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What have we learned and how have we learned it? Examples of Best Practices of a New Media Services and Development Center in Higher Education

1 Introduction

After a brief introduction of the Columbia Center for New Media Teaching and Learning and its design research method for project development, this paper discusses three projects: *Video Interactions for Teaching and Learning* (an online environment that allows for the editing, annotation, and multimedia text production in a specific field of interest using a digital video library as a base); *The Deconstructor* (an online video environment for scene analysis); and *Exploring the Poles* (the effective integration of online journals in an introductory general science class). We conclude with twelve emergent understandings about the best way to pursue the development of new projects, the results of our research on design.

2 The Columbia Center for New Media Teaching and Learning

The Columbia Center for New Media Teaching and Learning (CCNMTL) was founded in 1999 as a response to the recommendations of a university-wide faculty and administration committee charged to examine at the state of digital technology on the campus.[1] The committee's primary recommendation was to create a service organization that whose mission would be to support faculty in their use of digital technologies within the University's matriculated degree programs. The Center works to provide faculty with a broad range of new media services, including: workshops, forums, individual consultations, as well as ongoing and sustaining support in the development of more advanced projects. In partnership with the faculty as content experts, the Center is committed to advancing the purposeful use of new media and digital technologies in the educational programs of Columbia University.

CCNMTL's original staff of three has grown to 34. In its short history, it has provided service to over 2,000 faculty with projects ranging from simple course management support to over 150 larger projects. CCNMTL employs a number of professional web designers, programmers, and video experts but the core team of Educational Technologists are the frontline for engaging and working with faculty in project conceptualization and execution. The Center, funded in large part through the University's operating budget, has received over $5 million dollars in grants and $10 million in gifts.

[1] For more information about CCNMTL please visit: http://ccnmtl.columbia.edu

3 Design Research as a Framework for New Media Pedagogy

The notion of design experiments, or a design perspective in educational research, means shifting the focus of research from the laboratory to the classroom. The traditional gap between theory and practice was understood by researchers as the problem of a decontextualized notion of how learning occurs in real schools, and how teachers foster it. This move from one setting to another (Brown, 1992) implied the development of new ways of conceptualizing and addressing research problems in education. Some of these problems were still framed in advancing what was known about students learning process. But these problems were also related to an agenda of educational innovation and change. More recently, the notion of design began to be utilized as a very appropriate heuristic to describe what it takes to develop technologies that support different teaching and learning activities. Daniel Edelson (2002) explains that within a design research approach, development and research merge into a process of iterative cycles of design, implementation, and assessment. The notion of design, then, is more than a methodological perspective in educational research. It is also an epistemological frame for producing knowledge about teaching and learning. By addressing the research enterprise as a design effort, one assumes that knowledge gets articulated through a series of provisional understandings, through a refinement of appreciations, and through making the whole process public to others. This is actually one of the main methodological tenets of a design approach in educational research, namely the need for a systematic documentation of the overall design process. This demand for rich, comprehensive documentation is related to two main purposes:

(1) Analysis: One of the most salient features of the design approach is that it allows researchers not only to focus on analyzing the outcomes of a designed educational experience, but also on analyzing its very design processes. The process of designing an educational learning environment is full of pedagogical decisions. A design research framework attempts to capture and articulate this set of decisions and the way in which they play out in the actual educational experience of students and instructors (Edelson, 2002.) Documents provide records that represent all these decisions and articulate a framework for research and assessment.

(2) Communication: In order for design experiments to contribute to the advancement of knowledge about teaching and learning, researchers have to communicate and share their experiences, to make them public and available for the study of other researchers and practitioners. A rich documentation of the experience would provide this community of colleagues with better opportunities to understand and represent the nature of the activities and processes that took place (Lampert & Ball, 1999).

This approach to thinking about the production of knowledge about teaching has some important implications for understanding how pedagogical reflections can take place through the design of educational technology projects.

Firstly, identifying challenges or problematic areas in one's own teaching, and thinking about how technology could help address them, invites instructors to make explicit their pedagogical content knowledge (Shulman, 1987.) Shulman defines this concept as the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction. Secondly, the pedagogical reflection required to undertake design experiences entails collaboration. It is assumed that different professionals would provide different expertise to the design and understanding of the experience (Collins, 1999).

In August 2002, the Columbia Center for New Media Teaching and Learning began to develop a design research framework that would accommodate the needs of its daily services and design practices.[2] The Design Research process for developing classroom innovations begins by partnering with faculty members to discuss their teaching practices. This conversation unfolds in a series of discussions around the following stages.

1. *Initial Understanding of Curriculum:* What are the content, purposes, and activities involved in this course?
2. *Challenges and Opportunities:* What challenges or obstacles have faculty and students faced in the course? What new resources, teaching techniques, learning opportunities, and communication strategies would improve the educational process? What possibilities for the construction of new learning spaces begin to come into view, learning spaces impossible before the advent of digital technologies?

