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ABSTRACT

The Multimedia and Literature Teaching and Learning project was initiated to explore the potential of multimedia and hypermedia for supporting the response-based teaching and learning of literature. The project's initial phase involved developing criteria for considering hypermedia from a response-based perspective and then applying these to a critical review of commercial software. Findings from the review revealed that commercial hypermedia literature applications were moderately priced, designed for commonly available platforms, technically quite good, and related to works commonly taught in elementary and high school classrooms, but they did not embody response-based pedagogies. The project's second phase involved developing prototype applications for supporting literature teaching and learning designed to address support for student responses. An elementary-level application, "Kidspace," and a secondary/postsecondary application, "the Beats," were developed. The third phase involved pilot testing the prototypes in classrooms. Findings revealed the highly motivating nature of the program, its ability to support student responses, and the importance of epistemologically and technologically complementary classroom environments. As schools see more and more students coming to the learning process equipped with predispositions and skills for electronic communications, it becomes clear that issues surrounding the use of new media need to be addressed. Findings of the Multimedia and Literature Teaching and Learning project suggest that electronic media support unique and important forms of meaning making and should be included in a necessarily broadening view of literature study. (Contains 44 references, and 11 tables and 17 figures of data.) (Author/RS)

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ABSTRACT

The Multimedia and Literature Teaching and Learning project was initiated to explore the potential of multimedia and hypermedia for supporting the response-based teaching and learning of literature. Response-based approaches to literature teaching and learning regard readers as active meaning makers whose personal experiences affect their interpretations of literary works. Response-based practice likewise emphasizes the reader and the constructive reading process. There are many reasons to believe hypermedia might provide a promising enhancement to text for supporting response-based pedagogies; and indeed, many contemporary scholars believe that it is ideally suited for such purpose.

The project's initial phase involved developing criteria for considering hypermedia from a response-based perspective and then applying them to a critical review of commercial software. A group of ten graduate students developed eight evaluative categories which fell roughly into three groupings -- technical concerns, response-based considerations, and classroom issues. Applications for review were identified through a detailed search of listings dedicated to hypermedia materials. Fifty-four multimedia/hypermedia literature programs and/or program series were identified, and forty-five were acquired from their publishers and reviewed. The applications thusly acquired were evaluated by twenty-five graduate students. Findings from the review revealed that commercial hypermedia literature applications were moderately priced, designed for commonly available platforms, technically quite good, and related to works commonly taught in elementary and high school classrooms. They did not, however, embody response-based pedagogies. In particular, average ratings on response-based criteria for the applications we reviewed were 4.69 (on a scale of 1 to 10), while the same software packages averaged 7.26 on technical criteria relating to multimedia design.

The project's second phase accordingly involved developing prototype applications for supporting literature teaching and learning at both the elementary and secondary/post-secondary school levels designed to address what seemed to be conspicuously lacking in commercial software, namely, support for student responses. The elementary level application, *Kidspace*, was designed around the metaphor of a universe populated by individual students' worlds. Students can "visit" each other's worlds as readers, but they can only create (author) in their own. Each world supports a variety of personal spaces in which students are encouraged to recursively construct, explore, write, reflect, and otherwise express their feelings about their own and others' work. The secondary/post-secondary application, *the Beats*, is an open-ended program which is centered on the texts of the major Beat authors and contains hypermedia tools designed to support student (and teacher) discourse and reflection about literary works. These include the Personal Notes tool, the Notes tool, the Links tool, and Media tools.

The project's third phase involved pilot testing the prototypes in actual classroom settings. *Kidspace* was tested in six elementary classrooms chosen to reflect varying grade levels, student populations, and learning environments. Major findings from the pilot involved the highly motivating nature of the program, its ability to uniquely support student responses, and the importance of epistemologically and technologically complementary classroom environments for these capabilities to be realized. A class of twenty-six undergraduates enrolled in a creative writing course at a community college in upstate New York participated in the initial piloting of *the Beats*. Both the instructor and the students' responses to *the Beats* were extremely positive. Both believed that the program and its response-based tools offered a unique and interesting environment in which to explore literature. Indeed, data collected from the pilot study suggests that students online responses were both quantitatively and qualitatively different from their regular classroom responses.

As schools see more and more students coming to the learning process equipped with predispositions and skills for electronic communications, it becomes clear that issues surrounding the use of such new media need to be addressed. The findings of the Multimedia and Literature Teaching and Learning project suggest that electronic media support unique and important forms of meaning making that need to be included in a necessarily broadening view of literature study.

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BACKGROUND

There is growing recognition among educators of the need for establishing practical pedagogical approaches that facilitate the development of diverse problem solving and critical thinking abilities. "Literary understanding" is that form of critical thinking which is characteristically divergent and inward. It is focused on "personal meanings, understandings of human situations, and the complex web of relationships embedded in them" (Langer, 1993). Literary understanding is thus an important form of critical thought distinct from "scientific reasoning," which is characterized as convergent, objective, and logical. Indeed, scholars across the years (e.g. Britton, 1970, 1983; Bruner, 1986) have suggested that these two forms of thinking represent two important ways in which people make sense and construct meaning about their world. As such, they argue, both are necessary to mature thought.

Although a great deal of attention and activity in the educational community has been focused on the development of critical thinking skills, such efforts have tended to be unidimensional. Critical thinking has traditionally been defined by the properties of scientific reasoning, and so, most critical thinking curricula have been confined to the development of the same. Deeply embedded in the tradition of the English language arts, for example, is a set of beliefs which holds that there are "common images, evocations, and responses" to a literary piece that all good readers experience, hence, that "certain approved interpretations of particular phrases, lines, or themes . . . need to be learned" (Langer, 1993). Such beliefs have led to the development of literature curricula whose instructional goals and assessment procedures emphasize "objective" readings of the text that converge on sanctioned interpretations. In short, even literature curricula typically promote scientific, not literary, understanding (Applebee, 1990, 1993).

Response-based Literature Teaching and Learning

Response-based approaches to teaching and learning (Bleich, 1978; Holland, 1975; Iser, 1978; Langer, 1991a, 1995; Tompkins, 1980) provide alternatives to objectifying literature and so promote alternative, non-"scientific," models of problem solving and critical thinking. Whereas traditional approaches to literature champion the close readings of texts and "correct" interpretations, response-based theorists regard readers as active meaning makers whose personal experiences affect their interpretations of literary works. Response-based practice likewise emphasizes the reader and the constructive reading process. Students are encouraged to actively respond to what they read based on their own knowledge and experience and to further develop their interpretations in tandem with the knowledge and experiences of their classmates. Understandings are developed through discussions and other dialectic processes of discovery as individuals interact with one another -- explaining, challenging, testing, and building more coherent and elaborated understandings of literary works.

The teacher's role in a response-based framework is that of facilitator, responder, impresario. He or she encourages students to build, reflect on, and hone their own defensible meanings and understandings of a work (Langer, 1991b, 1995). Response-based teachers promote and guide the classroom exploration of multiple perspectives and student construction of defensible interpretations of literary works. They make the quality of students' critical and creative thinking the focus of assessment. Response-based teachers place student-generated questions at the center of learning, encouraging a problem finding, as well as problem solving, approach to critical thinking. They emphasize the importance of teaching and learning the processes of literary understanding, which they view as both socially and personally mediated.

Langer (1990) breaks literary understanding into four stances people take when engaged in reading for literary purposes:

1. ***Being out and stepping in.*** In this stance, readers make initial contacts with the genre, content, structure, and language of the text by using prior knowledge and surface features of the text to get sufficient information to begin to build envisionment. With literature, readers make initial acquaintance with the characters, plot, and setting. They use information from the text in concert with their background knowledge to get enough information to "step in."

2. ***Being in and moving through.*** In this stance, readers are immersed in the text world, using both text knowledge and background knowledge to develop meaning. They take new information and immediately use it to go beyond what they already understand, asking questions about motivation, causality, and implications.

3. ***Stepping out and rethinking what one knows.*** In this stance, readers use their text knowledge to reflect on personal knowledge. They use what they read in text to reflect on their own lives, on the lives of others, or on the human condition. Whereas the previous stance was primarily concerned with shared text knowledge and discourse around it, this stance is primarily concerned with personal knowledge and reflections.

4. ***Stepping back and objectifying the experience.*** In this stance, readers distance themselves from the text world, reflecting on and reacting to both its content and the reading experience. They objectify the text, judge it, and relate it to other texts or experiences. This evaluation and generalization is based on their notions of specific genres as well as the content of the text or the literary experiences in which they engaged.

Ideally, response-based pedagogies support each of these stances.

Multimedia/Hypermedia and Response-based Approaches

"Multimedia" can be defined as the integration of information from a variety of media sources into a single presentation. A few decades ago, the term was most commonly applied to presentations which combined multiple slide sources, sound, and sometimes video in a whole group, projected format. More recently, multimedia has come to refer to the integration of a variety of non-print media in computer-based programs, most typically designed for individual use. "Hypermedia" refers to multimedia which includes extensive

nonlinear organization. Coined by Ted Nelson (1974), the "hyper" refers to hypermedia's multidimensionality and the multiple paths a user can choose to travel through it.

There are several reasons to believe multimedia/hypermedia might provide a promising enhancement to text for supporting response-based pedagogies. Multimedia/hypermedia supports independent learning through student control of information and events (Milheim, 1988) and has proved a powerful catalyst for cooperative learning (Jiang & Meskill, 1995; Johnson & Johnson, 1986; Webb, 1983). It is frequently used to instantiate constructionist views of learning (Papert, 1993) and to support such constructivist approaches as cognitive flexibility theory (Spiro & Jehng, 1990; Jacobsen & Spiro, 1995), which share with response-based approaches basic notions like student construction of knowledge and the valuing of multiple perspectives. In addition, it can make accessible the extensive amount of information from which multiple meanings and interpretations evolve (Duffy & Knuth, 1992). Hypertext author Michael Joyce (1994) sees hypermedia as a structure that will support kinds of meanings and interpretations that do not yet exist. In this vein, the use of multimedia/hypermedia creates an opportunity for teachers to recast their own understanding of the role of text in the teaching and learning of literature, and, accordingly, their own beliefs about and roles in that teaching and learning. Indeed, many contemporary scholars believe that hypermedia, in particular, is ideally suited for response-based approaches to the teaching, learning, and assessment of literary understanding (Bolter, 1991; Landow, 1992), but such notions have yet to be systematically explored.

The Multimedia and Literature Teaching and Learning Project

The National Center for Research on Literature Teaching and Learning's "Multimedia and Literature Teaching and Learning" project was concerned with doing just that -- with exploring the attributes of multimedia and hypermedia that support response-based practice. The project's first phase was concerned with the development of criteria for considering multimedia/hypermedia software from a response-based perspective, and the application of those criteria to a critical review of commercial applications designed to support literature teaching and learning. The results of that review revealed that, although such programs were of high technical quality and linked to works commonly taught in schools, the pedagogical approaches embodied in them were not, in general, response-based. The project's second phase accordingly involved the development of prototype applications for supporting literature teaching and learning at both the elementary and secondary school levels. Prototypes at both levels were designed to address what seemed to be lacking in commercial software and to meet criteria developed in the project's first phase. The project's third phase involved pilot testing the prototypes in actual classroom settings. The purpose of this final phase was to demonstrate the usefulness of certain kinds of hypermedia tools for supporting response-based teaching and learning in real classroom situations.

This paper reports on all three phases of the "Multimedia and Literature Teaching and Learning" project and presents some preliminary conclusions that can be drawn from it. The first section describes the first phase of the project. It details the development of review criteria and the results of the application of those criteria to a critical survey of commercial multimedia literature applications. In the next two sections, phases two and three are collapsed to describe both the design and pilot-testing of the prototype applications we developed. The second section explains the design of a prototype elementary application, *Kidspace*, and its pilot testing in six elementary classrooms. The third section is concerned with the design and pilot testing of a secondary/post-secondary application, *the Beats*. The paper's final section presents preliminary conclusions that can be drawn from the project as a whole and suggestions for future research and development.

CRITICAL REVIEW OF COMMERCIAL APPLICATIONS

The first phase of the "Multimedia and Literature Teaching and Learning" project involved reviewing existing commercial hypermedia applications for the teaching and learning of literature from a response-based perspective (Swan & Meskill, 1995; Meskill & Swan, 1995). A major objective of this phase of the project was to develop criteria to help teachers and developers think about hypermedia from a response-based point of view.

