

Figure 2. Original Interface for Hypermedia Berlin

Presner identifies three key areas for his pedagogical and scholarly project, which allows students and their professors to annotate maps of Berlin from many different overlaid time periods: 1) "network theory and contingency," 2) "embodiment and navigation," and 3) "participatory platforms and remix culture" [23]. Although Presner uses technologies in this pedagogical project from Google Maps and Google Earth that are associated with traditions of military strategies of command and control, he wants participants to also understand how conditions of modernity may undermine the possibility of a "privileged position of spectatorship" or an "external view of the system" to reflect Berliners' experiences of "built space or cinematic space" as they take part in the practices of everyday life of the urban flâneur [23].

Presner has not been alone in seeking to use these multidisciplinary new media teaching and learning opportunities offered by the Hypercities project to engage in theoretically and critically sophisticated forms of inquiry that question existing systems of knowledge and power that had conventionally been legitimated in universities. As historian Philip Ethington from the nearby University of Southern California explains a larger

"spatial turn" in the late 1980s, "philosophers, critical theorists, intellectual historians, and others had developed a very advanced debate about the possibilities of producing knowledge of society," which "was not a debate between some naive believers in objective, scientistic value-neutral knowledge on one hand, and relativistic poststructuralists, on the other" [7]. According to Ethington, this group agreed that they were living in a "post-foundational age, aware that linguistic construction, cultural difference, and historical contingency have eliminated the possibility of appealing to timeless, underlying truths, impartial epistemological methods, and the positive accumulation of uncontested knowledge" [7].
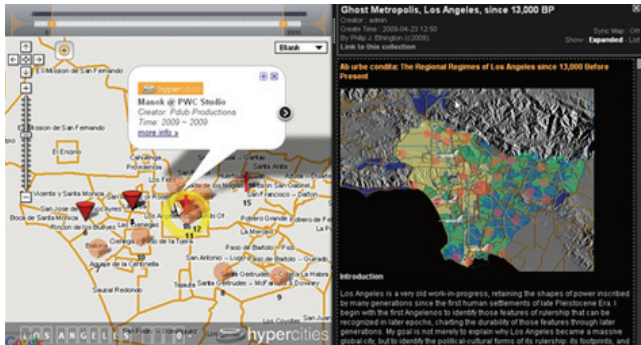

Figure 3. Ghost Metropolis in the Hypercities Collection

Ethington has used the mapping tools of Google's KML to create a vision of Los Angeles as a "Ghost Metropolis" to indicate important cultural landmarks that might otherwise be consigned to the rhetorics of extinction, abandonment, and obsolescence. This project has become one of the featured collections in the Hypercities project, which shows the "global history of Los Angeles since earliest human habitation, written in narrative, non-academic prose" that is "inspired by the Renaissance atlases of the 16th and 17th century, which are rich mixtures of typography, graphic arts, and of course cartography."

Many of the projects in the Hypercities initiatives are designed to be open-ended repositories that can archive personal histories, community stories, and collective narratives of habitation, refuge, migration, segregation, and banishment to appeal to a large population of so-called "life-long learners" outside of the academy's traditional confines. For example, Historic Filipinotown appeals to community activists who support cultural preservation efforts in the face of continuing urban development. Given advances in ubiquitous computing technologies with location-aware devices, Hypercities promoters are also planning to use cellular telephones as platforms for these materials, so that those situated in the urban environment can experience an augmented reality provided by the record of the past.
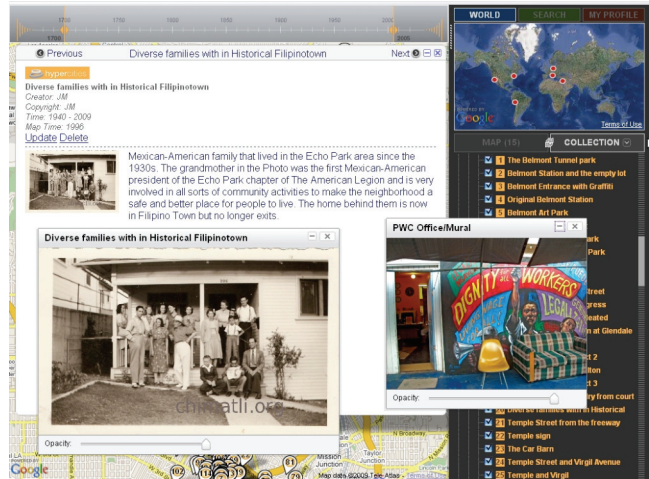

Figure 4. Historic Filipinotown

The roster of team members shows the fundamentally interdisciplinary character of the Hypercities project, which includes faculty from a number of foreign language departments, Comparative Literature, History, Classics, Political Science, Cognitive Science, Computer Science, Fine and Performing Arts, and Architecture and Urban Design. Some faculty members actually identity with multiple disciplines that might be seen as extremely different in conventional schemes for academic organization. For example, one team member lists her affiliations as "History and Statistics."