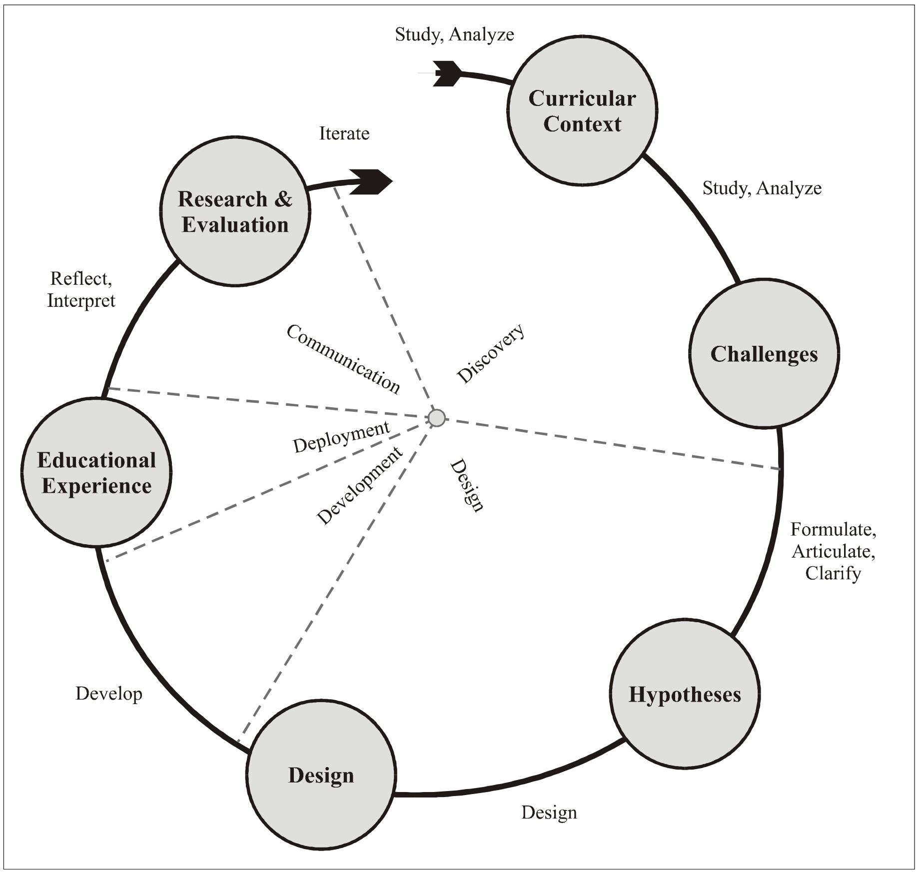

Fig. 1: Visual representation of the Design Research Process framework at CCNMTL

2 For more information about CCNMTL's Design Research framework, please see: http://ccnmtl.columbia.edu/dr/

3. *Design Hypothesis:* What digital technologies would provide the best solutions to these challenges? What learning experiences will technology enable that had not been possible before? How will students and instructors work within the redesigned learning environment? What principles and activities will best utilize these technologies to address the identified challenges?
4. *Design of Educational Experience:* How will these digital and pedagogical solutions be designed? These decisions determine the content, activities, and interactions that make up the learning environment.
5. *Educational Experience:* What facilities, orientation and/or training will be required to initiate the educational experience? Faculty, with CCNMTL support, implement the project within the course and closely monitor its use.
6. *Evaluation and Discussion of Findings:* What worked? What didn't? Together with our faculty partners, we evaluate the educational intervention, as well as our design process, and assess our hypotheses. We articulate recommendations for improving the project. The continuous documentation throughout the process enables this discussion and evaluation.

CCNMTL's design research process aims to optimize the development process by supporting faculty and educational technologists with a framework of the overall workflow. This requires faculty and educational technologists to iterate through a cycle of questioning, practicing, adapting their actions, using feedback, reflecting, and articulating their ideas about teaching, learning and technology.

4 The Framework in Action: Examples of Best Practices

Here, we introduce three examples of projects developed at CCNMTL using the Design Research framework. We believe these examples provide an opportunity to demonstrate best practices both in (a) teaching and learning with technology specific to particular disciplines and learning objectives and also in (b) the design process. In this section, we will introduce and describe three examples focusing on (a). In section 5, we will discuss the latter (b).

4.1 VITAL: Video Interactions for Teaching and Learning[3]

In the summer of 2002, CCNMTL was approached by Professor Herbert Ginsburg, a Professor in the Graduate School of Education, Teachers College. Professor Ginsburg sought help in the use of technology, specifically video materials, in his course. Right away, the CCNMTL design team engaged in a process of *understanding* Prof. Ginsburg's *course curriculum*. Prof. Ginsburg teaches a course called "The Development of Mathematical Thinking" at Teachers College, Columbia University. The course has a unique challenge in that it attempts to make aspects of developmental psychology accessible to a school teaching population. To make connections between his research-oriented content and the practice of teaching, Prof. Ginsburg employs an extensive collection of videotapes to illustrate specific phenomena and to model techniques adapted from psychology research in the classroom. In class, he guides students through videos that are linked to the weekly topics, highlighting important concepts and

[3] Source: *Evaluation Report: VITAL (Video Interactions for Teaching and Learning)* Spring 2003. Michael Preston, Educational Technologist. Columbia Center for New Media Teaching and Learning http://ccnmtl.columbia.edu/projects/evaluations/vital.pdf

encouraging discussion and debate. Prof Ginsburg had always seen the videos as a form of quasi-clinical setting that would facilitate the student's development of sound judgment in observing children in the process of making mathematical decisions. His desire that teachers not think of children as blank slates but capable of mathematical imagination was always a central concern and goal. His intuition, as well as CCNMTL's, that he stated in our first meeting, was that a digital video environment that allowed for ubiquitous viewing as well as manipulation would help students hone these critical skills. The course goals can be summarized as follows:

- Provide an engaging style of professional development that empowers teachers to think critically and develop personal theories about teaching and learning rooted in their analysis of children in the act of creatively solving mathematical problems with a clinical interviewer.
- Promote an understanding of the mathematics that young children know and can do, based on current literature, as well as evidence from the critical viewing of clinical interviews.
- Train teachers in skills adapted from developmental psychology research that can provide insight into the processes and understandings of children's minds.

Students have consistently given high ratings to Prof. Ginsburg and his course. However, he had long desired specific improvements to the ways in which he engaged students both inside and outside of the classroom. He pointed out his frustration that, with a class of 50, students were not able to use the tapes to study nor was he able to evaluate their ability to analyze behaviors represented in the interview. The design team, together with Prof. Ginsburg, then, identified the following *challenges* that needed attention in the course:

- Prof. Ginsburg needed easier means to present video of clinical interviews in the classroom (eliminate need for multiple VHS format tapes).
- Students needed access to these interviews outside of class for study and reflection.
- Students needed opportunities to work with these interviews analytically to develop personal, disciplined theories about children's abilities and the appropriateness of math instruction in the early grades.

These challenges began to point in the direction of an initial *hypothesis* that led the design of VITAL: an online learning environment in which students can watch video case studies, identify specific segments which they name and further annotate by saving notes and comments related to their analyses, would help them understand different conceptual notions of children mathematical thinking, as well as develop theories about children's cognitive development and mathematical thinking processes.

This initial hypothesis stressed the importance of providing students with the tools and resources they needed to study and reflect on clinical interactions. The CCNMTL design team and Prof. Ginsburg, however, also realized that it was important to provide students with specific activities and learning tasks that would foster the appropriate type of reflection. The team proceeded with the *design and development* of both the educational plan and the technologies necessary to realize it. The following table summarizes the course goals and the learning activities envisioned during the design process:

Course Purposes		Learning Activities
Promoting an understanding of the mathematics that young children know and can do, based on current literature as well as evidence from the critical viewing of clinical interviews	→	Content: Students will cite and provide examples of the concepts and theories of children's mathematical thinking at early stages of cognitive development.
Training teachers in skills adapted from developmental psychology research that can provide insight into the processes and understandings of children's minds	→	Methodology: Students will perform classroom observations, clinical interviews with children, and mathematical activities designed for the classroom.
Providing an engaging style of professional development that empowers teachers to think critically and develop personal theories about teaching and learning rooted in their analysis of children in the act of creatively solving mathematical problems with a clinical interviewer	→	Critical thinking: Students will analyze and offer their own explanations for children's behavior, demonstrating critical thinking skills in addition to their understanding of theory and educational methodology.

Fig. 2: Course Purposes and Learning Activities

This educational plan required the construction of a series of online tools, which, integrated with the digital library of videos, permitted students to edit and annotate selected videos during their study process and to produce multimedia essays to demonstrate their learning.