EVALUATION CRITERIA

A group of ten graduate students of literature education and instructional technology, together with the project directors (the authors) and the directors of the Literature Center, developed criteria and procedures for evaluating the content of multimedia literature applications in terms of their inherent capacity to represent and support response-based pedagogies. Eight evaluative categories were established through a series of five focus group sessions. While responses within each category (except classroom usage, see below) included ratings on a ten-point scale for comparative purposes, reviews were essentially narrative in form to encourage the same kind of critical thinking about the hypermedia applications that we would hope teachers would encourage about literature. Within this framework, however, reviewers were asked to answer specific questions and look for particular features or kinds of features in each of the evaluative categories. These fell roughly into three groupings -- *technical concerns*, *response-based considerations*, and *classroom issues*.

Technical Concerns

It is entirely possible that a hypermedia literature application might be excellent from an instructional technology viewpoint but deal with literature in a manner that is not at all response-based. To distinguish between the two, the first three evaluative categories considered technical concerns related to multimedia/hypermedia in general. They examined the general quality of programs without considering them from a response-based perspective and include the following (Swan & Meskill, 1995):

1. ***Content clarity*** is concerned with the general accuracy, completeness, and appropriateness of an application for the given population, and with whether the structure of a program and its use of hypermedia are appropriate to its content.

2. ***Technical quality*** is concerned with a program's user interface; in particular, with its navigational systems, its use of multimedia, and its ease of use. This category also asks whether an application's use of multimedia is intrinsic (serves to enhance content) or extrinsic (decorative), and whether or not it is aesthetically pleasing overall.

3. ***Use of technology*** is concerned with whether an application makes good use of multimedia/hypermedia technologies or if its content could be just as well or better presented using more conventional means. It is particularly concerned with the multimedia aspects of particular applications, but also looks for such uniquely computer-

based functions as nonlinearity, internal coaching, construction tools, and student management.

Response-based Considerations

There is some reason to believe that a unique characteristic of the computing medium is its ability to represent cognitive processes in ways that support their internalization as habits of thought (Papert, 1983; Salomon, 1981; Swan & Black, 1993). Response-based considerations consider whether the formal aspects of hypermedia literature applications present literary works in ways that might support Langer's (1990) four stances. Grounded in response-based conceptions of knowledge, text, readers, and teachers, these include the following (Swan and Meskill, 1995):

4. ***What counts as knowledge?*** is concerned with whether a program represents knowledge as constructed or static, as evolving or canonical. In this category, reviewers were asked to consider whether a program is capable of incorporating students' responses to a work of literature, whether it includes multiple perspectives on that work, whether it promotes linkages between the text and students' experiences, and whether it encourages an analytic or an exploratory approach to literary understanding..

5. ***The role of the text*** is primarily concerned with the way meaning is represented in relationship to the text. In this category, evaluators were asked to consider whether multiple meanings or interpretations are provided, and whether or not a program makes some provision for students to develop their own interpretations of a work.

6. ***The role of the students*** considers the degree of student control over a program. It asks whether a program contains tools for student construction, whether and how a program validates students' responses to a literary work, and whether or not a program supports student discourse.

7. ***The role of the teacher*** is concerned with whether software design validates and supports the teacher's role as guide, facilitator, and responder. It considers, therefore, whether and how a program can be modified by a teacher, whether it includes teacher materials and/or internal management tools, and whether or not a program promotes student-teacher discourse and/or interaction.

Classroom Issues

Finally, how multimedia/hypermedia materials are used ultimately determines their effectiveness. Bad materials can be used well; good materials can be used poorly. Group members felt, therefore, that a category should be included that dealt with classroom usage.

8. ***Classroom usage***, then, is concerned with how a hypermedia application might be used in a classroom to support literary understanding.

Because such usage is essentially a function of teacher creativity and not inherent in the applications, however, no ratings were elicited for this category. Evaluators were simply asked to discuss actual or potential classroom usage.

Features Potentially Supportive of Response-based Pedagogies

Evaluators were also asked to isolate specific features and multimedia/hypermedia tools that might support response-based teaching and learning. These were reduced to eleven general features that might reinforce response-based pedagogies as follows (Meskill & Swan, 1995):

1. ***Transparent navigation.*** Evaluators found that if it were not clear how users moved through an application, students and teachers became easily disoriented and frustrated. On the other hand, they noted that too much constraint, however transparent, can potentially inhibit and even drown out students' and teachers' voices.

2. ***Intertextuality and juxtaposition.*** Another desirable attribute for supporting response-based practice was found to be some mechanism through which a variety of media elements could be interrelated and/or juxtaposed to represent contrasts, similarities, and relationships between and among texts.

3. ***Facility to share responses.*** It was felt that one of the most powerful features of multimedia/hypermedia technology for supporting response-based literature teaching and learning was its potential capability to facilitate the sharing of student responses online. The medium, reviewers believed, could represent multiple threads of conversations around students' reading and writing experiences in ways that would be at best cumbersome in traditional paper-and-pen formats.

4. ***Facility to support non-text responses.*** The empowering aspect of adding visual and aural support to one's imaginings and understandings has long held appeal in the language arts classroom (Purves, Rogers & Soter, 1990). An aspect of response-based practice that evaluators felt multimedia might nicely complement, therefore, was the use of visual and aural media to illustrate and reflect student envisionment-building.

5. ***Facility to make links.*** A key tenet of response-based approaches is that readers make connections between what they read and their own knowledge and experience. Making such connections might be encouraged and supported by hypermedia tools that allow for on-screen linking. Visual representations of student-constructed connections are valuable both in terms of the processes evoked in their construction and their role in shared discourse.

6. ***Support for envisionment-building.*** The provision of tools with which students can create, edit, refine, and reinterpret representations of their personal envisionments using the full range of available media was deemed highly desirable from a response-based perspective. Reviewers saw clear benefits for both the public and collaborative use of such tools and their use by individuals to develop their own interpretations of texts being explored.

7. ***Access to multiple perspectives.*** Another key tenet of response-based approaches is the open-ended nature of text as regards individual interpretation. From a response-based perspective, then, a desirable feature is that no single authorial voice predominate, but rather that multiple voices, meanings, and interpretations be provided.

8. ***Support for discourse.*** An ideal role for multimedia in response-based classrooms is as a catalyst for discussion and socially mediated discovery. Differing points of view are a source of delight, and divergent imaginings are the optimal vehicle for discovery and growth among conversation participants. Multimedia and hypermedia programs,

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reviewers felt, ought to be designed to stimulate student-to-student and student-to-teacher discourse around literature.

9. ***Promotion of student ownership.*** Reviewers felt strongly that applications which presented only "canonized" knowledge and/or interpretations of text were antithetical to the goals and processes of response-based practice. Without explicit provision for student entry into textual worlds, multimedia/hypermedia technology can inhibit rather that induce imaginings. Such provision might include tools for students to annotate, extend, and build discourse threads of their own around a literary work.

10. ***Presentation of background knowledge.*** One of multimedia/hypermedia's strongest features is its capacity to store and display large amounts of textual, aural, and visual information. Evaluators believed that the technology was thus well suited to the provision of large stores of supporting information that could be accessed by students, as needed, to fill in gaps in their experience, and to help stimulate and enhance student envisionment.

11. ***Facility to explore the author's craft.*** Hypermedia's capacity to store and display large amounts of textual, aural, and visual information also allows for craft commentary in a range of media formats to which students can have ready access during various stages of engagement with a literary work. As such, it can stimulate and enhance students' awareness and appreciation of literary devices and the author's craft.

Review Procedures

Applications for review were identified through a detailed search of listings dedicated to hypermedia materials, such as the *Multimedia and Videodisc Compendium* (Pollack, 1994) and *Multimedia '94* (Educational Resources, 1994), as well as vendor catalogs that included educational hypermedia. Fifty-four multimedia/hypermedia literature programs and/or program series were identified, and forty-five were acquired from their publishers and reviewed.

The applications we acquired were evaluated by twenty-five graduate students of literature education and/or instructional technology. Most were practicing teachers. Each was given two programs to evaluate and asked to complete a written content analysis of both programs by responding to questions in each criterion, and to provide numerical ratings for each of the first seven criteria according to such analyses. Reviewers were also asked to look for features potentially supportive of response-based practice (from the above list), and to describe those they found. The written evaluations were collected and reviewed for consistency by a group of four graduate students, at which time some changes were made in ratings that were inconsistent with responses to content questions or with the general consensus concerning such ratings. The evaluations were then again reviewed by the project directors who made some changes of their own.

FINDINGS

The forty-five literature applications reviewed were produced by twenty-three different publishers, and evenly split between those designed for elementary and those designed for secondary/post-secondary populations. The

majority accessed multimedia from a CD ROM disk (31), although some used a combination of CD ROM and laserdisc (10), and a few (4) used only floppy disks. Most (24) were offered for both MacIntosh and PC computers, with the remainder evenly split between applications designed exclusively for one or the other platform. In general, the cost of the programs was moderate, ranging between $25.00 and $100.00 for straight CD ROM or floppy disk offerings, and between $200.00 and $300.00 for programs including a laserdisc.

Program content was also found to be well suited to the populations for whom the applications were designed. At the elementary level, content centered on fairy tales, fables, and published picture books commonly found in elementary classrooms. At the secondary/post-secondary level, all but two applications were based on works and authors from among those most frequently taught in secondary/post-secondary classrooms (Applebee, 1989, 1991, 1993). General descriptions of the kinds of programs found at both the elementary and secondary/post-secondary levels follow.

Elementary Level Programs

Almost all the applications designed for elementary students could be best described as ***talking books***. At their most basic, these applications presented stories as illustrated text in a linear, page-by-page fashion, with the text highlighted as it was read to the students. Many also defined words on request, both in text and speech, and almost half included a non-English option. Only one, however, offered a choice of readers other than by language. Most elementary applications also included sound effects and/or music and animated illustrations

Nine of the talking book programs included a print function which allowed students to print text or, more commonly, pictures. Six contained interactive quizzes which tested students' comprehension with multiple choice, single-correct-answer questions, and five included "interactive pages" -- illustrations which students could explore by clicking on their different elements to find hidden animations. Three talking books further encouraged students to manipulate the stories they were reading by allowing them to cut and paste text and pictures, to color pictures, and to add text and sound.

None of the elementary applications reviewed included video clips. Only one contained any background information about the works presented. None included online features that encouraged student comments or interpretations of the works, although a few encouraged off-computer interpretive activities.

All of the talking books, then, were uniformly centered on the reading of highlighted text, indicating that publishers view the teaching and learning of literature at the elementary level as little more than the teaching and learning of reading. Although some of the applications we reviewed seemed well suited to such a task, this ubiquitous association of sound and text tends to focus students on decoding processes, rather than on thinking and responding to literature. A common focus on content comprehension and the lack of interest in

interpretation, literary devices, authors, and/or background information are further indications of a bias toward skills-based reading instruction.

The three "non-talking book" elementary applications we looked at were quite various and therefore defy classification. One was an adventure-type game in which players explored an imaginary environment and picked up objects that they were then supposed to return to appropriate nursery rhyme characters. When an object was returned to the correct character, the nursery rhyme was recited. The other two applications might best be described as *story makers*, which, although they included story examples, were primarily devoted to student assembly of a variety of elements to create their own stories. One of these was primarily text-based, a kind of word processor containing predefined story elements. The other was also focused on assembling predefined elements, but was more oriented toward sound and animated elements linked with text.

Secondary/Post-secondary Programs

While the elementary applications we looked at made more extensive use of the computer's sound and graphics capabilities than did the secondary/post-secondary applications we reviewed, the latter made greater use of its nonlinear linking capabilities and interactive video technologies. They also exhibited a difference and a greater diversity in pedagogical approach. Some (6) of these applications could best be classified as ***books on computer***. Like their elementary level counterparts, these programs presented the full text of collected or single works on the computer screen, and were essentially linear, with student interaction limited, for the most part, to electronic page-turning. Although a few of these books on computer included audio readings of selected passages, however, none offered a complete reading and none highlighted the text as it was read. They were also more likely to at least minimally value student interpretations by providing online note-taking capabilities, and less likely to provide high quality illustrations and/or animations.

A second common type of secondary/post-secondary application was ***databases*** (7). These programs provided book notes or the complete texts of collected or single works, background information, and a variety of database functions for searching, collecting, and printing the information they contained. Most also included note-taking capabilities, and a few contained interactive questions and answers and/or off-line exercises.

Like the databases, the two (2) secondary/post-secondary applications we categorized as ***hypertexts*** were essentially text-based, but they differed from the latter in that they did not include typical database functions, but rather, extensive built-in links between entries. Both of the applications in this category were focused on background information about a single author and his works, and, although they included selected passages from such works, did not provide the complete texts of any.

Another category of secondary/post-secondary programs, ***hypermedia*** (6), linked the complete texts of particular works to background information and video segments presented via laserdisc, one of which provided multiple readings by various actors and multiple interpretations by various scholars of the five works it covered. All of the hypermedia applications we reviewed contained extensive online background information, and most included open-ended questions presented online but designed to be answered off computer.