The Hypercities project also recognizes that the digital record may also be translated by computer models that use 3-D software packages such as Maya to reconstruct vanished architectures and to visualize both the built and the natural environments of the past. In this way, the design practices among teams of digital artists and scholars must foster the reconciliation of different interpretations of the historical evidence to create materials for students that are both vivid and interactive.

Since 1997, "Rome Reborn" has involved the UCLA Cultural Virtual Reality Laboratory, the UCLA Experiential Technology Center, the Institute for Advanced Technology in the Humanities of the University of Virginia, the Reverse Engineering Lab at the Politecnico di Milano, the Ausonius Institute of the CNRS and the University of Bordeaux-3, and the University of Caen to create a hyperrealistic model of ancient Rome as it appeared in late antiquity, which can now be seen on Google Earth. In the Hypercities interface learners can tour the Temple of Saturn and view different time slices that present a visual interpretation of the archeological record as it has been reconstructed by archeologists and architectural historians.
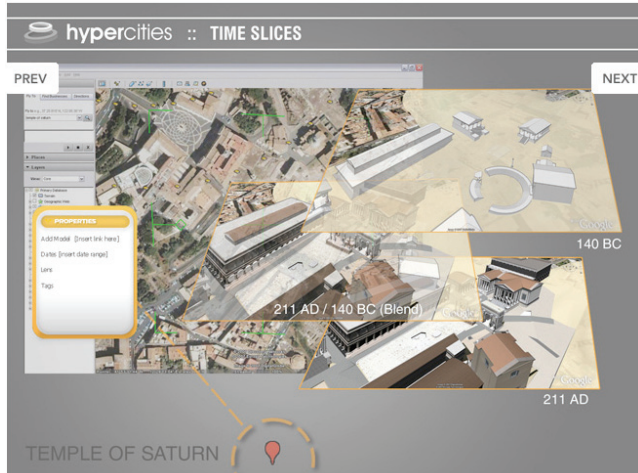
Figure 5. Hypercities: Temple of Saturn Time Slices

UCLA is also known for using its visualization portal as a space for scholarly lectures and classroom discussions in which students experience a more immersive version of the Rome simulation in which the "fly-through" experience occurs on a much larger scale.

Figure 6. The Visualization Portal at UCLA

Unlike many cave experiences, however, many of the architectural features of the traditional classroom space are preserved, because this mixed configuration encourages needed social interaction both between students and with the instructor. Thus, immersion in the volumes of the space of these archeological simulations is mediated by a faculty member who serves as a guide to help the group navigate and move through the simulation purposefully.

4. INTERFACE RHETORICS: UC SAN DIEGO

An even more immersive teaching environment has been planned for the StarCAVE at the University of California, San Diego, which uses polarized 3-D glasses to make visual research in biology, archaeology, structural engineering, and architecture more captivating to potential student spectators. However, critics note that in many ways this StarCAVE installation for all its vividness lacks real interactivity, because students are excluded

from the role of content-creators. Even curious or pedagogically adventurous UCSD faculty members are kept out of the StarCAVE, because the access to the display technology requires specialized key cards to get through two locked doors.

However, UC San Diego is also contemplating a more pedagogically radical approach to large scale display technologies, one that includes students as content-creators and treats them as active participants in what Jeremy Douglass has called "the rhetorics of demo culture." UCSD has also been the recipient of a number of grants related to Lev Manovich's Software Studies initiative and his related Cultural Analytics project, which attempts to represent the cultural production of up to a million professional and vernacular cultural producers who are engaged in creating the art, literature, design, fashion, and music not only of the past but of the present and the proximate future. To show such a huge data set that might include thousands of paintings, buildings, design portfolios, or examples of print ephemera, Manovich and Douglass have produced one of its first demos on the HIPerSpace wall, which offers one of the world's largest displays with screen resolution up to 220 million pixels.
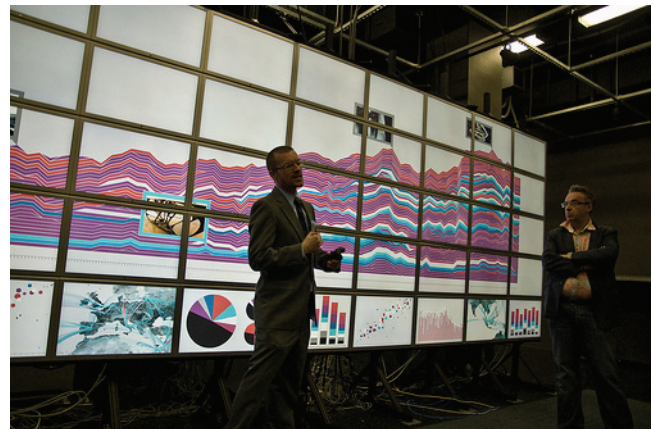