VITAL enables students to (1) create, annotate, and save video clips in a personal workspace, and (2) embed clips directly into the body of an essay thus allowing students to cite concrete video evidence that support their ideas. This in turn allows the instructor to evaluate the student's degree of acumen and understanding in observation, analysis and synthesis of ideas. Students were required to use these tools to write multimedia essays in each of the first nine weeks. The format for all of the essays, excluding the ninth, was the same: (1) to connect the video content with the readings, (2) to identify any implications for classroom practice, and (3) to ask any questions that could be addressed in class. The essays were not to exceed 500 words. The course assistants graded the essays each week and provided a summary of key points and questions to Prof. Ginsburg so he could address them in his lecture. In week 9, the essay format was altered to make the question more specifically tailored to the topic, which happened to be pedagogy. Students were asked to watch a series of video segments from a preschool classroom and to identify and explain three examples of good teaching. The final assignment for the course was an extended multimedia essay (3500–4000 words) that required students to capture and analyze a learning activity of their own design which they executed and taught. This final project integrated the full breadth of the course content and required the full use of VITAL's functionality.

VITAL was *implemented* during the spring semester of 2003 with 39 students enrolled in the course. During the implementation process, the CCNMTL team collected data focused on three elements:

- Student work, including weekly assignments and the final assignment
- Commentary on the course provided by the students in the format of weekly reflections about their learning experience
- Surveys administered to the students mostly focused on usability issues of the online environment.

The results of the project were that students were able to practice their analytical skills using video from the digital library of clinical interviews. Evaluations of the first two semesters indicated that students achieved a deeper understanding and higher level of skill in the domain of early childhood mathematics pedagogy, and Professor Ginsburg was able to monitor and more effectively respond to student work throughout the term. VITAL has become a form of best practice at Columbia that has been taken up by others in the applied professions – social work, dance theory and history, communications studies, clinical psychology. The project has been awarded $2.6 million to extend its capabilities and reach a larger national audience.

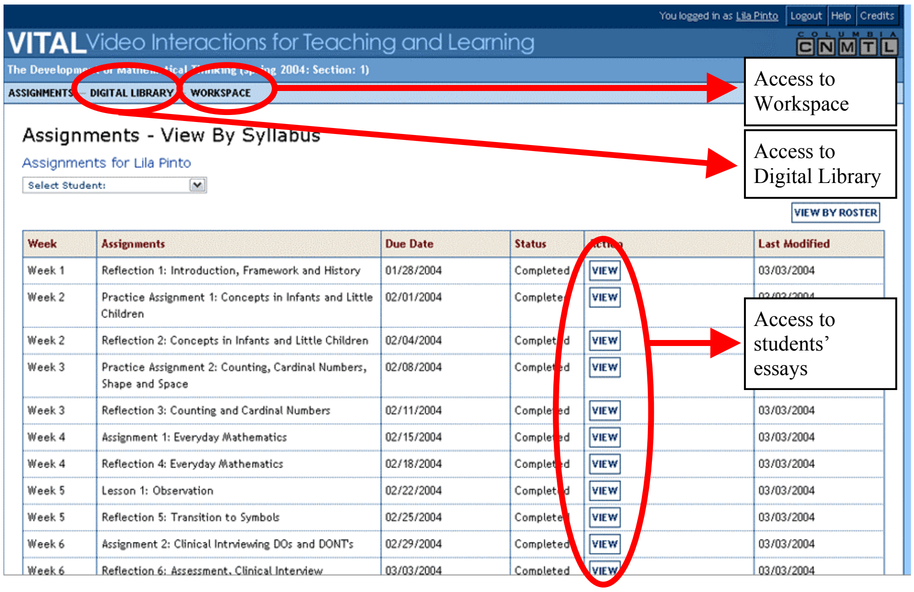

Fig. 3: Access to VITAL Assignments, Digital Library, and Workspace

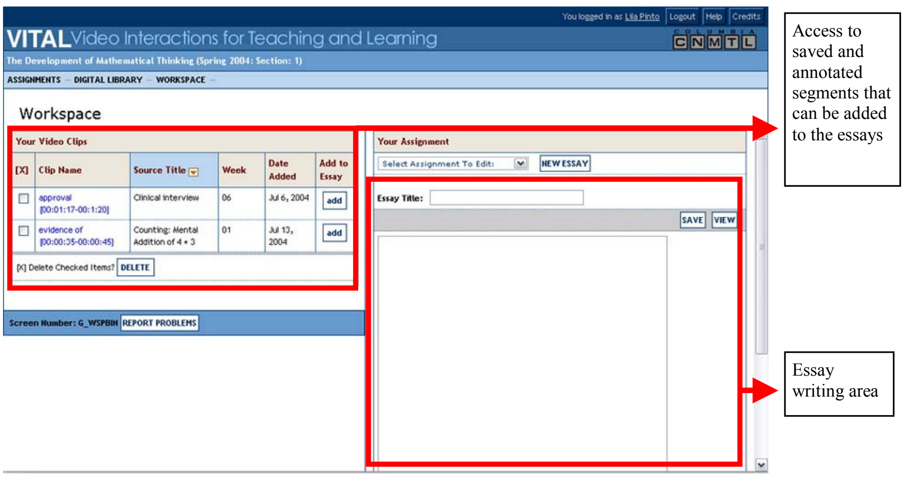

Fig. 4: VITAL Digital Library of videos of clinical interviews

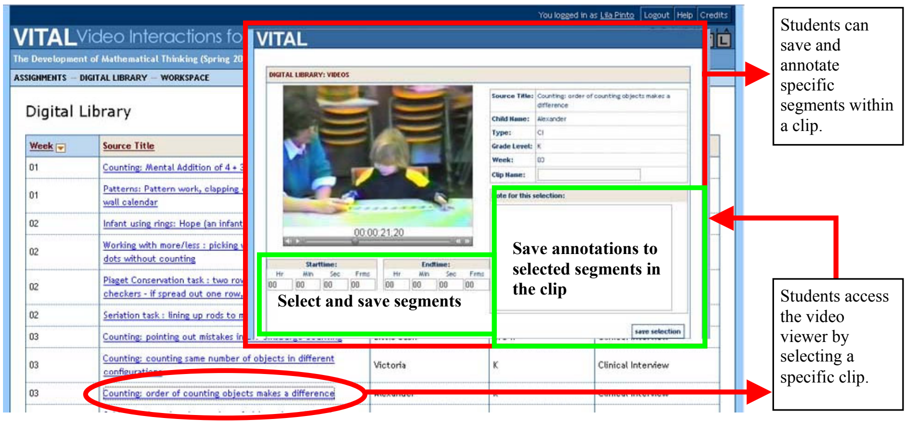

Fig. 5: VITAL Workspace

Following is a summary of *evaluation findings* of VITAL from which are derived *best practices* to take into account when designing online activities that incorporate as one of its main goals the analysis of performances and interactions such as clinical interviews, classroom practices, etc.:

– A series of reflective activities over time within VITAL is an important factor in providing students with a consistent and sustained opportunity to engage in the purposeful consideration of children mathematical thinking and their implications for classroom instruction. That is to say, one or two activities may be effective, but it is better to develop and integrate a series of exercises that require students to engage in this type of thinking throughout a course.

