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Design Research Report:
The Deconstructor

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http://ccnmtl.columbia.edu/projects/evaluations/deconstructor.pdf

Context

In 2001, School of the Arts Professor Lawrence Engel began working with CCNMTL to develop a way for his students to actively engage in deconstructing and analyzing film scenes in the courses he teaches: Introduction to the Study and Theory of Film, Documentary Tradition, Film Production and the Analysis of Film Language.

In the context of this study, to deconstruct is to dissect a whole into its component parts, describe and provide an interpretation of the dissected parts, and draw conclusions about whole with a new perspective. Deconstructing texts, films, or images, entails investigating complete compositions, identifying and describing the component parts and interpreting the inter-relationships between the parts. This results in new understandings and perspectives of the whole composition.

Introduction to the Study of Film is a course that 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).

In a semester-long cinema studies course, undergraduate 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 examining film. This type of analysis involves looking at specific cinematic elements and their various arrangements (Sharff, 1982). However, many film students lack the means to engage in this sophisticated shot-by-shot analysis, and 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.

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. Students would rely on VCR counters or stopwatches to time each shot and either trace the TV screen or draw the *key frame*[1] for each shot. Next, students described each shot in terms of over a dozen film characteristics such as shot type, shot angle, and subject

[1] A key frame is a special-purpose marker that denotes a shot.

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 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.

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 many-staged 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 the 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.

Challenge

CCNMTL's design team held weekly conversations with its educational partner, Lawrence Engel. These conversations were supplemented and informed by observations of Professor Engel's class. Together, they identified the course's key educational goal: to move students from "watching" films, to studying them, by applying the vocabulary of film. We broke this goal into two key questions:

- 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?

From Educational Theory to Design

Constructivist approaches to learning, according to Jonassen and Carr, "…strive to create environments where learners actively participate in the environment in ways that are intended to help them construct their own knowledge rather than having the teacher interpret the world and ensure that students understand the world as they have told them" (Lajoie, 2000, p. 188). To address the need for students to construct their own interpretations of films, The Deconstructor should be developed to enable film students to effectively manipulate, describe and analyze films.

Scaffolding provides students with supports in a learning environment and frames the interactions with the content (Young, Nastasi, & Braunhardt, 1996). With the appropriate scaffolding, novices can begin to construct their own knowledge of an unfamiliar domain. Types of scaffolding that could assist in the activity of deconstruction are timely explanations, observations, examples, guiding questions, and visualizations. These scaffolding techniques should enable novices to interact with authentic resources in an expert-like activity.

Prior to engaging in the sophisticated analysis of a text, it is necessary that students understand the language and vocabulary used in the discipline. Furthermore, students need to acquire and apply their knowledge of these terms while actively engaging in the deconstruction process. The terms should be coupled within the context in which they are applied (Cognition and Technology Group at Vanderbilt, 1997).

Lastly, visualizations of analyses can provide opportunities to review the global and local properties of an artifact (Lajoie, 2000). Specifically, visualizations are helpful in illustrating the interconnection among the elements that comprise a text, be it the plot of a play or the sequence of a film.

Many CCNMTL projects provide learners with the opportunity to engage in an authentic activity, that is one in which learners working with primary source materials in similar way to professionals in a given field. When students are given the same materials used by experts, they can gain experience, exposure and context by engaging real-life activities in contrast to artificial and de-contextualized activities. Authentic activities are designed to assist learners to confront the gaps in their knowledge rather than having the knowledge interpreted for them (Lajoie, 2000).

In early discussions with Professor Engel, other faculty projects CCNMTL worked on helped frame the initial investigations. Our past work with providing students with access to a digital library of film clips and the tools to select portions of these clips and to comment about them would clearly lend support to this project. Two projects were of particular benefit: the Media Machine (http://wwwapp.cc.columbia.edu/ccnmtl/app/portfolio/results_zx.jsp) and Third Space (http://www.ccnmtl.columbia.edu/projects/thirdspace/). The Media Machine is a library of film clips used in Professor John Broughton's cultural studies courses. Using the Media Machine Web site, students can search for and view video clips, browse a storyboard of images based on video key frames, and read movie summaries, screenplays and editorial annotations. Third Space was used in a social work course where students would review role-plays of situations socials workers may confront. Students would be presented with discussion questions and excerpt portions of the video clip as evidence to support their arguments.

Design Research Hypotheses

- 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.

Summary of the Development Process

Using Professor Engel's Excel spreadsheet template, CCNMTL specified and built 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.