Figure 7. The Cultural Analytics Demo at the HIPer Wall at UC Irvine for HASTAC II

For Manovich, one of the central issues in knowledge production and scholarly representation in the twenty-first century is expanding scale. Manovich also points to new disciplines like "meta-genomics" as representative of innovative forms of academic inquiry that are emerging in response to accelerating computational power, as the many variants of Moore's law are made manifest.

Manovich argues that scholarship is moving from a model based on "discrete communication," "discrete recording," and "analysis of past data" to "near continuous communication, connections, and recording" with "real-time analysis" [18]. For example, a student working on an independent study project with Manovich on LookBook.nu, an international site about street fashion and vernacular design, could "drink directly from the firehose," according to Douglass, as new data for her project streamed in every hour.

As teachers of digital rhetorics and interdisciplinary subject matter, Douglass and Manovich have modeled new presentation techniques with sizable data sets and these large-scale computer display walls that have been subsequently posted for mass-consumption as online videos on YouTube. In their first demo,

they present a general introduction to the topic of cultural analytics before an audience of conference attendees from the Humanities, Arts, Science, and Technology Advanced Collaboratory at nearby UC Irvine. Later Douglass performed a solo demo at his home UC San Diego campus that showed how a more conventional art history lecture about the paintings of Mark Rothko could be staged.

Figure 8. The Rothko Demo at the HIPerSpace Wall at UC San Diego

First, it is important to observe that these two rhetorical performances took place at two separate physical sites with similar and yet different display technologies that used different software and hardware that proved to be not entirely compatible, since one of the inventors had introduced elements of proprietary code to the wall at UC Irvine, unbeknownst to the UC San Diego presenters. This happened because of common patterns of faculty mobility between campuses in which researchers leave one UC campus to take a position at another. As Saxenian has noted, regional advantage produces both collaboration and competition, and in this case the similarities and differences between the HIPerWall and the HIPerSpace wall manifest how flows and resistances are created by the movement of persons and technologies between specific sites of pedagogical innovation.

Second, it is interesting to observe how Douglass compares this demo experience to a more conventional classroom presentation technology, PowerPoint, which has been understandably castigated by Edward Tufte and many other educators and information designers, because of its corporate mass-market aesthetics, communicative constraints, and proprietary software. Douglass and the CalIT2 HIPerWall group had actually created their own software application called "PowerWall Presenter" for the demo. However, Douglass noted that in some ways a given presenter actually has much less personal control of the content that is situated on the display than even standard PowerPoint affords, because the wireless mouse that seems to allow more natural interaction with the screen in Douglass's performances proved not to be as effective in "driving the wall," so that an unseen technician at a keyboard with his back to the wall is needed to serve as an offstage assistant.

However, despite this technology's potential reputation for legitimating a "sage on the stage" approach to teaching, UCSD students themselves have been able to create individual projects for coursework that have been displayed on the HIPerSpace wall. To prepare them for this task, Manovich instructed his pupils in VIS 149 who had already studied a number of genres of data visualizations to think about a more familiar set of rhetorical conventions, specifically those associated with the academic poster presentation. Students in the class essentially composed giant posters for their final projects that were uploaded into the HIPerSpace wall for graded evaluation.

Nonetheless, like the StarCAVE, Manovich's pedagogical experiment took place in the context of several architectures of prohibition. Most important, the building in which his class meetings took place actually explicitly prohibited such pedagogical uses of its rooms, and Manovich had to disregard other stakeholders' desires to control access to their instructional technologies.

5. COMMAND CENTER AND BACKCHANNEL: USC

At the University of Southern California, a private university in which students are entrusted with much more access to costly technologies, classroom learners have been encouraged to take an even more hands-on role when interacting with multiscreen displays. Students in the Interactive Media program who take part in creating playable and procedural media experiences can enroll in classes taught in the Zemeckis Media Lab (ZML) multi-screen space, which was designed by Scott Fisher and mirrors many elements of similar spaces built by Fisher for Keio University in Japan.