– It is important to include specific assignments where students are asked to:

  - Cite evidence in the video that backs up or refutes a concept from a reading.
  - Cite evidence as part of an analysis of a clinical interview and relate this to the student's own explanatory ideas.
  - Mark sections of an interview or classroom situation where the student, in the role of the interviewer or teacher, would intervene and describe the proposed intervention.

– To explore student understanding of specific concepts and theories, assign students to compare, support, or refute certain concepts using examples from the video.

– Keep in mind the sequence of in-class work and homework assignments. Pre-class assignments should be designed to prepare students for in-class activities and give the faculty member insight into student's understanding and misconceptions. Post-class assignments should allow for practice and clarification of ideas. Pre- and post-class assignments can be used to allow students to reflect on their initial conceptions.

– The integration of theory and practice is stronger when the assignment asked students to relate specific readings with video examples.

– VITAL papers can take the form of a new type of writing. Provide students with writing samples that demonstrate the kind of writing you expect. Work with your students to find the form of writing and method of citation that fits your learning objectives.

– The ability to read classmates' work helped students identify other ways to analyze situations than they originally envisioned.

4.2 The Deconstructor: film analysis and the importance of integrated study environments[4]

In 2001, Adjunct Professor Lawrence Engel[5] began working with CCNMTL to develop a way for students to actively engage in analyzing film scenes in his course "Introduction to the Study and Theory of Film." CCNMTL's design team held weekly conversations with Professor Engel about the purposes that shaped his course and the challenges he faced in order to accomplish his educational objectives. These conversations were supplemented and informed by observations of Professor Engel's class, and provided an understanding of the *curricular context* of the project.

Introduction to the Study and Theory of Film introduces undergraduate and graduate students to the history of cinema and the numerous ways in which film can be analyzed and understood. Students study the aesthetic or grammatical components of film, the language used to identify and describe these components, and the ways they shape narrative and dramatic elements of film. Students assess the impact of the structural design of film on the audience, which "…involves presenting chiefly linear information (the story) through a battery of shots" (Sharff, 1982, p. 6).

One of the goals of the class is to help students see film differently from the way they normally see movies at the theater. Rather than passively watch, students are asked to analyze. By reviewing a sequence of shots students have the opportunity to study the anatomy of film separately from the narrative or story to better understand how a reader becomes engaged in the text. Students look for the patterns, progressions, and the ways the cycle of familiarity and change lead certain films to carry greater "weight" to the narrative, to develop a more influential text that connects with the reader.

In order to achieve this goal, students typically spend three to four hours a week viewing films, both in and outside of class. During the in-class viewings, the instructor may provide commentary on different film techniques and the effects of those techniques upon the viewer. Additional class time may be devoted to shot-by-shot analysis, one of the many approaches to studying film. This type of analysis involves looking at specific cinematic elements and their various arrangements (Sharff, 1982).

Prior to CCNMTL's educational intervention, students deconstructed a film scene by using a Microsoft Excel spreadsheet template that provided a way to record data about a film scene. They would rely on VCR counters or stopwatches to time each shot and either trace the TV screen or draw the key frame for each shot. Next, they described each shot in terms of over a dozen film characteristics such as shot type, shot angle, and subject movement. Students noted the characteristics with numeric values in the spreadsheet that corresponded to the observed value (i.e. medium shot). Students used the Microsoft Excel Chart Wizard to generate

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4 Source: *Design Research Report: The Deconstructor*. Fall 2002 by Kristen Sosulski, Educational Technologist, Columbia Center for New Media Teaching and Learning: http://ccnmtl.columbia.edu/projects/evaluations/deconstructor.pdf

5 Lawrence Engel is Adjunct Professor in the Film department at the School of the Arts, Columbia University: http://63.151.45.66/index.cfm

the graphs from these values. From the resulting plotted line or bar graphs, students would try to identify patterns and show how they produced responses in the film viewers.

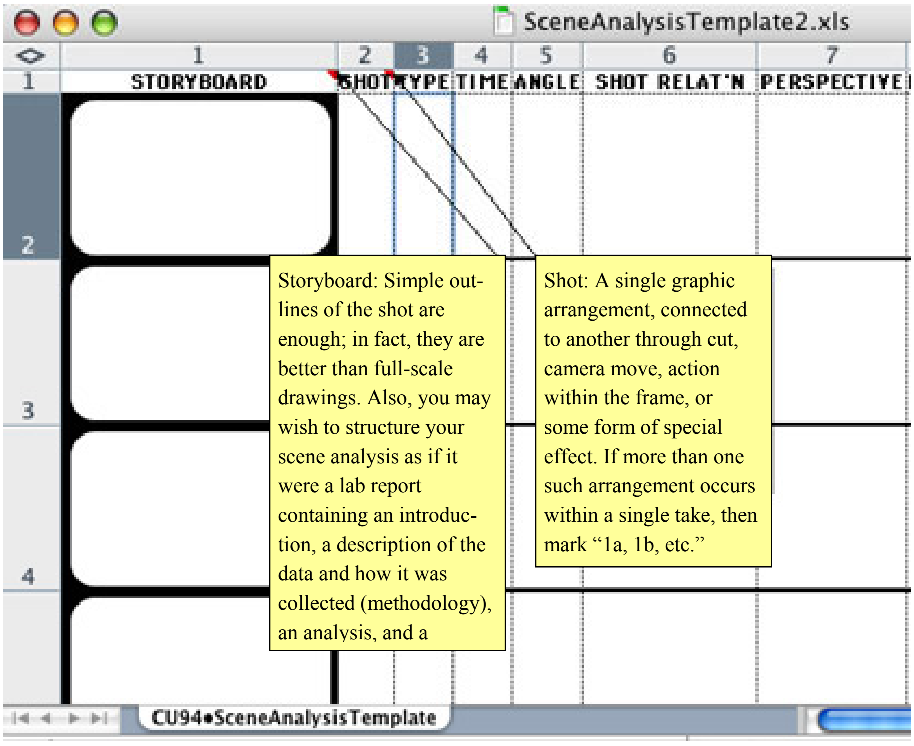

Fig. 6: Spreadsheet scene analysis template distributed to students.

This was an inordinately cumbersome process that took many hours of work. Students often chose not to pursue this kind of detailed analysis. In addition, using the spreadsheet was a final step in a complex process that created several layers of abstraction from the film content: view the film excerpt on a television monitor, trace or draw relevant features in a notebook, summarize film characteristics on paper, record start and start times with a stopwatch, record numeric values in a spreadsheet, convert spreadsheet data to a graph. Such a method for film analysis was an awkward solution.