The development team observed and questioned 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. In 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 major task left before CCNMTL was to develop the administrative functionality to allow the professor, CCNMTL staff and the teaching assistants to add, edit, delete users, view and comment on student work, and upload film scenes. Once the administrative features were complete, the project was ready for launch.

Resulting Technological Intervention

After Students login to the Deconstructor they are then automatically taken to the View/Select Scene screen. There are over seventy scenes available through the Deconstructor *film library* for students to investigate. Students extract each shot from the scene by indicating the start and end time for each shot. Figure 1 illustrates a scene dissected into nine distinct shots that comprise the forty-three second scene.

Figure 1. Storyboard View. An example of a film scene from *Psycho* (Hitchcock, 1960) dissected in The Deconstructor.

After dissecting the scene into a series of shots, the Databoard acts as a scaffold that frames and focuses the analysis of each shot (see Figure 2). The Databoard focuses the student analysis of each shot on two basic sets of elements; one is the static or photographic set, the other the kinetic or movement set. Should students be uncertain of the meaning of a designated term and/or the ways in which to apply it, they can click a red question mark to obtain a definition and an example of its application. Additionally, a glossary of terms is provided within the Deconstructor *Help* menu option.

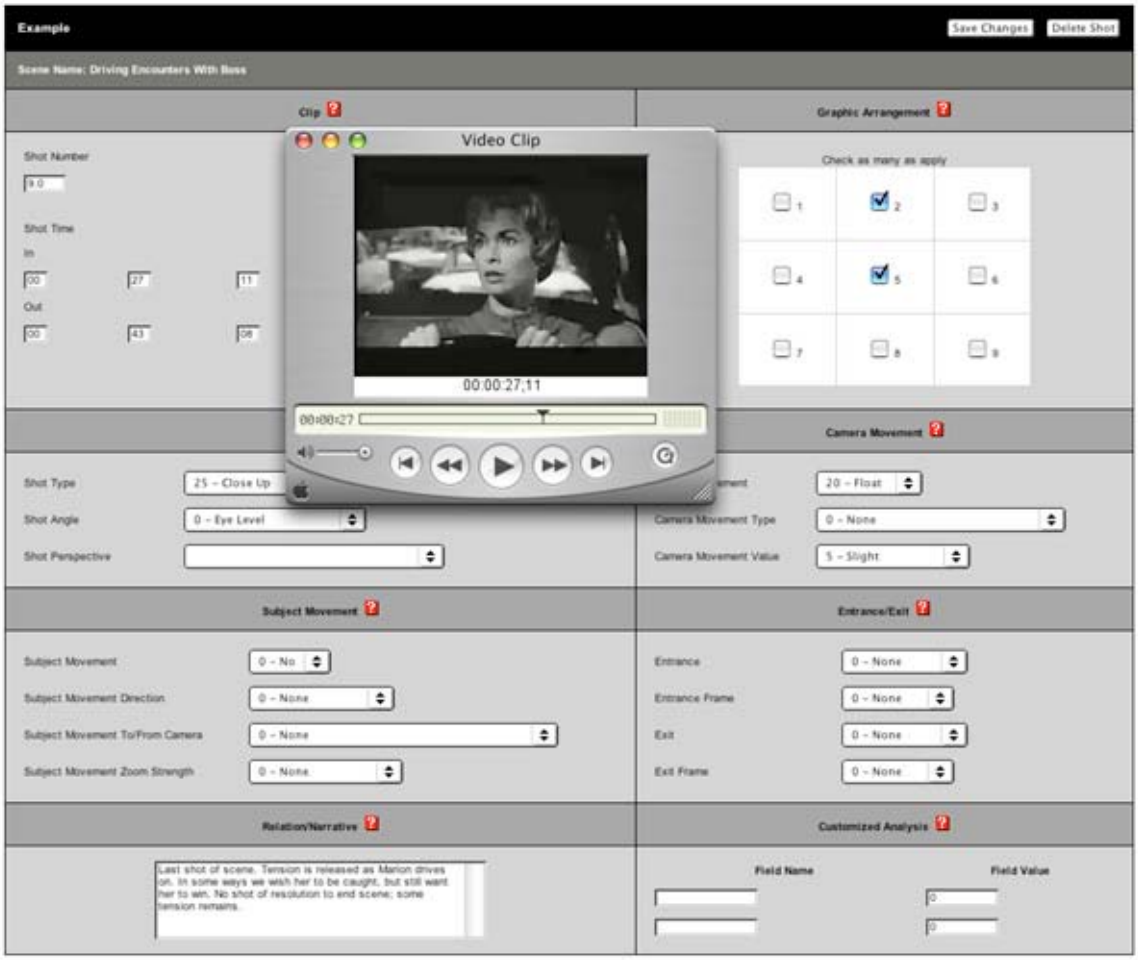

Figure 2. Databoard View. A shot analysis using various descriptors such as shot type, shot angle, and shot perspective.