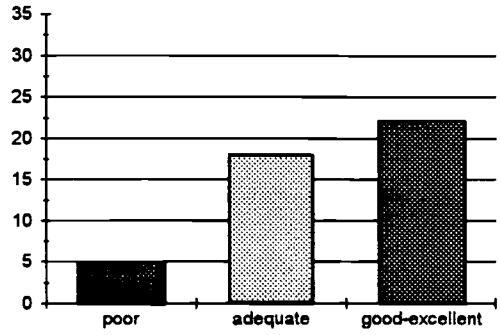
The final two (2) secondary/post-secondary hypermedia applications we reviewed were ***problem solving games***, ostensibly linked to literary works. The games were highly interactive and contained excellent graphics and sound. In both, students were asked to explore simulated environments and collect clues to solve a mystery, but the mysteries were not related to the works on which the games were based, and, although they encouraged a kind of critical thinking, that thinking was convergent and focused on single correct solutions to the mysteries.

In general, then, the secondary/post-secondary applications were much more concerned with literature -- with interpretations, with context, with authors, with literary devices, and with analyses -- than were their elementary level counterparts, and they were more likely to provide for at least note-taking on the part of students. In tone, however, and more importantly perhaps, in form, these applications focused on single "correct" interpretations and analyses. They shared the "scientific," text-centered approach to literature teaching and learning Applebee (1993) commonly found in high school literature classes.

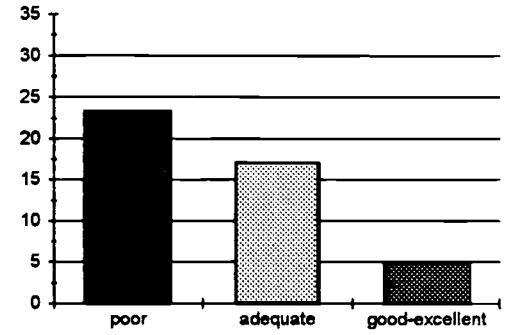
Indeed, the most prevalent design paradigm for these commercial products seemed to be the "transmission of knowledge" model that once dominated both instructional technology and the teaching of literature. When response-based criteria were applied to commercial multimedia/hypermedia products, they faired poorly. Although software products were rated quite positively as multimedia, when examined closely for features that were pedagogically grounded in response-based theory, they fell a good bit short of what participating teachers deemed desirable within response-based contexts.

Findings Regarding Evaluation Criteria

In particular, average ratings on response-based criteria for the applications we reviewed were 4.69 (on a scale of 1 to 10), while the same software packages averaged 7.26 (on a scale of 1 to 10) on technical criteria relating to multimedia design. If one considers programs with ratings of 4 or below as "poor" with respect to such criteria, those with ratings of 5 to 7 as "adequate," and those with ratings of 8 or better as "good" to "excellent," fully 23 of the 45 programs we reviewed were rated as "poor," and only 5 were considered "good" to "excellent" from a response-based perspective. On the other hand, from a technical point of view, only 5 applications were considered "poor," while 22 were rated as "good" to "excellent." Figure 1 below graphically summarizes these ratings.



TECHNICAL CONCERNS



RESPONSE-BASED CONSIDERATIONS

Table 1
Comparison of Ratings on Technical Concerns and Response-based Criteria

Such results are, as previously mentioned, quite discouraging from a response-based perspective, indicating as they do that these applications, rather than breaking new ground in literature teaching and learning, have generally adopted older and more traditional reading and text-centered pedagogical approaches. McLuhan (1963) suggests that new media generally mimic old forms before exploiting their uniqueness, as in the cases of, for example, the Gutenberg Bible or early movies. Perhaps it is too early to be overly discouraged. Perhaps, on the other hand, it is a good time to become proactive on such issues. Specific findings concerning each response-based criterion are discussed below.

What counts as knowledge? is concerned with the formal representation of knowledge within a program. In general, evaluators found that the hypermedia applications we reviewed tended to represent knowledge as static and "canonical" (overall rating, 4.65). If one considers applications with ratings of 4 or below as "poor," those with ratings of 5 to 7 as "adequate," and those with ratings of 8 or higher as "good" to "excellent" in response-based knowledge representation, the greatest number of programs (21) were seen as "poor" in this regard. Nineteen programs were viewed as "adequately" representing knowledge in a response-based fashion, and only 5 were seen as providing "good" to "excellent" representations of knowledge from such perspective. Table 2 shows these rankings.

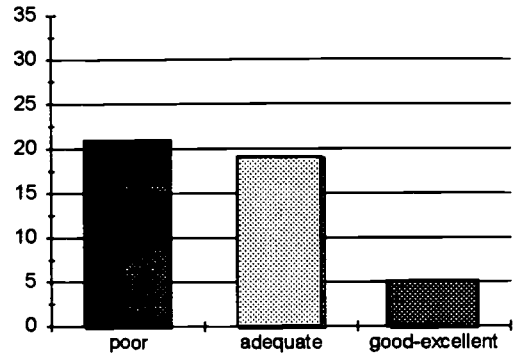


Table 2
"What Counts as Knowledge" Ratings

Elementary level applications were rated a good deal lower (3.82) than secondary/post-secondary applications (5.48) on this criterion, mostly due to their propensity to provide a single reading of the text and to give single-correct-answer comprehension questions. The more highly rated elementary applications provided multiple voices, open-ended questions, and/or "interactive pages." Evaluators who observed students using the latter commented that these pages encouraged an exploratory approach to literature and elicited both questions and links to personal experience from their users. Elements in secondary/post-secondary programs that evaluators thought represented knowledge in a more reader-based fashion included multiple representations of the same knowledge, search capabilities, provisions for note-taking, open-ended questions, and construction tools.

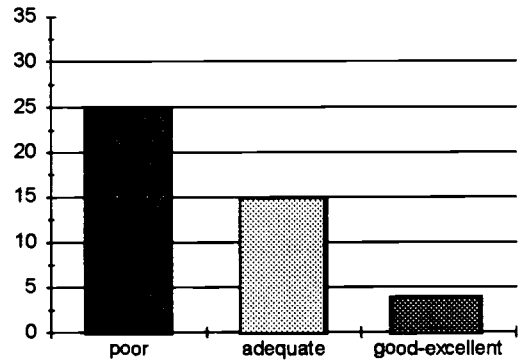


Table 3
"Role of the Text" Ratings

The role of the text (Table 3 above) refers to the way a program represents meaning in relationship to a text. A response-based perspective assumes that there will always be multiple defensible interpretations of a text because readers will always bring varied experiences to their readings. Evaluators felt that the majority of applications they looked at did not support such an assumption (overall rating, 4.83). Applying standards as above to this criterion, evaluators ranked the majority of programs (25) as representing text "poorly" from a

response-based perspective. Fifteen programs were found to "adequately" represent text, and only 4 were seen as providing "good" to "excellent" representations of text from a response-based perspective.

Elementary applications were again rated lower (4.18) in this category than secondary/post-secondary applications (5.48), mostly due to their lack of provision for student responses, but also because of their frequent use of pop-up definitions which evaluators thought created a very concrete impression of meaning residing in text. The two elementary applications most highly rated on this criterion, in contrast, offered multiple representations of meaning and/or alternative definitions of words from which students could choose. Secondary/post-secondary applications' higher ratings came mostly from the strength of two features commonly found in them -- note-taking capabilities and open-ended questioning. While evaluators thought all note-taking capabilities were at least minimally a positive feature from a response-based perspective, they preferred notes linked to text or written in the margins of a text to the more common drop-down notes. For similar reasons, reviewers favored the rarer programs that provided spaces for answering open-ended questions online to the more frequent use of questions asked online but designed to be answered off computer. They also thought that video representations linked to text supported a response-based perspective because they offered alternative interpretations of it.

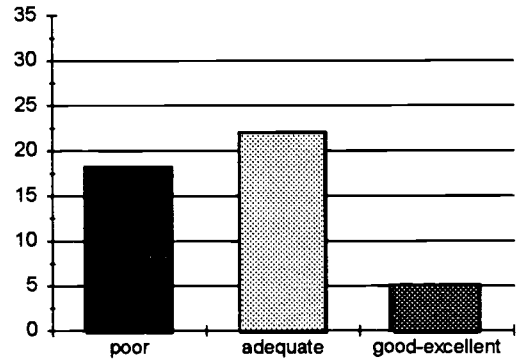


Table 4
"Role of the Students" Ratings

The role of the students (Table 4 above) is concerned with whether and how a program validates students' responses to a literary work. Evaluators gave this criterion the highest ratings in the response-based category (overall rating, 5.59; secondary/post-secondary, 6.09; elementary 5.09), indicating that they felt that students were somewhat empowered by the hypermedia literature programs we reviewed. Applying standards as above to this criterion, evaluators ranked slightly fewer programs (18) as assigning "poor" roles to students from a response-based point of view, and a good deal more programs (22) as assigning them "adequate" roles. By these standards, however, only 5 applications were viewed as providing "good" to "excellent" opportunities for students to interact with text.

Features that evaluators found empowering of students included interactive pages, construction tools, note-taking capabilities, nonlinear access to background information, and open-ended questioning, but it was noted that all of these could be improved upon from a response-based point of view. With regard to the latter, evaluators felt that not only is the agenda of such questions set by the application and not by the student, but the common practice of presenting questions online to be answered off-line tends to value the questions (i.e., the "expert") over the answers (i.e., the student). It should also be noted that the programs we reviewed, if they provided them at all, provided opportunities for individual student responses rather than spaces in which discourse among students was encouraged, and none encouraged student-generated questions.

The role of the teacher is concerned with whether a teacher is empowered or constrained by a program, and with whether or not a program promotes student-teacher interaction. Evaluators gave this criterion the lowest ratings in any category (overall, 3.68; secondary/post-secondary, 4.22; elementary, 3.14), indicating that they felt that teachers were essentially disregarded by the hypermedia literature programs we reviewed. Applying standards as above to teacher empowerment, fully 29 programs were seen as "poor" in this regard. Twelve programs were viewed as providing "adequate" roles for teachers, and only 4 applications were seen as providing "good" to "excellent" roles for teachers from a response-based point of view. Table 5 below shows these results.

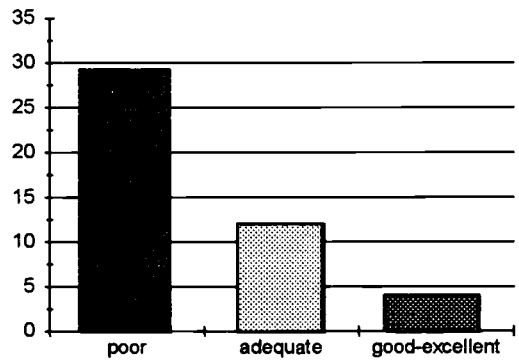


Table 5
"Role of the Teacher" Ratings

Indeed, few of the applications we looked at had well-designed teacher guides, and most teacher guides offered no teacher materials at all. Very few of the applications we looked at included any provision for teacher input other than the ubiquitous "notes," and only one included program management tools. In addition, as noted above, none of the applications we reviewed provided public discourse spaces which might be seen as the primary areas in which teachers could interact with students in a variety of ways.

Findings Regarding Response-based Features

In terms of response-based features (Table 6), only two -- transparent navigation and intertextuality and juxtaposition -- were found in more than half the software packages reviewed. Fully five of the features identified as supportive of response-based teaching and learning -- the facility to share responses, the facility to support non-text responses, support for envisionment, access to multiple perspectives, and the promotion of student ownership -- were found in less than a quarter of them. A sixth feature -- support for discourse -- was found, if at all, as an off-line, rather than an online, feature.

	found in < 25%	found in < 50%	found in > 50%
transparent format			39
intertextuality & juxtaposition			25
facility to share responses	6		
support for non-text responses	11		
facility to make links		14	
support for envisionment	11		
access to multiple perspectives	7		
support for discourse	1	(17)*	
support for student ownership	12		
provision of background knowledge		20	
facility to explore author's craft		13	

* -- support for off-line discourse

Table 6
Response-based Features Found in Programs Reviewed

Indeed, the pedagogical approaches taken by the vast majority of the commercial applications we reviewed mirrored the approaches commonly found in schools. At the elementary level, literature teaching and learning was equated with reading instruction. At the secondary/post-secondary level, teaching and learning was almost exclusively text-centered. What was sorely missing, from a response-based perspective, in most of the commercial applications we reviewed, was any provision for constructive roles for learners. In the next phases of the "Multimedia and Literature Teaching and Learning" project, we set out, therefore, to design and test programs containing features that addressed this shortcoming. Based on the strengths, weaknesses, and potentiality found in commercial products, two prototype applications, *Kidspace*, for elementary students, and *the Beats*, for secondary/post-secondary students were designed and pilot-tested in active classroom settings.