Figure 9. The Multi-Screen Pedagogical Space in the Robert Zemeckis Media Lab (ZML) at USC

In the ZML instructors might choose to serve as desktop DJs who manage a much more complex rhythm of visual materials around the room than a single-screen room allows. Or they may encourage students to make the private screens of their own laptops into public space, so that all participants can see the content of their screens.

Like the command centers of professionals engaged in managing air traffic control, space missions, or subway systems, which have been studied by ethnographers of technology, the use of the ZML space can not be reduced to a simple pyramid structure oriented around hierarchies of power and authority. Although the instructor is nominally in charge, the arrangement of instructional technology encourages awareness of simultaneous activity by

others and attention to distributed and yet coordinated actions by a range of social actors who may have different roles in the classroom.

Because students may be assigned specific tasks for finding and displaying materials to others, the pedagogical space of the ZML emphasizes modes of situated learning in which the students' social roles in the classroom are part of the explicit instruction. Holly Willis, head of the Digital Educators Consortium, which has facilitated interdisciplinary pedagogical conversations between USC and many other regional campuses, has called this shift the transition from "learning about to learning to be" [29].

In addition to this "command center" or "control room" aesthetic that feeds multiple channels of information to participants in the room simultaneously, ZML classes often also incorporate display of a "backchannel," where attendees who may not be participating in the main class discussion can still provide commentary and criticism that indicates a different kind of engagement in the room's pedagogical drama. Often these students provide links and further research resources to extend class discussion into time-on-task devoted to self-study that is enhanced by online chat.

As Fisher and his collaborators acknowledge, because of the potential for distraction and subversion of authority, this backchannel can also be seen as "threatening to the institutionalized learning environment," so that "most of what happens in technology-augmented classrooms today is still traditional – students take notes, and professors lecture" [9]. Nonetheless, the USC group argues that "the potential exists for new and important forms of collaborative learning within these spaces, harnessing the power of network multimedia for augmented learning experiences" [9].

In an essay called "A Pedagogy of Original Synners," Steve Anderson and Ann Balsamo, who have taught in the occasionally free-for-all environment of the ZML pedagogical space, describe how they might manage even more transgressive students in the "game matrix" of a sci-fi virtual classroom in 2020 in which their charges are instructed to "Pick your Medium: Physical, Mental, Chance, or Arts" [2]. They hypothesize that new instructional situations could be generated by "evaluation bots" who would serve up the following options: "a) naked, b) tool, c) machine, d) animal." Although the third "machine" option emphasizes "digital devices and applications, as well as engines, robots, biolution devices, flickercladding and other nano manufacturing gadgets," the second "tool" option includes present-day learning aids that are familiar to instructors who use paper prototyping and rapid prototyping technique in game development: "markers, dice, picks, hammers and pens" [2].

6. RAPID PROTOTYPING: UC IRVINE
Rapid prototyping is also an important part of interdisciplinary pedagogy at the University of California, Irvine. Part of this interest in rapid prototyping in student composition is driven by the constraints of course scheduling, since classes are taught in ten-week quarters rather than offered at the more leisurely pace of other campuses.

In 2006, the campus launched a Freshman Integrated Program that aimed to provide first-year students with precisely the kinds of interdisciplinary faculty team experiences that Taylor's manifesto in the *New York Times* had argued should be implemented. The most popular course in FIP focused on computer games and was

taught by three faculty members from different programs: film and media studies, software engineering, and informatics. According to the syllabus, freshmen who were enrolled in "Computer Games as Art, Culture & Technology" or US 12 would be exposed to the "vocabularies, perspectives, tools, and skills from multiple disciplines necessary to create and critique computer games" and "contemporary art practices utilizing game metaphors, design principles, and technologies."
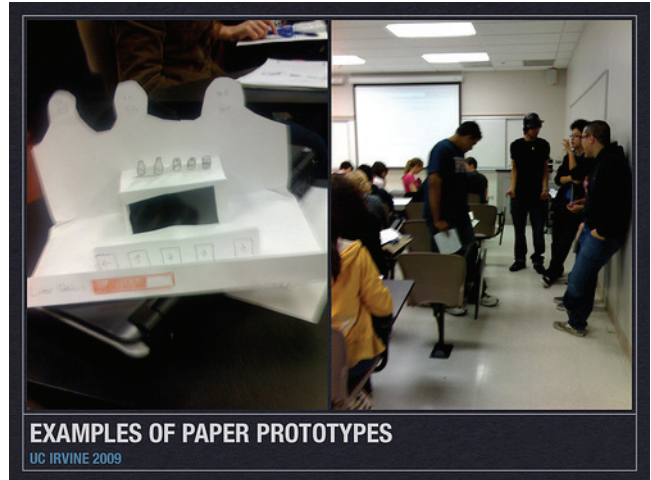