When students identify the shot's characteristics, each element[2] corresponds to an integer value that is assigned to the shot along with a textual description.

This is done in order to aggregate the analysis into a visualization of the scene, as illustrated in Figure 3.

[2] Each shot has the following structural characteristics that can be described in the Deconstructor: graphic arrangement, shot type, shot angle, shot perspective, shot camera movement, shot camera movement type, camera movement value, shot subject movement, subject movement direction, shot subject movement zoom, shot subject movement zoom strength, shot entrance, shot entrance frame, shot exit, shot exit frame, and the custom fields defined by the student.

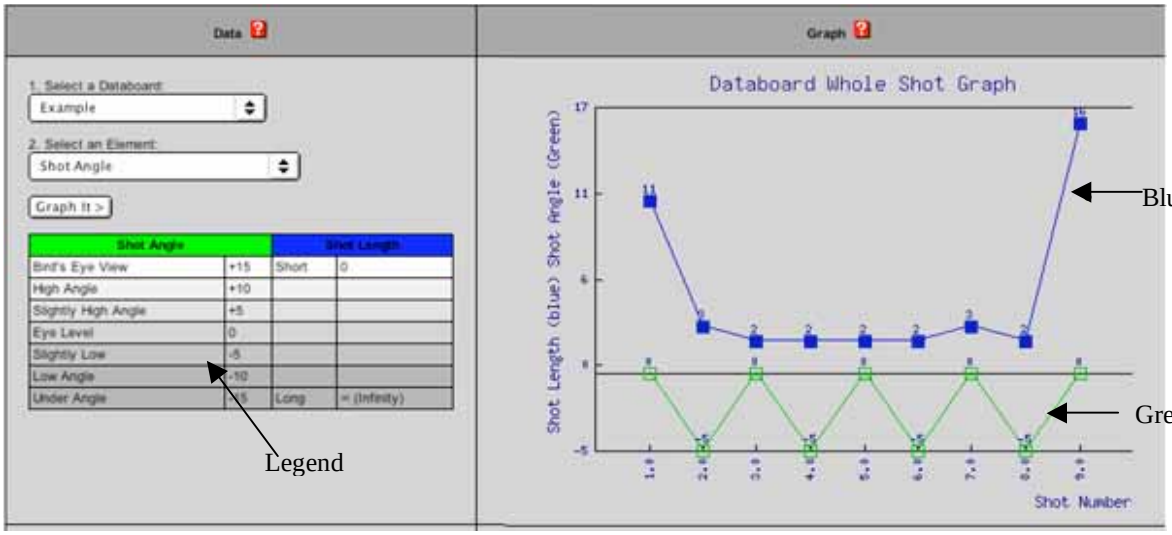

Figure 3. A Film scene visualized graphically.

Here, for example, the representation of the angle of each shot is juxtaposed with the duration of each shot. The resulting graphs provide a basis for isolating, comparing and interpreting underlying cinematic elements of the scene, independent of watching the scene and becoming absorbed in the story. A legend is provided to help students interpret the visualization of their scene analysis. The graphic visualization also allows students to *see* patterns or changes in the rhythm and flow of the chain of shots. It is a crude *score* of the underlying cinematic structure. As in a musical score, the arrangement of shots into coherent phrases and *beats,* according to the instructor's school of film analysis, distinguishes masterpieces from pedestrian works and one director from another. When a particular change occurs from one shot to another, students are asked to look back to the film for a correlation between this cinematic moment and its narrative state. The graphs generated in the Deconstructor can be saved and inserted into a word processing document, where students begin to describe and interpret the visualizations generated by the Deconstructor.

Implementation

After several training sessions with graduate teaching assistants who would lead small group instruction, the Deconstructor was used in Professor Engel's Introduction to the Study and Theory of Film course in fall 2002. The seventy-four 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 the center of the course. Members of the design team provided an initial training session to each of the small groups.

Assessment

In pursuit of testing our hypotheses, 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.

Methods and Data Sources

Prior to the beginning to the fall 2002 semester, three meetings were held with the instructor and several teaching assistants to identify implementation strategies and to introduce them to the Deconstructor. Informal meetings were held throughout the semester with class teaching assistants to assess their perspectives on the Deconstructor and students' progress using the technology to analyze film scenes. Two additional meetings were held with the instructor to assess the value of The Deconstructor in the classroom.