DEVELOPMENT & PILOTING OF *KIDSPACE*

Figure 1: *Kidspace* Title Screen

The second phase of the "Multimedia and Literature Teaching and Learning" project focused on the development of prototypical tools and applications that provided explicit online support for student construction, reflection, and discourse around texts (Meskill & Swan, 1996). The first of these, *Kidspace* (Figure 1) was designed for students in grades one through six. It was developed by a design team of five graduate students of education and the project directors. It evolved from a set of simple, stand-alone *ToolBook* applications which were individually tested in the laboratory with child volunteers, formatively evaluated by the design team, and recursively developed into the four "spaces" available to students in the current version of the application.

Kidspace was designed around the metaphor of a universe populated by individual students' worlds (Figure 2). Students can "visit" each other's worlds as readers, but they can only create (author) in their own. Each world supports a variety of personal spaces in which students are encouraged to recursively construct, explore, write, reflect, and otherwise express their feelings about their own and others' work. The application also provides a public area for collaborative reflection and discourse.

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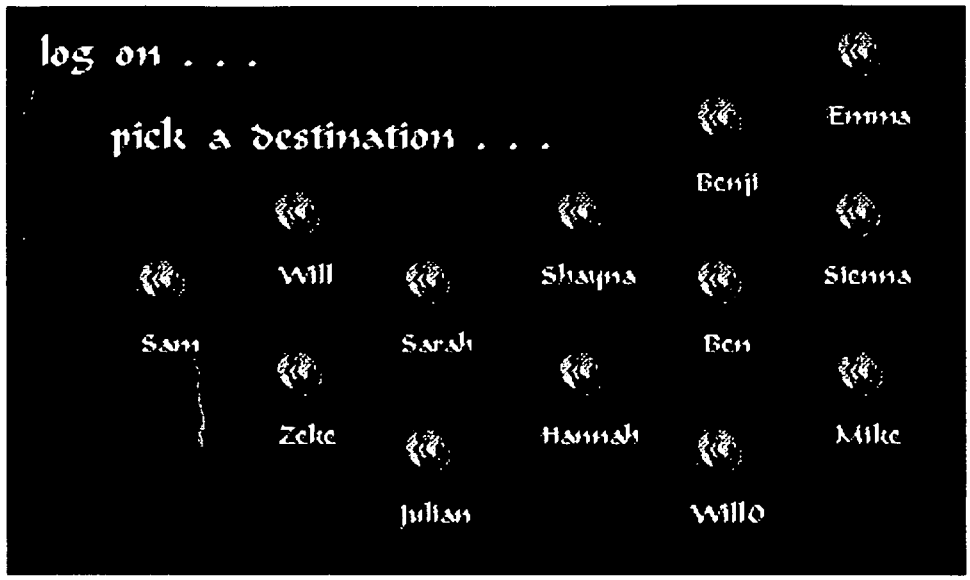

Figure 2: *Kidspace* Universe

The spaces in *Kidspace* are accessed through each student's *control panel* (Figure 3). From this panel, one can move to any one of the spaces provided -- *Cricket Village*, the *Y Dimension*, and the *Exploratory Mission* are personal constructive spaces; *Communications* and the *Captain's Log* are public and private reflective spaces, respectively. Each of these five spaces is described in greater detail below:

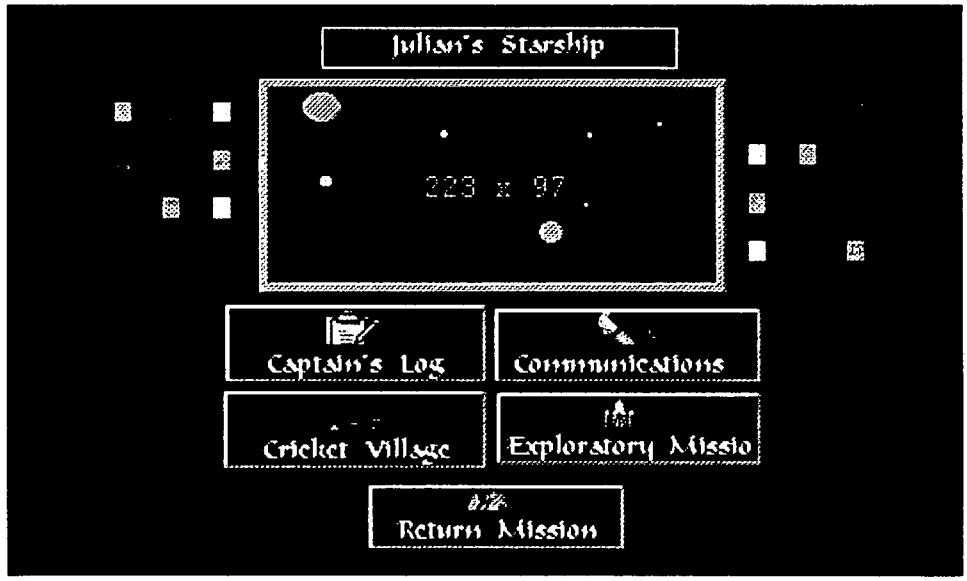

Figure 3: *Kidspace* Control Panel

Cricket Village (Figures 4 and 5) was designed as a space for students to explore dialog and narrative. It consists of nine colorful woodland scenes which are intricately detailed and populated by whimsical creatures. Students choose scenes and give them meaning by adding narrative text and dialog (in cartoon-like bubbles

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which students can position within a scene). Students can develop several such scenes to produce extended narratives. In addition, both reflective spaces (*Communications* and the *Captain's Log*) are always available so that students (and teachers) can publicly and/or privately comment on both their own and others' *Cricket Village* creations.

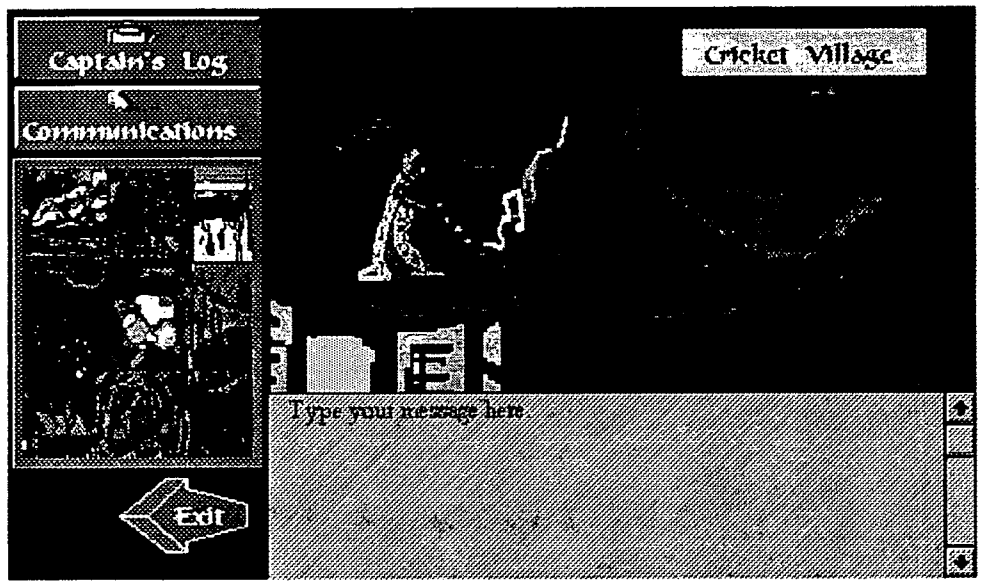

Figure 4: Opening Screen *Cricket Village*

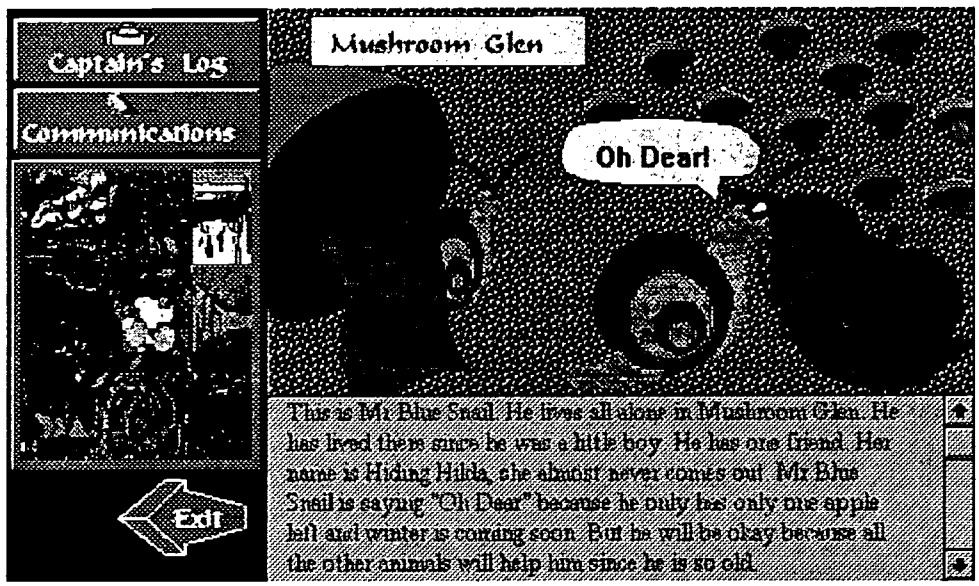

Figure 5: *Mushroom Glen* in *Cricket Village*

The ***Y Dimension*** was designed as a space for students to explore character, dialog, and plot development. It provided children with tools for creating their own stories by cutting and pasting cartoon characters against a black background to create scenes, and writing dialog (in bubbles) for the characters and narrative (in a text

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box) to tell their story. As in *Cricket Village*, *Communications* and the *Captain's Log* were ubiquitously available within the *Y Dimension* so that stories thusly created could be publicly and privately commented on. Serious technical problems, however, developed around this space during the early classroom trials, and it has been eliminated from the current version of *Kidspace*.

Of the three constructive spaces, the ***Exploratory Mission*** (Figure 6) is the most open-ended. It provides students with a writing space in which they can develop a poem, story, report, or commentary. In one of the current versions of *Kidspace*, students are also provided with two sets of pictures from which they can choose to illustrate their writings. In the other version, students use standard *ToolBook* authoring tools to develop graphics and animations of their own. The *Exploratory Mission* was designed as a space where students could explore their own writing and/or develop reflections on their off-line reading (and other) experiences. *Communications* and the *Captain's Log* are always additionally available so that students (and teachers) can comment on both their own and others' *Exploratory Mission* writings.

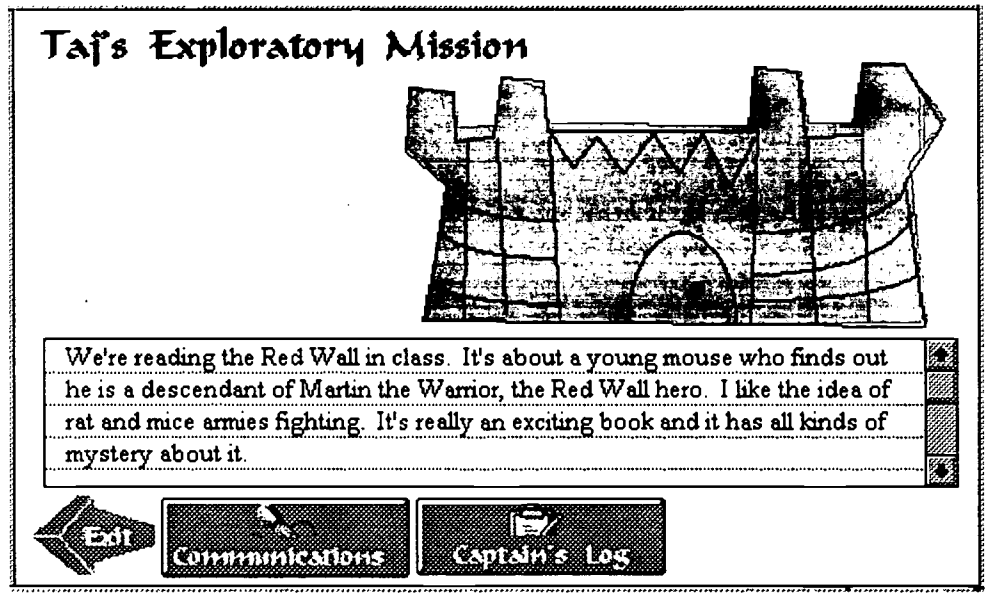

Figure 6: *Exploratory Mission* page

Much like a bulletin board, ***Communications*** (Figure 7) is a public space where students can carry on conversations and comment on work done in the other public spaces (all spaces except the *Captain's Log*). It can be accessed at any time from any of the *Kidspace* spaces, as well as from the control panel. *Communications* was designed to support online discourse among students (and teachers) about particular works. It can also be used by a teacher to elicit discourse about a particular work or topic.