The complexity of the spreadsheet approach combined with the lack of expertise in film analysis prevented introductory students from easily engaging in their own deconstructions of film scenes as a method to explore the underlying structural elements that provide a narrative discourse for the audience. Moreover, limited class time makes it difficult to adequately analyze any film thoroughly. This structure prevents students from constructing their own interpretations of film. Thus, students may rely on the interpretations of others to inform their own understandings in these types of courses.

This understanding of the course content, purposes, and activities led CCNMTL's design team and Prof. Engel to identify two main *challenges* that needed to be addressed in order to better achieve the course goal. These challenges are presented below as questions that informed the design process:

- How do we enable students of film to identify the strategies employed by filmmakers, in particular the use of the camera and subsequent editing methods, to present a cogent narrative to the viewer?
- How do we provide students with a working vocabulary and grammar of film language with which to discover and analyze the relationship of sub-parts of a film to the complete work?

A review of current learning theories oriented CCNMTL's team and Professor Engel in formulating the key *design hypotheses* for this project. Authentic activities are important for learners in providing experiences and to place their learning in context (Brown, Collins, & Duguid, 1989). As educators, we argue that this type of constructivist investigation is invaluable for novices if they are provided with the appropriate supports and resources to engage in this type of study. Students should be provided with opportunities to construct their own knowledge "rather than having the teacher interpret the world" (Lajoie, 2000) for them. To address the need for students to engage in the authentic activity of deconstruction of film we conjecture:

- If students were provided with a learning environment that specifically supported them in deconstructing and analyzing films, then students would more easily engage in the sophisticated analysis of film.
- If a learning environment facilitated the acquisition and application of the language of film in the context of use, then students would demonstrate the use of the language with greater precision and better be able to construct their own interpretations.
- If the instructor models the use and application of the language when describing content, then students will be able to both apply the model on their own and interpret the application of the model by others.
- If students are provided with multiple examples of film vocabulary and its application, then this will offer a more cohesive understanding of the domain of film.
- If students are provided with questions and guides, then this will shape the way novices focus their attention on film and help in constructing a framework for analysis.
- If students are provided with visualizations of their analyses, they can easily review the global and local properties and the interconnections of its elements.

Using Professor Engel's Excel spreadsheet template, CCNMTL engaged in the *development* of The Deconstructor, an online digital environment for use by students in Engel's Analysis of Film Language course in spring 2002. This linked group of tools enabled students to select and view film clips, dissect the film clips into a series of shots, describe each shot, and finally graph the scene analysis. The Deconstructor allows students to perform a four-step process for scene analysis: careful review of the scene; dissection of the scene into a series of shots, during which each shot's duration and variables under analysis are documented; determination of the cinematic variables in use; visualization of the data; and using the data and their visualizations to articulate the results that concentrate on the relationships among the shots and their connection to the plot.

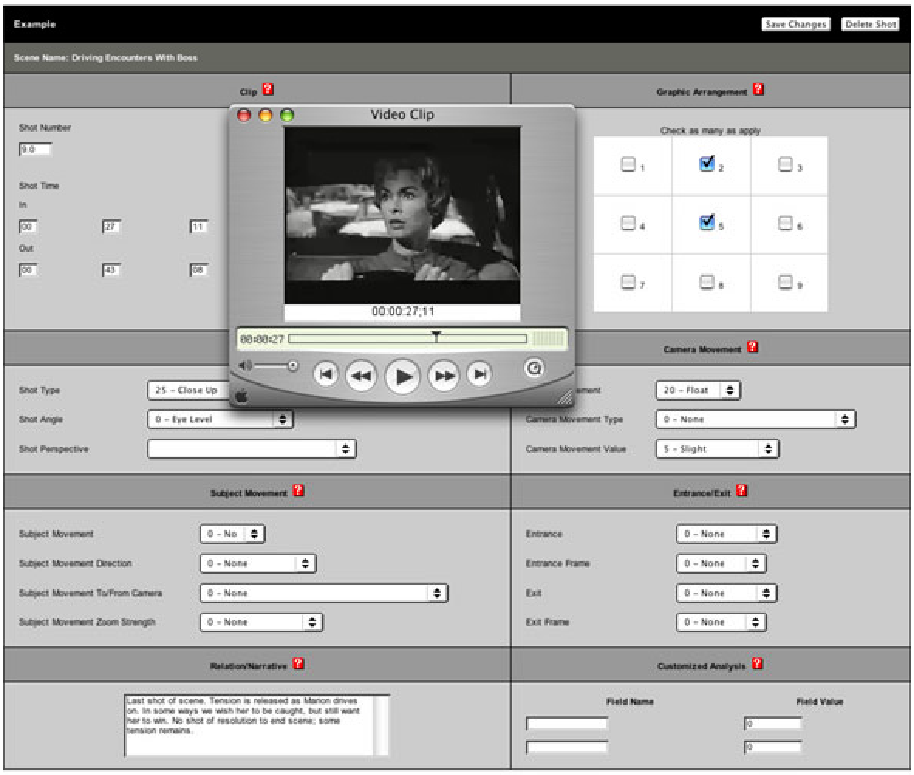

Fig. 7: The Deconstructor. An analysis using various descriptors such as shot type, shot angle, and shot perspective.

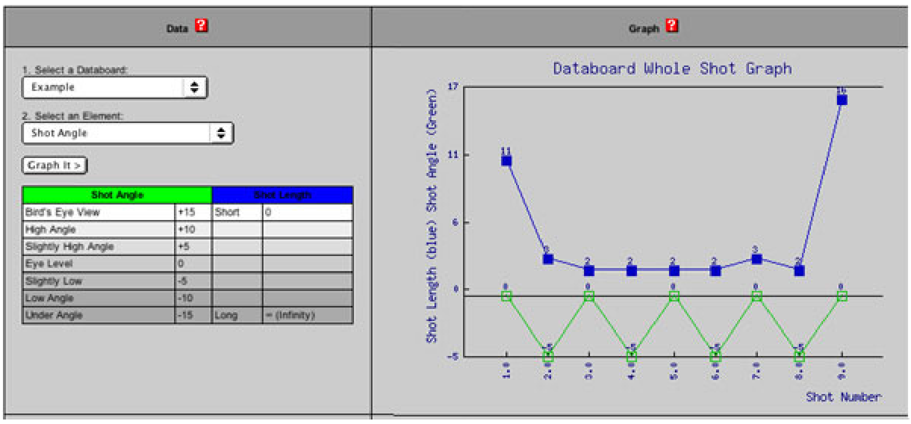

Fig. 8: Visualization of shot-by-shot analysis generated by The Deconstructor.

Fig. 9: An example of a scene from Psycho (Hitchcock, 1960) dissected in The Deconstructor.

The development team observed and interviewed selected film students who tested a functioning alpha version of the Deconstructor. This version was also reviewed thoroughly by a three-person quality assurance team. As a result of conversations with the students, professor, and developers, several new features were added and a few existing features were refined. After refining the alpha version, the project was ready for *implementation*.