Throughout the semester, the class lectures and three discussion sections were observed to gather insight into the ways The Deconstructor supported the curricular goals. Working closely with the teaching assistants, each discussion section was observed regularly with a particular focus upon the research questions identified above.

In November 2002, we conducted a one-hour focus group session with students from each of the three discussion sections. Thirty students were selected at random (utilizing a randomizing algorithm) from the class population of seventy-six students; twenty-two participated in the focus groups. The students were asked to respond to questions regarding graphical representations of an undisclosed deconstructed film scene produced in The Deconstructor. The goal was to understand the ways students were interpreting the graphical visualizations produced by the Deconstructor and how explicit the patterns were to students. A discussion about their reaction to the exercise and a survey assessing motivation and usage was administered. A CCNMTL staff member who was not the developer of the Deconstructor conducted the focus group. This was done to help ensure objectivity.

In addition, student presentations, take-home exams and participation in class were analyzed with a particular focus upon the ways students used the language of the discipline and the degree to which students made use of the Deconstructor. The professor was interviewed by CCNTML to gauge the quality of student analysis in The Deconstructor.

Lastly, a survey instrument was administered to students in the Documentary Tradition fall 2003 course and the spring 2004 Introduction to the Study and Theory of Film course after a Deconstructor training session. The purpose of the survey was to gain insight into ways students understood film analysis and their confidence applying film vocabulary and framework prior to using the Deconstructor.

Results

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.

The Deconstructor offers students and faculty a means to identify, analyze, and deconstruct film in modes never possible. Students and faculty were able to precisely deconstruct the film scenes and isolate portions that warranted close analysis. Evidence from examining student work done in the Deconstructor reveals the average number of scene analyses completed in the Deconstructor in 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. Students were only required to analyze two scenes, one as a training activity and another for the midterm exam. Out of the three discussion sections, one teaching assistant required students to present an analysis once during the semester. 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. This was observed in the discussion sections and the lectures.

One key attribute of the on-line tool is the enormous timesavings dividend. There is enough automation and program support for collecting, distributing and visualizing allowing the student a more efficient and in-depth engagement in the close-study of film scenes. On average, students from the focus group estimated that they spent over nine-and-a-half hours using the Deconstructor. The minimum time spent was two-and-a-half hours and the maximum was as high as thirty hours. It is highly unlikely that students would have completed one scene analysis, much less four or more, had students been forced to utilized the spreadsheet/tracing method, utilized prior to CCNMTL's intervention.

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.

Students used the language of film in their interpretations; however, the vocabulary was not acquired through the use of The Deconstructor alone, but through the readings, lectures and discussions. Students had problems using The Deconstructor in the beginning because they did not know the film vocabulary well enough. The on-demand terms and glossary were not the source of information on how to apply the vocabulary. In fact, students rarely referenced

these resources. Thus, it was concluded that readings and lecture were the key means by which students gained knowledge of relevant terms, as opposed to through engagement with the Deconstructor.

It appears that students learn how to re-think the way they see film much more quickly through early exposure to the Deconstructor. In-class discussion indicates that students are far more aware of the arrangement of shots and the relations of this arrangement to the core narrative discourse of the film.

Additionally, student journal entries support the argument; more entries relate to phrasing and categories of cinematic structures than to story or character issues (although these are clearly important elements of film as well).

In the fall 2002 Introduction to the Study and Theory of Film course, students saw the Deconstructor as a useful tool in identifying general trends within a scene. While engaging 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.

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.

The instructor is able to model the various ways to look at film and require students to engage in their own analysis to form their own interpretations of films. 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.

The instructor and teaching assistants evaluated student work in the Deconstructor. This assessment took the form of written comments on the midterm and verbal feedback in lectures and discussion sections. The instructor and teaching assistants made little use of the feedback feature in the Deconstructor. The instructor chose to provide feedback to student interpretations and syntheses rather than to the actual analyses from which the interpretations were derived.

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.

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.

If students are provided with visualizations of their analyses, they can easily review the global and local properties and the interconnections of its elements.