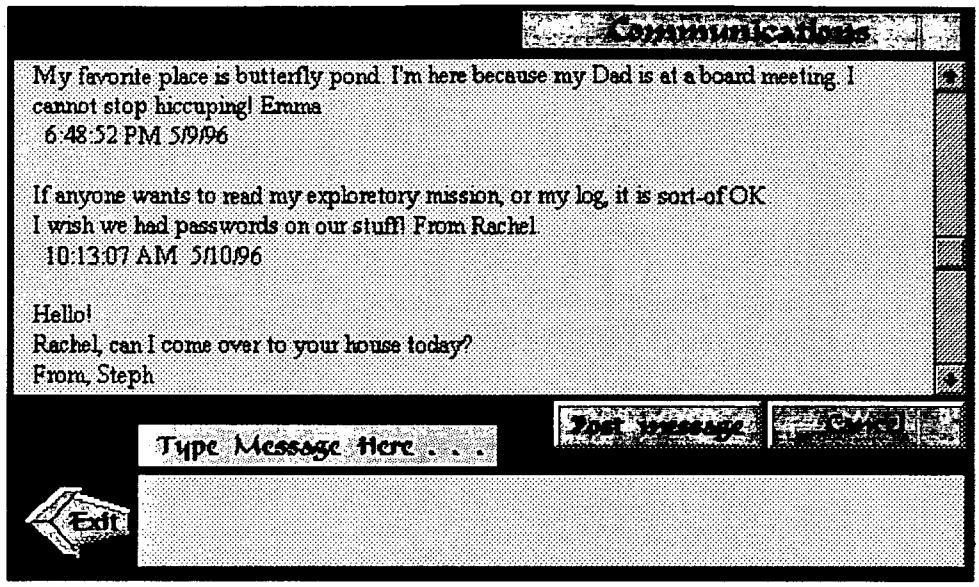

Figure 7: ***Communications***

The ***Captain's Log*** (Figure 8) is a private response space for recording reflections about one's own or others' work. Each student has their own private *Captain's Log* which they can access from any point in *Kidspace* to record such responses without worrying about other students seeing them. It is thus designed to function like an online response journal. Reflections recorded in the *Captain's Log* can be copied into *Communications* if and when a student wants to make them public.

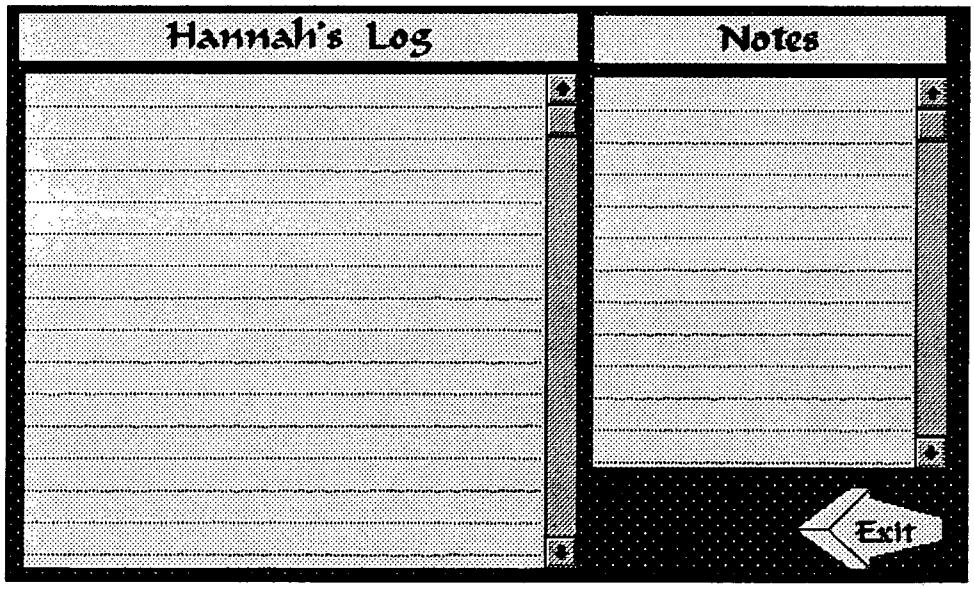

Figure 8: the ***Captain's Log***

	What counts as knowledge	Role of the text	Role of the students	Role of the teacher
Cricket Village	Knowledge is discovered and created through story telling; visual elements are used to elicit students' explorations.	Students generate text around pictures; connections between these writings and other experiences can be made and elaborated.	Students are the discoverers and creators of meanings in pictures and texts.	The teacher can value and facilitate students' creative processes through online and off-line conversations.
The Y Dimension	Knowledge is discovered and created through students' storytelling; visual elements are combined to create and explore meanings.	Students generate stories by combining graphics and text; connections between these and other experiences can be made and elaborated.	Students are the discoverers and creators of meanings in pictures and texts.	The teacher can value and facilitate students' creative processes through online and off-line conversations.
Exploratory Mission	Students represent their personal knowledge and understandings through creatively combining media.	Texts and graphics are generated and responded to by students; these, in turn, can be responded to both online and off.	Students are the discoverers and creators of meanings in pictures and texts.	The teacher can value and facilitate students' creative processes through online and off-line conversations.
Communications	Knowledge about student works is collaboratively constructed through online discourse.	Students reflectively respond to texts, which are cast in the role of catalysts around which conversation can build.	Students are encouraged to respond to texts and to develop and defend their own interpretations in reflective discourse.	Teachers are cast as collaborators and facilitators in the processes of meaning making through reflective, online discourse.
Captain's Log	Personal knowledge is developed through reflection on student works.	Text is the vehicle through which personal meanings are developed and explored.	Students are encouraged to respond to texts and to develop their own interpret-ations.	Teachers are cast as facilitators of student reflections.

Table 7
***Kidspace* Spaces in Relationship to Response-based Criteria**

In general, then, *Kidspace* was designed to emphasize the personal knowledge, reflection, and construction of texts and the personal and social construction of meanings around them that we found virtually disregarded by commercial multimedia/hypermedia applications. In short, it was designed to instantiate response-based criteria concerning knowledge, the role of the text, the role of the student, and the role of the teacher. How each of these criteria were accommodated and complemented by each of the spaces within the *Kidspace* application is outlined in Table 7. Table 8 summarizes the response-based features instantiated in the various *Kidspace* spaces. It shows that all the features identified as supportive of response-based practice, except the presentation of background knowledge, can be found somewhere in *Kidspace*, and the latter could be developed in the *Communications* or *Exploratory Mission* spaces by interested teachers and/or students.

	Cricket Village	Y Dimension	Exploratory Mission	Communi-cations	Captain's Log
transparent format	*	*	*	*	*
intertextuality & juxtaposition	*	*	*	*	*
facility to share responses				*	
support for non-text responses			*		
facility to make links				*	*
support for envisionment	*	*	*	*	*
access to multiple perspectives	*	*	*	*	
support for discourse				*	
support for student ownership	*	*	*	*	*
provis. of background knowledge					
facility to explore author's craft	*	*	*		

Table 8
Response-based Features Found in *Kidspace* Spaces

PILOT STUDIES

Kidspace, then, was designed to focus on features that met the response-based criteria established by the "Multimedia and Literature Teaching and Learning" project, and revised and refined in laboratory trials. What works in the laboratory, however, does not necessarily work in the classroom; thus *Kidspace* was also pilot tested in actual classroom settings. Our goals in examining the prototype in actual classroom contexts were threefold.

First, we wanted to see whether the software would/could be used in the ways we had imagined.

Second, we wished to establish what classroom contexts might be most conducive to such imagined practice.

Third, we wished to determine whether and how response-based multimedia contributed to students' development of literary understandings.

Students and Classes

Six elementary classes participated in the piloting of *Kidspace*. Students and classes were chosen to reflect varying grade levels, student populations, and learning environments from among volunteers who shared a common whole language/literature-based approach to reading instruction and previous classroom experience with computers. Four classes -- two classrooms each from an urban Montessori school (a combined first and second grade and a combined third and fourth grade) and a suburban elementary school (a combined second and third grade and a fifth grade) -- participated in the project over a two and one half month period in the spring of 1995. Because serious technical problems developed during this first trial, *Kidspace* was reworked and briefly tested, mostly for technical reasons, in two additional classrooms in a private rural elementary school where one of the authors is the computer teacher (a combined third and fourth grade and a combined fifth and sixth grade). This second study took place for two weeks at the close of the 1995/1996 school year.

The student population at the Montessori school was multicultural, with about equal numbers of white, African-American, and Hispanic students from working class backgrounds. Students at the suburban school were predominantly white and came from middle to upper middle class backgrounds. Students at the rural elementary school were exclusively white and represented a full range of socio-economic backgrounds.

Teachers in all six participating classes used a whole language approach to the teaching and learning of reading that relied exclusively on children's literature rather than basal readers for their primary texts. Teachers in the Montessori school seemed to put a greater emphasis on individualized reading, and teachers in the suburban elementary school seemed to put a greater emphasis on skills development, but all six teachers combined individualized reading and skills development with reading group work. All six teachers also classified themselves as "computer literate" and had experience assigning math and language arts activities on computers in their classroom. Without exception, participating students also had experience using computers for math, word processing, and games, both in school and out.

The learning environment in the Montessori classrooms appeared to be in keeping with how we envisioned *Kidspace* being integrated to best effect. Montessori education is grounded in a constructive philosophy of learning which centers on student creation of knowledge through the guided manipulation of an extensive collection of classroom materials. In addition, the Montessori notion of providing children with opportunities

to take charge of their own learning processes and to do so in a social/collaborative framework (Standing, 1962) complements the design and aim of *Kidspace*.

In the suburban classrooms, one the other hand, the use of *Kidspace* represented a break from everyday classroom activities. Although the combined second and third grade classroom had an established pattern of small group work, teaching and learning was still predominantly teacher-centered, and independent work on the computer that was not drill-based was still something novel for both the students and the teacher. Establishing a place and a pattern for using the software was, therefore, more subject to constraints. Such constraints were even more evident in the fifth grade classroom, where a pattern of teacher-led activities had been thoroughly established.

The private, rural school classrooms fell somewhere between the other school classrooms. In terms of classroom environment, they were, if anything, more child-centered than the Montessori classrooms. Both classes were very small (12 and 13 students respectively) and project-oriented. In terms of epistemology, however, the classes were more traditional -- somewhat less constructivist than the Montessori classes, somewhat more constructivist than their suburban counterparts. In addition, in these classrooms, use of *Kidspace* was relegated to "computer times" -- mornings when the "computer teacher" (one of the authors) was available.

Table 9 summarizes the ways in which *Kidspace* became integrated into the daily routines of the six classrooms. Differences in socio-physical space, scheduling, instructions given students for using *Kidspace*, and constraints governing its use are outlined.

Data Gathering and Analysis

Kidspace was designed for children in the first through sixth grades. The overarching goal was to have children use the software as a thinking, construction, and communications tool centered around student-created stories, poetry, and prose. We also looked to teachers to integrate the use of the software with off-line reading and reading-associated activities. In piloting the prototype in classrooms, we were interested to see whether students and teachers naturally engaged in these activities in the ways we had envisioned. We were also interested in the ways teachers went about integrating the use of the software into the daily classroom routine.

	Socio-Physical Context	Scheduling	Instructions	Constraints
Montessori 1st and 2nd	Computer brought into room on cart as one of many hands-on centers in room.	Teacher scheduled pairs to work in 45-minute sessions throughout the school day.	Children were told to work in pairs and to write and respond to others' work.	Time allotted each child; first graders' lack of writing skills.
Montessori 3rd and 4th	Computer situated as an additional learning center next to the reading center.	Teacher scheduled individual students and, later, pairs for 45-minute sessions.	Children were directed to write stories and to examine and respond to others' work.	Distractions from room noise; competition for mouse and keyboard control.
Traditional 2nd and 3rd	Computer was in the back of teacher-centered classroom.	Individuals worked for timed 20-minute sessions whenever scheduling permitted.	Children were told to explore the spaces, to compose, and to respond to each others' work.	Distraction from teacher-directed activities; time allotted was too short.
Traditional 5th grade	Computer was in the back of a teacher-centered classroom.	Individuals worked for 20-minute periods, three times per week.	Teacher told students to read and respond to each other's writings.	Students unaccustomed to individualized work; distraction from other activities; time too short.
Private 3rd and 4th	Computer located in an activity area separated from main classroom.	Students worked in small groups for one 30-minute session and individually for one 30-minute session.	Children encouraged to compose in *Cricket Village*, write reading responses in the *Exploratory Mission*.	Time (total) too short for extended use of spaces; no time allocated outside of computer time.
Private 4th and 5th	Computer located in an activity area separated from main classroom.	Students worked in small groups for one 30-minute sessions and individually for two 30-minute sessions.	Children encouraged to compose in *Cricket Village*, write reading responses in the *Exploratory Mission*.	Time (total) too short to evolve extended use of spaces; little time allocated outside of computer time.