After several training sessions with graduate teaching assistants who would lead small group instruction, the Deconstructor was implemented in Professor Engel's Introduction to the Study and Theory of Film course in fall 2002. The 74 students in the course met once a week as a plenum for four hours in an instructor led session and an additional hour per week in smaller groups led by one of the three teaching assistants. Professor Engel demonstrated the Deconstructor in the first class meeting and used it to model the method of film analysis that would be center to the course. Members of the design team provided an initial training session to each of the small groups.

In pursuit of *testing our hypotheses and assessing the educational experience*, data was collected from multiple sources. The data sources included class observations, periodic meetings with the instructor and teaching assistants, a student focus group, instructor interview and analysis of student work.

The Deconstructor offers students and faculty a means to identify, analyze, and deconstruct film in modes never possible. The tool allowed students and faculty to precisely deconstruct the film scenes and isolate portions that warranted close analysis. Evidence from examining student work done in the Deconstructor reveals that an average of 4.5 scene analyses were completed in the Deconstructor with the Introduction to the Study and Theory of Film course was four-and-a-half. Half of the Introduction to the Study and Theory of Film students used the Deconstructor as the primary source material for their final projects. This type of integration of the Deconstructor in the students' activities enabled students to talk about film analysis, helping students reflect on their learning, while actually engaging in it.

While working with the Deconstructor, students noted the value of the tool in helping them conceptualize the film analysis methodology studied in the course. One student commented:

"It was helpful in that now I have a much better understanding of shot type, length, and all of the other things we look at with the Deconstructor, but it was more helpful in helping me understand the importance that each of these elements had on film." (Student 13, November 20, 2002)

This comment illustrates the value the student places on language as it is applied in a real context. More importantly, this student presents an understanding of the impact and results of the careful arrangement of cinematic structures, a common theme shared by many students.

One student described the impact of the technology as a way to help *"... understand the complexities and planning a director must look at when designing a shot"* (Student 53, November 21, 2002). The sentiments of this student illustrate an understanding of the director's deliberateness in constructing a single shot. A comment from one student described the Deconstructor as an insight into the complexity of an ill-structured domain such as film. *"The Deconstructor truly revealed a new level of cinema that I didn't believe existed"* (Student 49, November 20, 2002). This student revealed that the Deconstructor presents learners with a new way of looking at film. This sentiment was consistent with the course goals.

Observations demonstrate that the Deconstructor permits the instructor and teaching assistants to engage students in deeper conversations regarding the value and challenges of film analysis, since students can easily analyze many scenes outside of class. The results of the study suggest that these possibilities are a consequence of the way in which the digital working environment, The Deconstructor, is integrated into course curriculum.

Following is a summary of *evaluation findings* this project allowed CCNMTL design team to learn and carry on as part of its growing repertoire of design experience. These insights provide a *collection of best practices* to take into account when designing online environments that incorporate as a one of its main goals the learning and analysis of visual materials such as images and audiovisual resources. Educators who include in their teaching practices the analysis of images, works of arts (film or visual art), and performances, for example, may find the following design recommendations particularly relevant:

- If we wish for students to reflect upon their own selection of visual resources (e.g., digital slides, digital photographs, movie stills) they should have the opportunity to place and view these images side-by-side on the computer screen. By having such a subset of images available for viewing, students begin to identify similarities, differences, and patterns.
- A strong means of fostering learners' ability to identify elements of a visual image, focus their viewing, and note their findings is to provide an on-screen form with the relevant

vocabulary or questions for the student to complete, on the same screen as the target image(s).

- A strong means of fostering the analytic skills of identifying the key components and variables of a specific discipline when applied to source materials is to enable students to identify and abstract selected elements from source content, and compare the change in these elements over time or the relationship between these elements. Generating graphs from student data collection is a powerful way of facilitating this process.
- Providing glossary of terms solely in help documentation or separate pages is not useful to a learner in the course of using a tool or working in a digital environment.
- It is beneficial to both teacher and students to provide a tool or environment that allows the faculty member to model expert practices for students, thereby making the expert practice more transparent to the novice.

4.3 Exploring the Poles: Asynchronous communication tools to foster a writing community[6]

During the summer of 2002, CCNMTL collaborated with Professors Stephanie Pfirman and Robin Bell in the *curricular development* of their course "Exploring the Poles," a Barnard College First-Year Seminar based on Environmental Sciences. First-Year Seminars are introductory courses *"focused on critical reading, writing, and speaking skills in the context of intellectual exploration and social bonding in a shared first-year experience,"*[7] taught by faculty from different disciplines. The goals of this introductory course to writing and science are to:

- Promote critical reading, writing and discussion.
- Introduce non-scientists to the value of environmental science through polar literature.
- Discuss issues related to venturing into the unknown that are of relevance to any discipline: self-reliance, leadership, preparation, decisions under uncertainty.
- Show students the human face of science.
- Change attitudes about science and scientists.
- Use data to engage students in exploring/understanding the environment and help them learn to draw conclusions from data.

During the curricular design process, CCNMTL and Professors Pfirman and Bell identified a central *challenge* for achieving the goals of this First-Year Seminar: for the environmental science field to be interesting for reading, motivating for discussion, and inspiring for writing, the course has to engage students with the challenges and enthusiasm that is experienced by scientists and explorers in real scientific practice. However, students do not yet have the understanding of scientific discourse and the knowledge of the tools that make possible their involvement in that kind of activity. Students need to develop a specific language, writing style, and knowledge in order to get to the interesting issues that would allow for and moti-

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6 Source: *Evaluation Summary: Exploring the Poles*. Fall 2002. Ryan Kelsey, Senior Education Technologist, Columbia Center for New Media Teaching and Learning and Laura Zadoff, Graduate Student, Teachers College, Columbia University. http://ccnmtl.columbia.edu/projects/evaluations/poles_summary.pdf

7 From Barnard First Year Seminars' Home Page: http://www.barnard.edu/fysem/

vate thoughtful argumentation and writing. Therefore, the course needs ways to bridge this knowledge gap.

Our main *hypothesis* in the design of this course suggested that students would be able to make sense of the scientific aspects of the readings and get involved in the thinking and writing within this new content field if the following tools, activities, and conditions were provided:

- Visualization tools for representing environmental and geographic information,
- A variety of writing activities for exploring writing in different ways, and
- Communication opportunities for short feedback loop between students and professors.