The focus group experiment verified that students are able to interpret the graphical representations of scenes

generated in the Deconstructor. A student who participated in the focus group experiment expressed that she "… could totally interpret what the graph [graphical representation of the film scene] was saying. But I'm not sure if I could offer a full interpretation [of the film scene]" (personal communication, November 20, 2002). While students were able to make meaning from examining the visualizations provided in the focus group, many noted the importance of actually deconstructing a scene to understand the principles that can be learned. The ways students interpret the graphs without actually doing the scene analysis was surprising. Many students did not simply interpret the numeric information presented on the graphs. Instead students correlated the patterns presented in the graph with a story line. The visualizations provided in the Deconstructor are intended to isolate the dramatic and narrative content from the structural elements of film. However, students were using a narrative as a starting point to form their interpretations. Reflecting on the results of the focus group the instructor discussed,

> *…if they [students] can get a gestalt of, or sense of the scene, and immediately relate it to story, that's really good. And, maybe more sophisticated than what I've been doing, which is, looking at the different elements and try to come up with what the underlying cinematic structure is. [Students may not use my approach exactly] because they are not used to it, which makes sense because they are used to stories. So, if they see this [the graphs], and connect it to beats and stuff, which I have harped on in class, so much the better…If they can create the story, that would be very cool. That was what I was trying to do*. (L. Engel, personal communication, December 4, 2002).

As anticipated, the students utilized the graphical visualizations as primary source documents in take-home exams. Students saved images of their graphs into word processing documents, as a way to show evidence to support their claims and the syntheses of their analyses. Students used the visualizations generated in the Deconstructor as presentation material and discussion points in discussion sections. Lastly, about half the students in the focus group reported that they were using the Deconstructor to generate material for their final projects.

Recommended Design Revisions

A recommended curricular change for the next implementation of the Deconstructor is to increase the frequency that students use the Deconstructor. Discussion sections could be restructured to support the discussion and presentation of student work in the Deconstructor.

The strengths of the Deconstructor are that students can easily break down a scene into a series of shots. However, the way that shots are currently identified could be improved. Usability would be improved were students to have a way to add a shot or duplicate a shot from their scene analysis databoard. Coupling the functionality within the databoard could prove most efficient. In addition, the ability to duplicate a shot may help in the case where many of the film elements are similar. In terms of managing databoards or scene analyses, students should be provided with the ability to rename their databoards.

The ways in which visualizations are generated within the Deconstructor is somewhat limited. If new graphing patterns were developed, students could graph multiple parameters simultaneously. Currently, students can only juxtapose shot type, length and one other variable. It is important to connect each film shot with the corresponding points on the graphs. The graphical visualization produced in the Deconstructor clearly isolates the dramatic and narrative content from the structural elements of the film scene. It would best if the connections between the points on the graph and the video excerpts were explicitly associated

The ability to deconstruct a shot into a series of sub-shots would further enhance the analytic piece of the Deconstructor. A sub-shot analysis would allow the student to identify the basic characteristics of a shot, but then sub-divide the shot into smaller sections for more precise analysis. This would require a means to engage in this sub-shot analysis and graph the sub-shot analysis along with scene analysis.

Best Practices

- 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 information 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.

- One technique for identifying opportunities to work with a faculty member to substantially enhance the teaching and learning in her classes, is to solicit which activities and/or techniques the faculty member utilizes as an expert in her discipline, but has heretofore only been able provide the students with the results of such efforts or demonstrate the techniques. Together with faculty, we can explore the possibility of creating scaffolded environments and tools that would allow learners to engage in such authentic activities or models thereof.

- 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 and thereby make the expert practice more transparent to the novice.

Future Applications

- The ability to view a time series of images or figures on a single screen would be of value to a number of disciplines, as it promotes the ability of learners to identify similarities, differences, and patterns. Digital environments that would facilitate such viewing would be of particular benefit to, for example:
    - students of fine arts, whether the images were sections of a film, video, dance or theater performance, or the change in a single painting or student portfolio over time;
    - art history and architecture;
    - the sciences, for example in the study of the ontogeny of particular life forms.

- Comparing elements of still and moving images by representing them in graphs is a key tool of analysis. This type of analysis can be applied to the performing arts, sciences, and clinical practice.

- The Deconstructor provided students with a means to see how film techniques elicited responses in the viewer. This is a key literacy skill that could be applied to many media. For example, the environment could be utilized or adapted to examine the rhetoric of a newscast, television advertisement, or other mode of propaganda.

- Providing on-screen forms for students to complete beneath target source images or video focuses student attention, facilitates learner analytic skills, and provides a means of recording student findings. Other fields in addition to the performing arts would benefit through the use of such an environment. For example, student teachers could use such a tool to analyze video portrayals of teaching strategies or student behaviors, and thereby promote observing and describing skills.

- Filmmakers in the course of creating films could utilize the Deconstructor. Such users could analyze their own storyboards, dailies, or even work backwards from template graphs to create visual sequences.

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