Table 9
Classroom Implementations of *Kidspace*

In the first four studies, we collected both observational and attitudinal data. Observational data included teacher logs, classroom observations, and student work saved in their individual and collective *Kidspace* files. Participating teachers were asked to keep a daily log recounting how *Kidspace* was being used in their classrooms. This was supplemented by visits made to participating classrooms by graduate students participating in the project, who both observed students' use of *Kidspace* and made videotapes of such usage for later review. All available student work was also saved for review, but equipment problems made this a less than satisfactory source of information. Attitudinal data consisted of a range of questions asked of participating students during and after the pilot period regarding their computer experience, attitudes toward learning in general and reading in particular, and perceptions regarding how computers figured in their reading and writing learning experiences. Participating teachers were also interviewed during the classroom selection process on similar issues, and their attitudes recorded.

In the second study, only observational data were collected. This consisted of students' individual and collective work and the observations of one of the authors who participated in all the students' *Kidspace* sessions.

INITIAL FINDINGS: URBAN AND SUBURBAN CLASSROOMS

During the pilot study, we learned that major technical changes had to be made in *Kidspace*. Indeed, the program which had worked perfectly well on our laboratory computers for small numbers of children overwhelmed the classroom machines when used with whole classes of them. We reduced the graphics, eliminated the sounds, and generally reconfigured the program, but *Kidspace* still occasionally crashed, usually when students were working in the *Y Dimension*. That space was accordingly dropped from subsequent versions of the program.

Although these technical difficulties, in a very real sense, limited findings from the pilot study, we were still able to learn a great deal. Such findings can be grouped into three categories -- patterns of actual classroom usage, the relationship between classroom contexts and effective use, and students' development of literary understandings.

Patterns of Use

Students in all four classrooms were uniformly motivated by *Kidspace*. This is evident in teachers' logs, observations, and students' statements in the post-pilot interviews. Students looked forward to having their turn at the system, and, in most cases, worked diligently within the application during their time on the computer. Their engagement with the program can be seen on the videotapes. When observed and interviewed about their experiences with *Kidspace*, participating students unanimously praised the software.

The most typical response was that it was "fun." When asked about the value of *Kidspace* for their students' reading and writing, teachers were also uniformly enthusiastic. Teachers in the traditional classrooms, however, also expressed a desire for the software to "do more," e.g., have spell and grammar checkers and a printing capability so their students' work might be more polished and portable.

Students in both schools uniformly spent the majority of their online time writing stories in the *Cricket Village* space. In addition to developing plot and character through extended stories for the woodland creatures depicted on the screen, they filled in dialog bubbles with story-appropriate conversations. Students, for the most part, then, used the space as designed -- to explore plot development, setting, characterization, and dialog. Students in the Montessori classrooms also used the *Communications* space to comment on each other's work.

The second favorite space among students in both schools was the *Y Dimension*, where they cut, pasted, and arranged the cartoon characters, and assigned plot and dialog to them. In short, students generally used the space as intended -- to constructively explore dialog, character, and plot development -- and a good percentage of them also explored and commented on each other's creations. Because they also tended, however, to crash the computer in the *Y Dimension*, most student work therein was lost, and students increasingly avoided it.

Less popular with most students was the *Exploratory Mission*, where students wrote poetry and stories and selected pictures to enhance what they wrote. This was envisioned as a good space for students to undertake extended writing activities, especially writing about their reading experiences and/or other classroom activities involving literature. They did not do so on their own. We believe this was in part because the *Exploratory Mission* space offers less visual guidance than the other two spaces and in part because they were given little guidance from their teachers to do so.

Montessori students used the *Communications* Space to invite each other to read their work and exchange comments about it. Although there was no extended discourse among these students about specific writings, the students made good use of the area and seemed to enjoy commenting on each other's spaces. Montessori students did not use the *Captain's Log* for any purposes.

Students in the traditional classrooms used *Communications* as a place to exchange personal information unrelated to their *Kidspace* work. Thus, although these students were more likely to produce extended discourse, it was not about each other's, or indeed any, writing. These same students, under their teachers' direction, used the *Captain's Log* as a composition space for writing stories (in much the way the *Exploratory Mission* was intended). The teachers' purpose seems to have been to encourage more student writing, but, because the *Captain's Log* is a private space, this closed off discourse around that writing. It may be that these

teachers conceptualized writing as a private act. Such usage does suggest, however, that students respond well to teacher direction in the use of the spaces.

In general, then, students tended to use *Kidspace*, especially its *Cricket Village* space, as we envisioned. The cartoon-like formats of this area seemed well chosen to evoke student exploration of literary elements in a constructive fashion, and many students enjoyed visiting each other's spaces and commenting on each other's work. In addition, some areas of usage that were disappointing, for example, extended discourse in the *Communications* space, might reasonably have been expected to develop given a longer and less challenging pilot period.

On the other hand, teachers in all the participating classrooms did not use *Kidspace* as intended. They did not use it to communicate with students, nor did they make any attempts to integrate its usage into regular classroom reading and/or literature activities. In some cases, they actually directed students to use the program in ways we considered counterproductive. It seems very likely, then, that extensive teacher training will be necessary for this or any similar program to be used to its full potential, even in classrooms where the approach to literature teaching and learning is generally response-based.

Classroom Contexts

While all four participating teachers had had some training and experience in computer use and prior experience having students use computers in their classrooms, their perceptions of the *Kidspace* activities differed in terms of how those activities were understood and instantiated. Such perceptions, in turn, appeared to be related to variations in the epistemological beliefs and attitudes inherent in the differing cultures of the schools in which the pilot study took place.

Teachers in the traditional classrooms seemed to view the computer as an instrument of instruction, much like a workbook or a traditional text. What students did in *Kidspace* was perceived more as a result of the software than of the individual child's thinking. This was evidenced in teachers' logs which consistently cast *Kidspace* and the machine as "doing" or "not doing" something for the children's writing, and in the ways in which they assessed its usefulness. In the traditional classrooms, there was also concern that students working on the computer not get distracted by surrounding classroom activity, and vice versa, and so an effort was made to keep other students away from those involved with *Kidspace*. Students in these classrooms accordingly were less likely to explore each other's worlds. Rather than using the *Communications* space to comment on each others' work, they used it to communicate thoughts about the school life and life in general.

In contrast, in the Montessori classrooms, *Kidspace* was perceived as one kind of material among many which students could manipulate as a concrete aid in constructing their own understandings of the literary experience. Montessori teachers encouraged classroom discussion of the program, exploring with their

students their responses to it in terms of their work, rather than as an end in itself. Teachers and students in the Montessori classes also seemed more accustomed to the notion of public writing and response. Children in these classes frequently called their teachers and other students over to the machine to show and read their work to them, and students not working on the computers often stopped as they passed by to see what students working on them were doing. The Montessori students were also more likely to explore each others' efforts on the machine and consistently took advantage of the *Communications* space to write comments about them.

Another cultural difference in the use of *Kidspace* in traditional and Montessori classrooms involved collaboration. Students in the Montessori classes were almost always paired for work within the program, and, in the majority of cases we observed, worked collaboratively within it. They talked about their writing and shared in its construction regardless of whose world they happened to be in. Montessori pairs also discussed their responses to other students' work and formulated collaborative comments about it. In contrast, students in the traditional classes were scheduled for individual time as often as they were paired. Even when paired, these students tended to split their time at the computer into individual turns. We observed several instances in these classes in which the pair member not using *Kidspace* was totally disengaged, obviously more interested in what was going on in the larger classroom than in what his or her partner was doing on the computer.

All in all, the learning culture shared by teachers and students in Montessori classrooms seemed more supportive of the use of *Kidspace* as intended than the culture of the traditional classrooms. Interestingly, however, teacher perceptions concerning the role of computers in classrooms had one striking similarity across schools. In all classrooms, work on the computer was consistently cast as separate from other classroom activities and not incorporated and valued as part of a larger reading and writing program. While this surely was at least partially an affect of the experimental nature of the pilot study, it seems also to have resulted from a common belief that computer-based learning is somehow self-contained. This is perhaps the greatest stumbling block for teaching professionals and one that must be addressed before applications like *Kidspace* can be used to their full advantage.

Literary Understanding

Kidspace was designed to support students' development of literary understanding. As such, it was designed to be integrated into regular classroom activities involving the response-based teaching and learning of literature. In particular, it was hoped that students would use the *Exploratory Mission* space to develop impressions of the works they read both in and outside of class, and the *Communications* space to carry on an extended conversation about these and other writings. In the pilot study, these areas were not so used, making it difficult, if not impossible, to reach any conclusions concerning the utility of the program for supporting such development.

None the less, there is some reason to believe the *Communications* space could support extended conversations about literature, in that students did use it conversationally:

> *In approximately 9.2 hours my life will be over. Felt out. Log off.*
> *P.S. The all city concert is in 9.2 hours. Sean*
>
> *Good luck, Sean. We will see you at the concert.*
> *Megan and Alex*

to comment on the program:

> *This new Kidspace is so cool. I'm the first one to use it. So far I've been into Captain's Log and Communications. I'm going to check out the rest.*
>
> *The computer is cool. We are having lots of fun with it.*

and, occasionally, to write comments on other students' work:

> *Ben, we like the story you wrote in Cricket Village. It's scary.*
>
> *We like the story Angela and James wrote in the Y Dimension. It's funny.*
> *Look for our story in Cricket Village.*

It seems reasonable to assume that given the right kind of encouragement from teachers and enough time, they could use it to develop extended conversations, not only about each others' writings within the program, but about what they read both in and outside of class.

Another good indication that *Kidspace* could support the development of literary understanding can be found in the very positive ways the writing spaces, especially *Cricket Village*, were used. The rich illustrations in *Cricket Village* seemed to inspire students to produce equally rich and coherent writings:

> *Once upon a time there was a snail named Bob. One day Bob was going for a walk when he saw an apple in a curly leaf. He decided to eat the apple when he saw something blue behind a giant mushroom. He went to go see what it was. What he saw there was the cutest snail he ever did see. He went over but the snail got scared. It tried to run away but you know how fast snails are.*
>
> *It was night time now. I had just gone to bed when a beautiful sound made me run to the window. On top of my house was a little cricket blowing on a flute. His flute had a soft sound. It was just loud enough that I could hear it. If it was any louder, it would wake up our neighbors.*

Compare these with the writing students in traditional classes produced in the *Captain's Log* (without reference to illustrations):

> *Once upon a time there was a little girl and her name was Michelle. Her mom asked her to go out and find a house. She came upon a house and there was a lady outside. She said, "Hello, can I borrow some flour so my mom can make some cookies?" Then*

the lady went inside and said come in and she got me some flour and I said, "Thank you." Then she went outside and went to her house.

Once there was a girl
Who was as pretty as a pearl.
Her hair was all brown,
Which looked beautiful with a crown.
She lived in a castle,
Which was no regular one.
It had stables in the living room
And a mall in the kitchen.

These writing samples suggest that the *Cricket Village* scenes helped students to focus on details of setting and character in developing well-constructed plots. Some students also seemed to use the pictures in the *Exploratory Mission* as inspiration for extended writing:

There's fire in the sky if you look up you can see the celebration of whatever you feel like celebrating. It feels good inside and all your troubles fall behind. When the noises start, at first you're scared but by the end you could care less about the noises in the sky cause the color's the wonderful thing.

The Fish and the Shark
Once there was a shark and a fish and they wanted to have a race. The fish said, "I bet you all the treasure in the sea." The shark said "Go," and the shark gobbled the poor fish up and he won the race

Others did not:

Roses are red
Violets are blue
I'm writing poetry
And you should be too.

No students, however, used the space as intended to develop extended commentary on their reading. This is clearly a usage that requires teacher prompting and quite possibly valuing (some sort of grading, perhaps). Future investigations should focus on this response.

EXTENDED FINDINGS: RURAL CLASSROOMS

To explore the issue of teacher guidance and, more importantly perhaps, to see whether *Kidspace* would run smoothly in a classroom setting without the *Y Dimension* space, a second, very brief, pilot study was undertaken with classes and students who normally work on computers with one of the authors. Because the students involved were comfortable authoring in *ToolBook*, the *Exploratory Mission* space in the version of *Kidspace* employed in this pilot was also modified to let them create their own illustrations for their writings. Students were encouraged, but not forced, to use this space to write about their reading experiences. Otherwise, they were allowed to explore and use *Kidspace* as they wanted. They were introduced to the

applications in small groups during one 30-minute session, then allowed to work individually with the author. Students in the third and fourth grade classroom had one individual session each; students in the fifth and sixth grade classroom had two individual sessions each. In addition, some students used their free time to work in *Kidspace*.