Based on this hypothesis, the CCNMTL design team and Professors Pfirman and Bell *designed and developed* curricular activities around three major polar explorations (Nansen and the North Pole, Scott and Amundsen's push for the South Pole, and Shackelton in the Weddell Sea) and a set of resources that would provide students tools to engage with the environmental science content of the Seminar:

a) *Curricular activities*: The course was grounded in two content areas, which were intended to work in tandem with the goals of the first year seminars.

   i. First, the course explored scientific knowledge through an introduction to the polar environments and the challenge of their study from an environmental science perspective. Students were introduced to the intellectual challenge of environmental sciences. In other words, at this early stage of their academic careers, students begin to define their future interests according to their perception of existing possibilities. The course aims to include science within their scope of possibilities.

   ii. Second, the course examined the social and human dimensions of scientific expeditions, namely, the role of luck vs. skill, issues of leadership, companionship, competence, and ethics, among others. Hence, students are exposed to issues they will face as they embark on their academic career and as future leaders. The three polar explorations served as units for exploring the different issues involved in polar expeditions. Each unit entailed readings, essays, group activities, and journals that corresponded to its particular topics and themes. While these topics recurred and allowed for building upon one another, the variety of situations and challenges provided a fresh approach and an unexplored context in which to expose students to increasingly complex dimensions. Each of the three units was structured around a core reading and was enriched by other texts and materials.

b) *Resources*: a series of different tools were made available to students in order to work with the course content, in and outside the classroom:

   i. Geographic Information System (GIS) mapping tools, slideshows, and interactive maps to explore and view data along the paths of the early explorers, as well as their own simulated journeys. These tools enabled students to relive the journeys of an arctic explorer such as Fridtjof Nansen, who in the spring of 1893 set off, determined to reach the North Pole by applying the then revolutionary theory of a westerly polar ocean current that was eventually proven correct. Students used these maps, photos, and GIS data on Nansen's journey to write their own account of an aspect of his exploration.

ii. The course also made extensive use of CourseWorks, Columbia University's course management system. CCNMTL adapted CourseWorks' discussion-board to provide each student with a private individual thread for writing journals to reflect on previous writings and get frequent feedback from instructors. Poles Together's contextualized journal-writing activities allowed students to refer to data and historical information within the same environment.

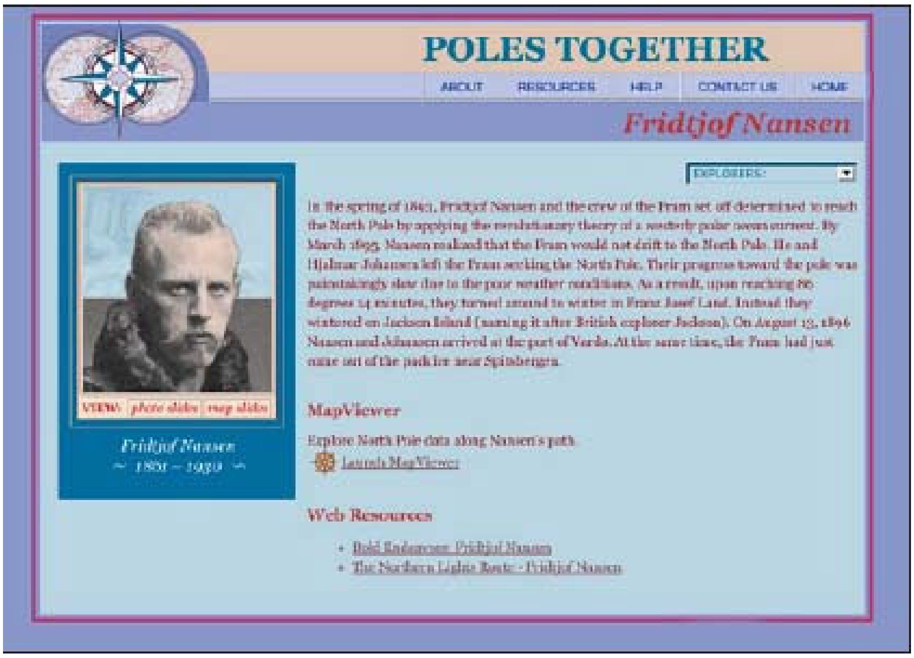

Fig. 10: Fridtjof Nansen Expedition

In the fall semester of 2002, the "Exploring the Poles" Seminar was *implemented* for the first time in Barnard College. Once the course started, the CCNMTL design team collected information *to assess and improve* different aspects of the project. The research techniques for learning about the project were:

1. Observation and recording of classes
2. Initial questionnaire to register students' ideas
3. Individual interviews with students at the middle of the term
4. Analysis of students' work
5. Meetings and frequent communications with Professors all along the course.

It is not possible to report here on all the interesting *findings* that emerged from this experience. Instead, we have decided to focus on a specific aspect of the course that allowed CCNMTL to generate a series of best practices related to the use of the University's Course Management System to foster a writing community: *the online-journal writing activity*.

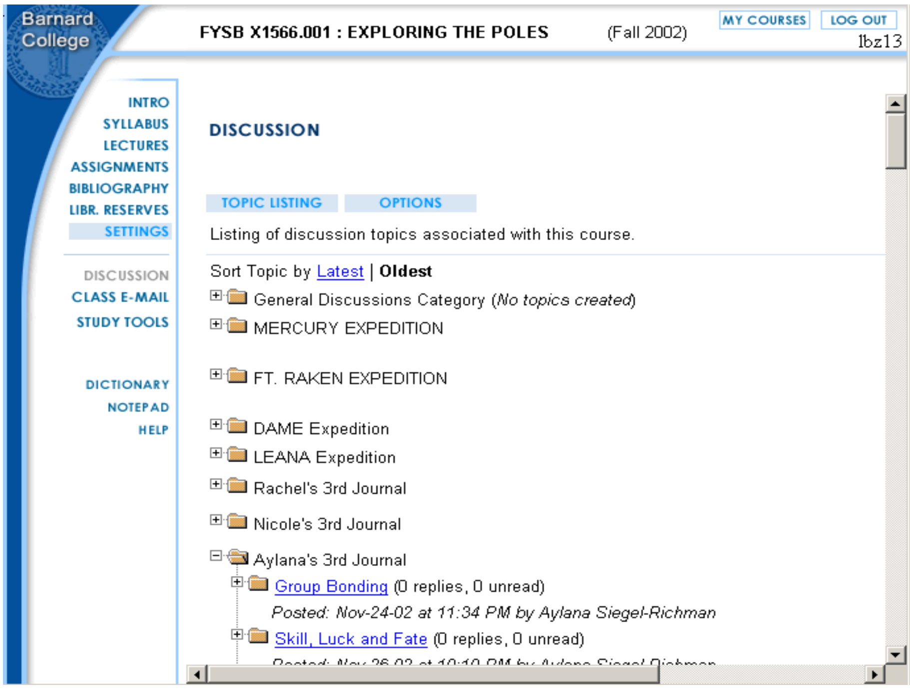

Fig. 11: Students' Journals in the Discussion Board

Although we expected that the journals would provide students with important learning opportunities, they actually played a more central role throughout the course than we had anticipated. Students wrote a journal entry for each reading assignment. From the students' perspective, this activity provided writing opportunities as way of appropriating the readings. It also functioned as a means with which to relate their own personal experiences to the issues discussed and to share them with the professors, to prepare for class discussions by working through the issues, and to practice their writing skills. From the faculty perspective, journal entries provided a way to assess students' understanding of the readings as well as to gain insight about their interests. In addition, it enabled the faculty to anticipate questions that needed to be addressed, thereby allowing faculty to plan the pace and content of the course according to the needs of the students. The journals work efficiently as a feedback tool for both learners and professors, who adapted the curriculum of the course based on the content and character of the students' comments and questions. Each class session, the professors used the information and the questions on students' journals pulling from them the questions/topics/problematic issues to start an informal discussion. This is an important element, as students needed help to understand the geography, environmental issues, and the other topics presented in the course in order to make sense of the readings.