Figure 10. Paper Prototyping of Games from Computer Games as Art, Culture & Technology at UC Irvine

After being trained in paper protyping techniques, a number of the students from US 12 continue to work together with their teaching assistant Garnet Hertz on projects in the Laboratory for Ubiquitous Computing and Interaction that are aimed at public audiences. For example, currently a group of five students is working on "OutRun," an augmented reality game that combines a real world street vehicle with an arcade driving game that had been released by Sega in 1986.

Also at UC Irvine, upper-division writing students in "Digital Rhetorics" or WR 139 produce digital files in a variety of Internet genres, such as Facebook profile, multi-week blog, wiki entry, and YouTube video. The reading list covers a period of several decades, beginning with Vannevar Bush's "As We May Think" and includes texts from several different disciplines that bridge the arts, the humanities, the social sciences, and computer science.

These graduating seniors, who soon will be deploying digital rhetorics in situations outside of the university, are also asked to read work about procedural rhetorics and persuasive games and to write a proposal for a game that adapts a work of print literature. Although students were instructed that their final project, an online video could be as simple as a webcam recording of themselves reading a script or a converted PowerPoint presentation, all students decided to engage in learning new software practices, and the group experimented with editing, image manipulation, machinima, and computer animation.

Figure 11. YouTube Video from a Digital Rhetorics Student at UC Irvine

At one point, however, a fierce debate broke out on the class blog, after one student praised the multi-screen experimental teaching classroom and expressed his appreciation for having access to its resources. The student said the class was a "great example of how we are actually applying the things we learn in class to the real world," and he argued that "with the help of various tools we use in class, we are able to do things that I would never have thought possible in a regular writing class," which included having access to "projection screens, wireless devices, YouTube, blogging, and other new technology." He closed by expressing his "hope" that these technologies "will be applied to all classes in the future." Other students protested that these technologies should be available in *all* classes now and that they actually had been cheated in their other classes rather than rewarded in this one learning experience. Subsequent use of the university's teleconference facility by the class only made these students more vocal in their objections about their previous lack of exposure to instructional technologies that were paid for using public taxes and their student fees.

It is worth noting that both WR 139 and US 12 also took advantage of the availability of classroom space in "Anteater Island," property that the university had purchased in the virtual world *Second Life* to be used for pedagogical purposes. However, the instructors of these courses wanted to avoid the distance learning pitfall of many *Second Life* based courses in which conventional classroom spaces and interactions are merely recreated in 3-D digital environment. Instead, the emphasis was placed on individual production and the design of collaborative projects, as students spent their time engaged in sandbox activities and actively creating built environments on Anteater Island for others to appreciate. Rather than watching videos or PowerPoint presentations as passive spectators, as far too many students do in *Second Life*, these students were engaged with the software interface for building architecture.

It is also worth noting that many of the large-enrollment interdisciplinary courses at U.C. Irvine for undergraduates that deploy these kinds of technologies are also writing-intensive. Thus, these courses require students to compose in multiple media and through multiple modalities in a variety of genres with a "demo-or-die" fast-paced approach. For example, both US 12 and WR 139 satisfy four units of the undergraduate writing requirement in a campus curriculum that mandates at least eight units of lower-division writing instruction and at least four units of upper-division writing instruction. The courses have also shared pedagogical capital, in that faculty teaching one course have guest lectured in the other, and there is a continuing conversation about the two syllabi.

7. CONCLUSION

This paper attempts to provide several examples of courses that are designed to prepare college students for exciting contemporary academic and professional environments of intellectual collaboration, disciplinary boundary crossing, simulation, prototyping, and play. It argues that the unique cultural geography of Southern California that relies on the availability of hubs for pedagogical discussion has encouraged exchanges about teaching practices that cross disciplines and intersect with new forms of computational media at four local universities.

Furthermore, although these initiatives are primarily faculty-driven, students are also imagined as critical partners for developing lasting art-science alliances and interdisciplinary collaborations. For effective digital pedagogy to function, learner-participants must be allowed to air concerns about access, equity, usability, and sustainability and to raise objections to proprietary software, costly hardware, or untested prototypes.

8. ACKNOWLEDGMENTS

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