As in the previous pilot, students were uniformly enthusiastic about *Kidspace*, which ran with no technical problems as reconfigured. The participant author was especially taken by the enthusiasm of several students (mostly older girls) who had previously expressed negative feelings about using computers, but could not get enough of this particular program. All students looked forward to using the application and worked diligently within it; many used their free time to work in it. This latter finding provides evidence not only that *Kidspace* is motivating but that students can use the program productively on their own.

We also found that when guided to do so, most students chose to write about their reading experiences in the *Exploratory Mission* space:

> *Lately, I have been reading a series of books. One of them is called Dunc and the Flaming Ghost. It is really funny. In fact the whole series is very funny. It's about two kids who solve mysteries. One kid, Dunc, is very neat and usually gets them involved with the mysteries. The other, Amos, is a disaster waiting to happen. Everything he does winds him up in the hospital. Especially answering the phone.*
>
> *I am reading a Hardy Boys book called The Tower Treasure. What's happened so far is that the Hardy boys were run off the road on their motorcycles by a crazy driver, and their friend Chet's car got stolen. I have no idea what's going to happen and that's what I like about Hardy boys books -- they're exciting mysteries! This is my second one and I am really looking forward to it.*
>
> *I read a comic. It was a Goose and Grim and it was funny!!!!!*
>
> *I'm reading Dealing With Dragons. It's about a stubborn princess that likes living with dragons and doesn't want to get rescued. It's very funny. She's meeting with a witch right now and learning spells. When she was little, she learned fencing, cooking, Latin, and philosophy.*
>
> *I'm reading a Boxcar Children book. It's a part of a series about some kids whose parents died and they went to live in a boxcar, but now they are living with their grandfather. Their names are Henry, Violet, Jesse, and Benny. The book I'm reading is called The Deserted Library Mystery. This one is about the Boxcar Children staying in a friend's cabin and going to an old deserted library which has pieces of an old civil war sword in it. The children are trying to put the sword together but someone is trying to stop them and get the sword for themselves.*

It is interesting to note that most students chose to write about books they were in the process of reading. Given more time, this phenomenon could perhaps be capitalized on to explore the reading experience in greater depth. Many students also illustrated their writings (See Figure 6), and all chose fonts and colors to

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match their feelings about their readings. One student related her reading to a personal experience the class had shared -- the death of a classmate -- and then went on to recommend the book to an obviously intended audience:

> *I just finished Bridge to Terabithia by Katherine Patterson. I thought it was sort of weird, but it made me remember when Dylan died. I really got into it, but it took me a few chapters. It's not my favorite of Katherine Patterson's, but I still liked it alot. I recommend it to people who like to read books that are thoughtful and don't have wonderful "Happy Day!" endings.*

Several students used the *Exploratory Mission* to explore other experiences that were meaningful to them in both text and graphics, and/or to create personally meaningful animations. These responses, elicited over a very brief period of time, suggest that *Kidspace* can be used very effectively to support reflection on reading and other experiences. In addition, several students used *Communications* to comment on other students' reading reflections, which suggests that more extended discourse could be developed. Indeed, students' regular classroom teachers were very excited about using *Kidspace* over an entire year for just that purpose. Such an extended and integrated trial is sorely needed and will be pursued.

Similar *Communications* commentary developed around students' *Cricket Village* creations, which, as in the earlier pilot were also numerous. The stories students developed in this space seemed, as previously, to be aided by reference to the drawings provided:

> *This is Mr. Blue Snail. He lives all alone in Mushroom Glen. He has lived there since he was a little boy. He has one friend. Her name is Hiding Hilda because she almost never comes out. Mr. Blue Snail is saying "Oh Dear" because he only has one apple left and winter is coming soon. But he will be okay because all the other animals will help him since he is so old.*
>
> *One day the Ladybug family were having a party in the meadow near the beach on the lake. Charles was thinking about how hungry he was. His sister Linda went to look for some food and drink.*
>
> *The cricket is called Professor B. The "B" stands for "boring". He is always thinking that the happy, frivolous bugs are weird. He's really a jerk. The cricket that is saying "Wwhoooo!!" is Professor B's sister. She has a long history of sibling rivalry.*
>
> *Once upon a time in a spooky forest, I mean a swamp, there was a fat little green bug. He was walking through the forest when all of a sudden there was a ghost gang all around him. He was so scared that his antennae got screwed.*

As with their writings about their reading experiences, some students seemed to personalize their *Cricket Village* writings:

> *Me and some of my classmates went for a walk one day and I found this great meadow. Now we go there all the time for picnics and we call it Maera's Meadow.*

Once upon a time, there was a poor little cricket. Everywhere he went people rejected, hated him. He was sad as anyone would be with that kind of treatment, and played the Blues on his clarinet every night. Oh, how that little cricket hated his life. He had no friends, no family. And yet he felt happy when he played the Blues. He had a warm and cozy little hut overlooking the village in which he lived. But his only faith was in God; Christianity his only hope for love.

As previously stated, students in both classes in the rural school used the *Communications* space, as intended, to comment on their classmates' work. As in the previous pilot, they also used it for personal communications, in one striking instance, developing an extended conversation about interpersonal relationships in the classroom. In another instance, some younger boys used *Communications* to develop a fantasy conversation using the outer space metaphor developed in *Kidspace*'s opening frames. These results suggest that the space could be used to develop ongoing conversations more focused on literary understanding.

Finally, some students in both classes in the rural school used the *Captain's Log* as a personal journal. While none of them used it to write about reading experiences, such a finding suggests that students could be encouraged to so. Indeed, all students asked that "secret passwords" to protect their journals be developed, suggesting that greater usage might be made of the *Captain's Log* if they knew it was absolutely secure.

DEVELOPMENT & PILOTING OF *THE BEATS*

Figure 9: Main Menu

The Beats (Figure 9) is an open-ended *ToolBook* program which is centered on the texts of the works of Jack Kerouac, Allen Ginsberg, William Burroughs, and Lawrence Ferlinghetti. It was designed to incorporate the use of a *Rhino Word Beat* (1994) boxed set of three audio CDs entitled *The Beat Generation* which contains recordings of these authors reading some of their works, jazz, period radio interviews and much more. *The Beats* also includes hypertext background materials and pictures. More importantly, *the Beats* contains generic tools designed to support student (and teacher) discourse and reflection about literary works.

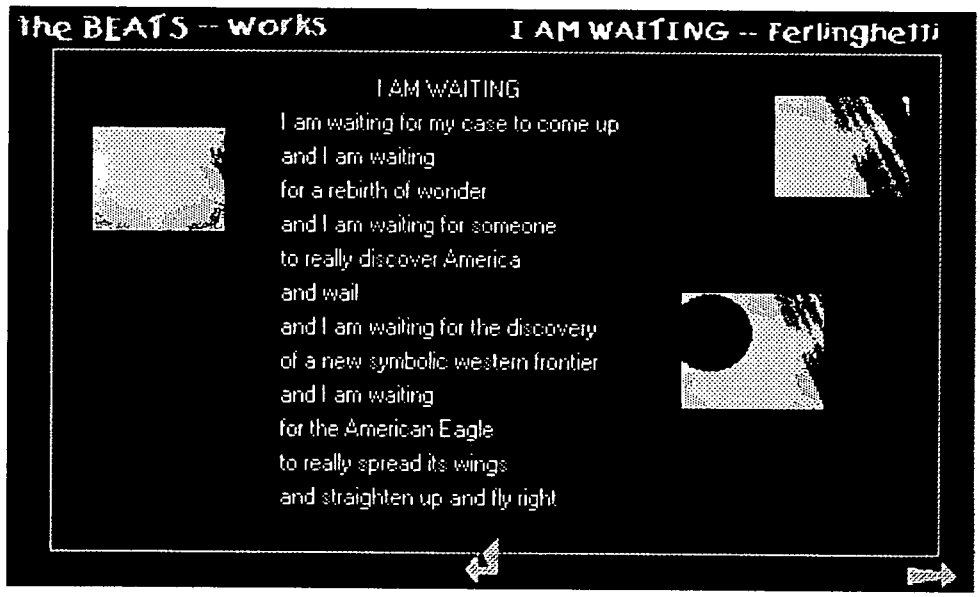

Figure 10: "I Am Waiting" by Lawrence Ferlinghetti

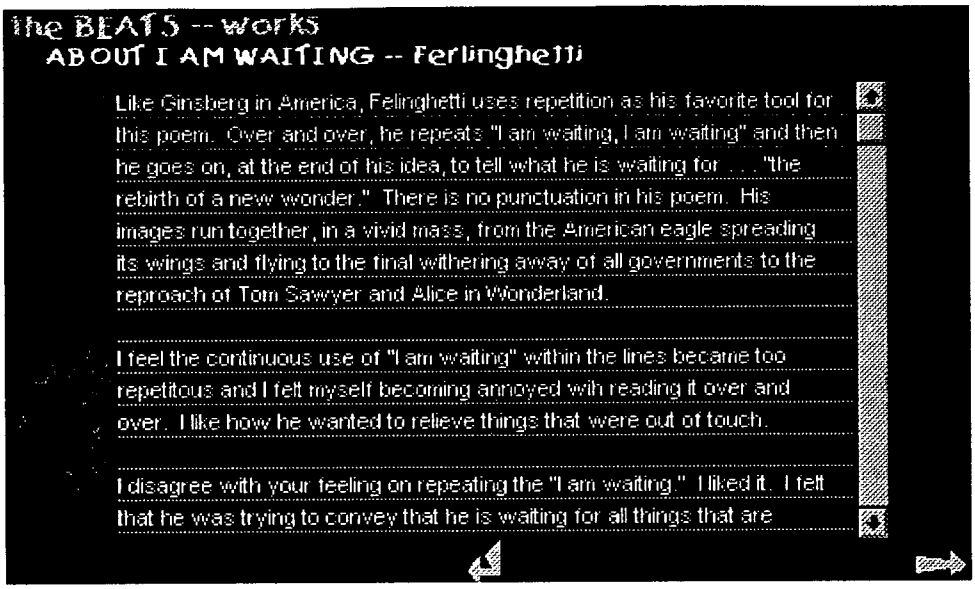

Figure 11: Discourse Pages for "I Am Waiting"

The Beats is a hypermedia environment in which students can explore the lives and works of the Beat writers and develop personal and collaborative meanings about them. Central to it are the works themselves (Figure 10). These can be accessed either by author or by title and consist of either the complete texts or extended excerpts. In many cases, the user can choose to hear the work read by its author, and most pages also contain illustrations and/or animations. In addition, linked to every work is a three-page discourse area (Figure 11) where students and teachers can leave their general comments and/or questions about it.

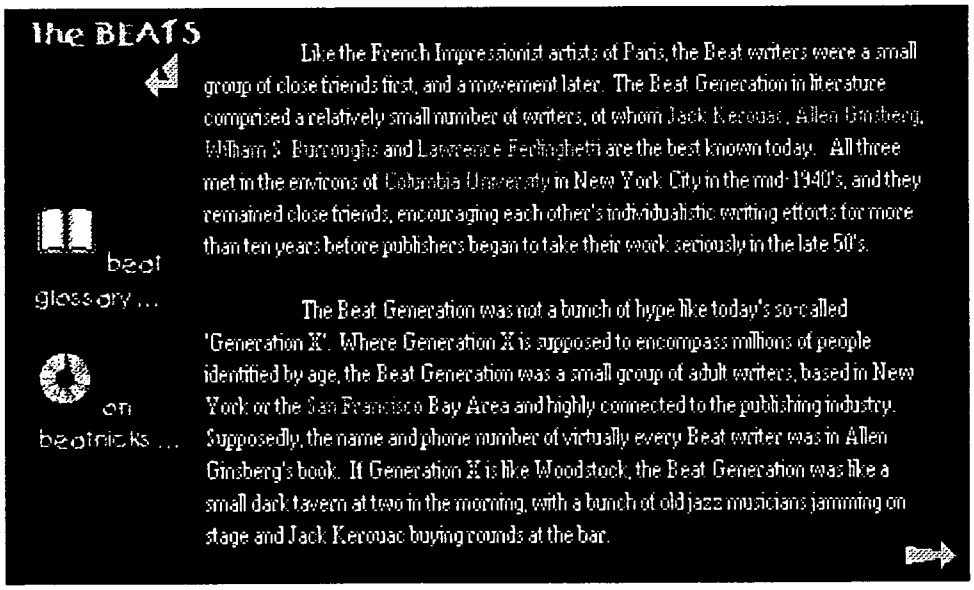

Figure 12: Background Material from *the BEATS*

Surrounding these central texts is a variety of background information presented in words, pictures, and sounds (Figure 12). *The Beats* contains a biography (Figure 13) for every author represented, as well as descriptions of many of the places that figured prominently in the history of the Beat movement (Figure 14). The program also contains period newspaper articles and radio interviews, musical selections, photos, and a glossary of beat terms. All background information contains hypertext links to other information and/or the literary works themselves, and buttons through which photos and cuts from the audio CDs can be accessed. Global and local navigational tools are provided in the top and bottom margins of all pages.