Several *insights* about the value of asynchronous communication in the classroom emerged from this experience. These insights allowed CCNMTL to introduce some changes in the University's Course Management System, as well as generate a set of *best practices* for the successful implementation of these asynchronous communication tools in their courses.

As already described, the journals were integrated with the discussion feature in CourseWorks. However, such a combined set-up proved inefficient for the professors as well as the students. Specifically, the placement of journal entries within the discussion board created difficulties for professors because when they accessed CourseWorks, the students' journals (journal folders) appeared together in the discussion section. Since they had to read the entries in a short period of time, this configuration rendered the task confusing and overwhelming. Therefore, considering the benefits derived from journal writing, CCNMTL recommended creating a unique and independent component within CourseWorks to allow a separate space for journal writing. An independent feature for journal writing would thus separate and distinguish individual journal entries from the general discussion thread categories. Hence, the proposal for a unique and separate journal section within CourseWorks to address the issues above was submitted to the Course Management System development team and a set of practices related to this asynchronous communication tool created to present to faculty the potentialities of this learning activity. In the fall of 2003 some of CCNMTL's recommendations were implemented by the Course Management System development team.

Following is a summary of the practices and recommendations made for the successful use of online journaling:

- The act of writing a journal entry is a private, reflective one. Distinguishing the journal section from the Discussion Board is important, as it puts the students in a "private space" for reflection and writing. A separate section and nomenclature thus help students to differentiate between the two kinds of participation they are asked to do online.
- Journals can have three main functions, each important to foster a safe and motivating learning environment:
  1. Encourage students to write
  2. Receive feedback on writing
  3. And provide information to the instructors about the questions and difficulties encountered in the readings. Instructors use this information to plan upcoming classes.
- Online journals allow for short and frequent writings and can be framed in a less structured (and less grade-relevant) way than essays. These characteristics provide students with a less risky place for exploring/venturing in using environmental science ideas (or any new content area for that matter) in their writing.
- Online journals can become an occasion for professors to provide writing guidelines and feedback to students in a less evaluative, threatening, way.

5 Lessons for the Future

We have chosen to put in the form of 12 admonitions or maxims what we have learned from our work that is general applicable to all our efforts. These are some of the main principles that CCNMTL educational technologists follow in their everyday design activities. As we write them down, we realize how important these maxims are for us, educators working with technology, to engage other educators in pedagogical innovation:

1) Listening carefully to and dialogue with your faculty partners before even beginning to plan a project allows you to enter their world of pedagogical and intellectual practice. Do not ask them what is it they would like you to do before having a rich sense of what they already do. Imagine you are interrogating an informant from a culture you are studying.

2) Remember that you are likely to do tomorrow what you did yesterday. As you listen, do not be afraid of imagining an activity that faculty do not describe. New learning possibilities mean that they did not exist before. This places a premium on imagination in order to glimpse the new as they separate themselves from the commonplace and the familiar. Imagining things is hard work and requires a willingness to unsettle the fabric of the synthesis that gives you comfort and to place in angles of light the familiar so that you can see its limits and powers in a glance. This dislocation is what makes invention possible. It is in developing an agonistic posture with where you are that makes new opportunities for learning possible. Do not always expect a blinding vision and do not be brutal with your first intimations. Nurture them and realize that they, as new things, require care.

3) As you listen, measure the faculty partner's commitment and willingness to stay the course. The degree, to which you are able to realize something new and innovative, as well as successful in practice, depends in part on the energies and willingness of the faculty member's staying the course.

4) Technology in our age sings the song of the Sirens, pulling those of us who are educators too quickly to its shore, sometimes producing brilliant multimedia educational shipwrecks. Hold your ideas and possibilities loosely as you proceed remembering that all technology based pedagogical projects are first and foremostly educational in content and purpose. Delay starting the wheels of production until you have clarity about what you are trying to accomplish and why. When necessary build prototypes as explorations that do not commit you to the larger process in order to root your project in a more certain understanding.

5) Remember what staying the course means, that it is not enough to have designed something and see it up and running. That completes a stage but from then on you must see how it works in the hands of students and the faculty member with the intention of changing what you did from either a curricular or technological perspective.

6) The stages of design research should be pursued sequentially and simultaneously. Work on the whole of things and its parts at the same time as you begin the process of design. The visual nature of so much of what we do and the fragmentation that results from thinking of things as successive screens sometimes blinds us to the fact that what we support – teaching, learning and study – are processes of the mind and spirit and best conceived as wholes. To do otherwise is to chance that all the parts will be successful but the goal for the learner, which requires a higher integration into a set of larger understandings or a capacity for a certain kind of judgment, has failed.

7) Heed your faculty partners' sense of the possible but also ignore it. Remember that you must on the one hand work out of the landscape presented to you and that may indeed include intuitions of great value of what's possible, but it is equally the case that you will see things not yet visible or clear to you r partner. Hold on to those and test their viability as prospects as you pursue the conversation.

8) In the discussions about purpose and design, it is important to deploy visualizations as early in the discussion as possible. At all stages of the process, visualizations in tandem with verbal discourse increases the chances that people understand each other. In addition visualizations are more apt to become a more useful manipulative in the conversation than words. The greater the reliance on words the greater the possibility that people

will agree that they agree before they actually do. Think of visualizations as a hedge against your own semantic laziness.

9) Assess to *understand* not to *prove*. Design research is decidedly on the side on hermeneutics rather than empirical and theoretical science. The goal is understanding what you have done and developing a more refined capacity for judgment so that you can proceed in the world of praxis.

10) All projects are heuristics in that they represent the early experiments of the beginning of a thorough transformation in the way we learn. They must be examined for how they both yield immediate positive results but also from the perspective of how, given their existence, we might reshape them and or invent new possibilities.

11) Understand the larger world of transformed and transforming media in the midst of which all students now live. The background of the eidetic figure of the student to whom we address our work is shifting and morphing all the time and with those changes come new expectations, possibilities, and limitations. To do so, the true developer and new media pedagogue must also be something of a social and cultural theorist in order to avoid an ostrich like approach to the challenges at hand.

12) Stay the course. The prior technological revolution in education, occasioned by the printing press, took centuries to consolidate and it was not the technology alone that determined the results but the people who shaped it and its contexts that focused its influence. Technologies do not produce inevitabilities but people attributing divine agency to them do so by accepting the momentum of things as fate and giving up their true freedom which does not lie in the apparent proliferation of choices but in the deciding on what project technology is to be put.

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