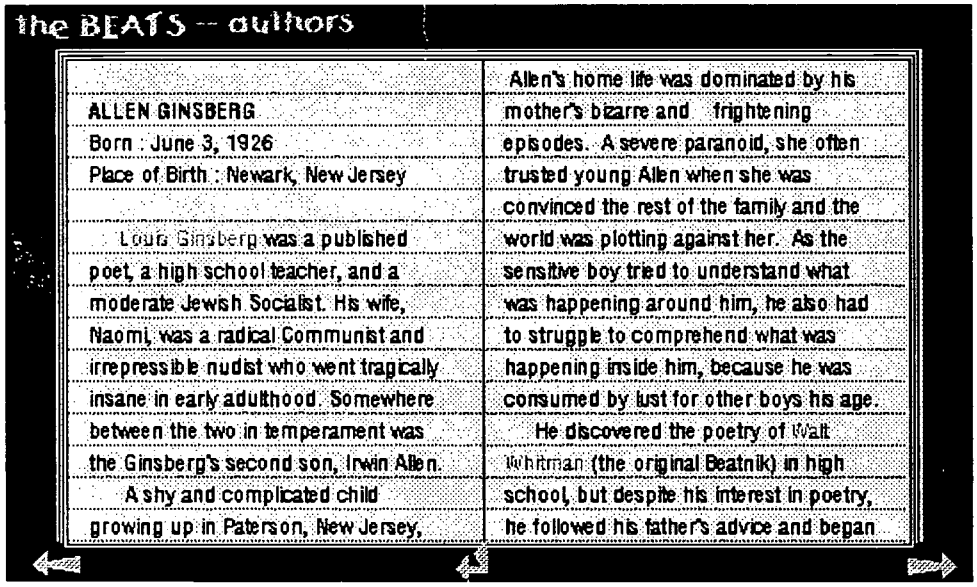

Figure 13: Allen Ginsberg Biography

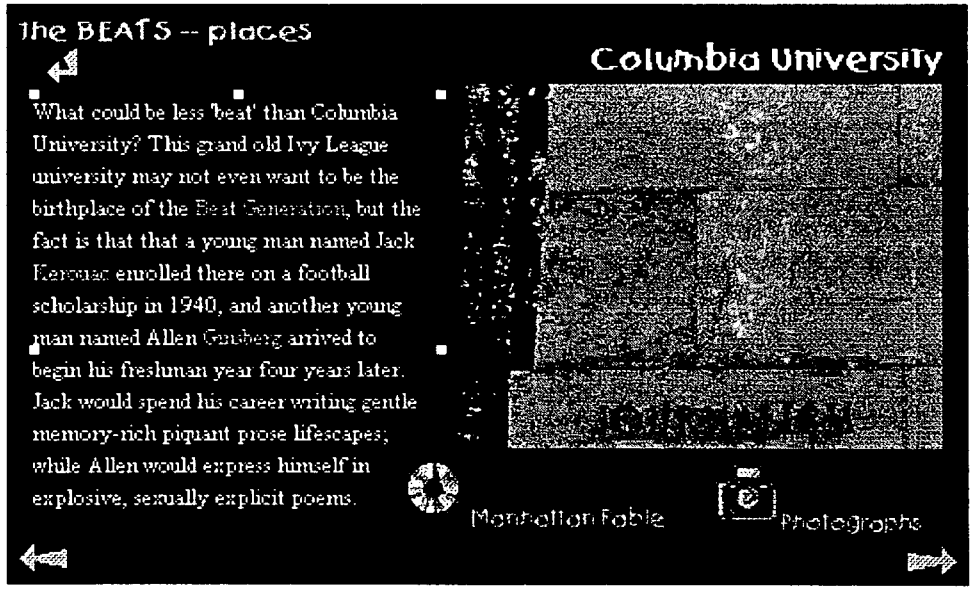

Figure 14: Background Information on Columbia University

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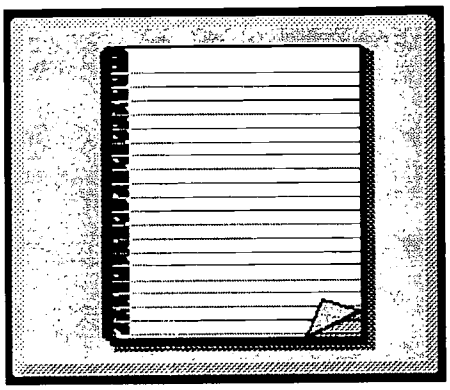
Most importantly, *the Beats* contains a set of response-based tools which are found on a toolbar accessible through a right button click from any page in the program. Clicking on a button (shown below) on the toolbar, activates the corresponding tool. These are of four types:



The ***Personal Notes Tool*** allows students to link the literary texts found in *the Beats* to writings in a personal journal. It links every page in the main program to a similarly numbered page in a separate toolbook for each student. Each can access their "private journal" (Figure 15)," which also contains a hot index, by clicking on the Personal Notes tool on the toolbar. All pages in the journal can be copied and/or printed.

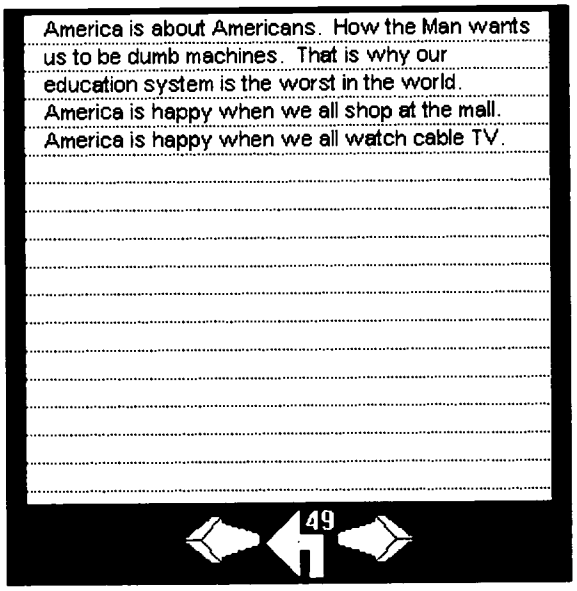
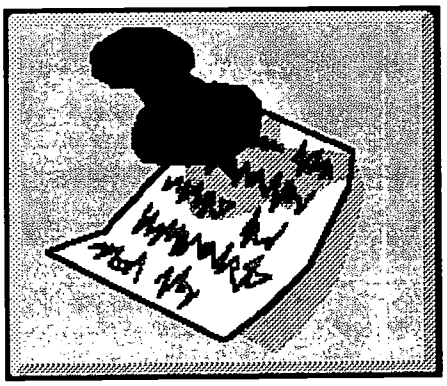


Figure 15: Page from a Personal Journal

The *Notes Tool* allows students to drop buttons in the margins of a page in the Beats to annotate text (Figure 16). These buttons pop-up scrolling text fields which anyone can read and/or write in. *Notes* is a tool designed to support public discourse about particular elements of literary works. The spaces it creates hold reflective conversations among students and teachers across time but linked to specific text.



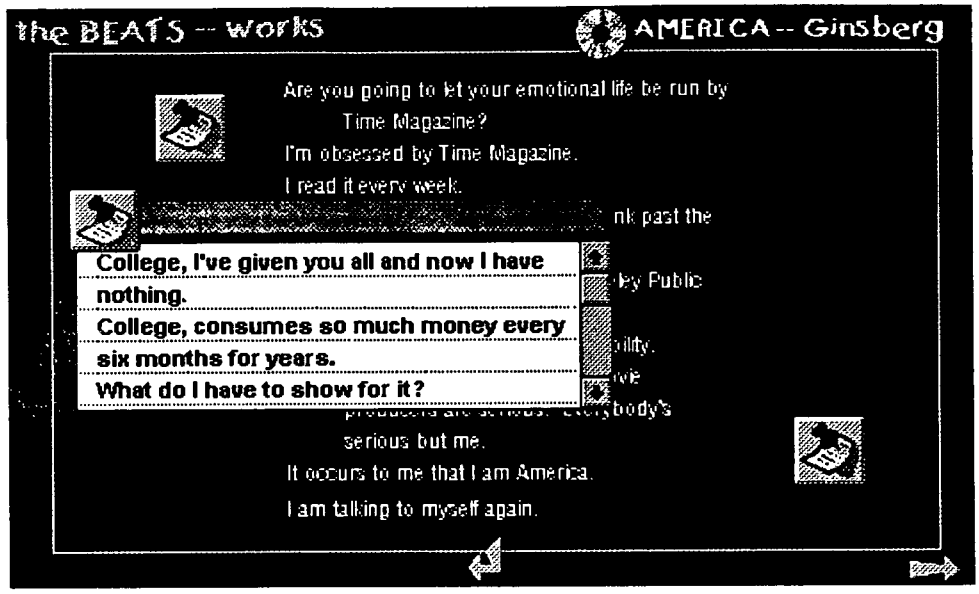
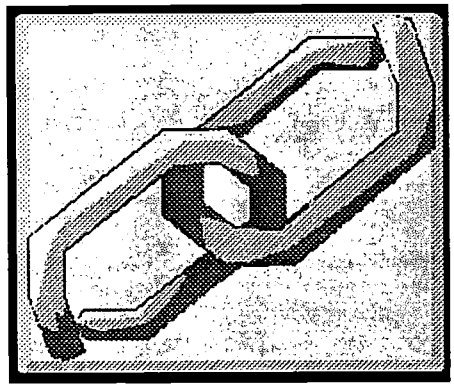


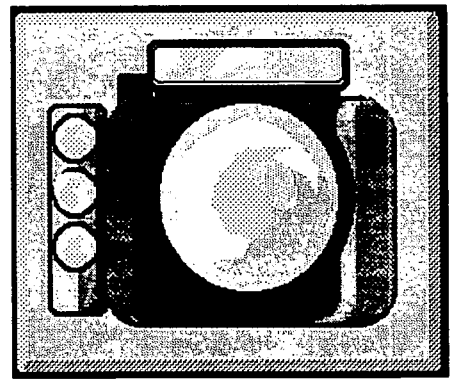
Figure 16: ***Notes*** **buttons on a page from "America"**

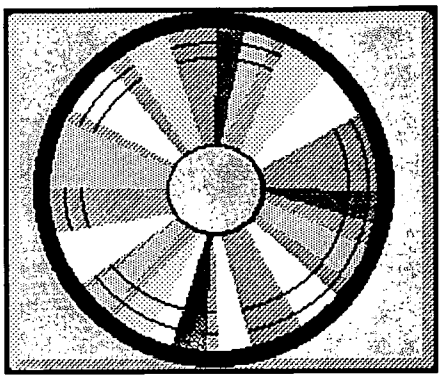


Media Tools allow students to link photographs and audio clips to text.

Clicking on the ***photography tool*** allows students to choose from over one hundred photographs of people, places, and things related to the readings, and to place an icon in the margins of a work through which that photo can be accessed.

The ***Links Tool*** supports student creation of links between any of the pages in *the Beats*. Clicking on the *Links* icon on the toolbar pops up a dialog box in which students are asked to name the relationship they see between the two items they are linking. The program then adds that name to a *Links* button, which the student can place anywhere on the page, and asks him or her to go to the page he or she wants to link to. On that page the student similarly positions a return link.





The ***audio tool*** similarly lets students select audio clips from the three audio CDs it incorporates (Figure 17) and place icons in the margins of the application through which they can be played.

Figure 17: Audio Tool

These four tools were specifically developed to support response-based teaching and learning in ways we felt made the best use of the unique characteristics of the computing medium. Table 10 outlines the ways in which these tools instantiate the response-based criteria concerning knowledge and the roles of text, students, and teachers developed in the first phase of the "Multimedia and Literature Teaching and Learning" project. Table 11 highlights the response-based features instantiated in the tools and pages of *the Beats*. It shows that all of the features identified as supportive of response-based literature teaching and learning in the first phase of the project can be found in the program.

	What counts as knowledge	Role of the text	Role of the students	Role of the teacher
Personal Notes	Personal knowledge is developed through reflection on works and student's own and other's reflections.	Text is presented as a vehicle for developing private meanings and literary understanding.	Students' personal responses and interpretations are valued and protected.	The teacher is cast as off-line guide, facilitator, responder and supporter of student explorations.
Notes	Knowledge about the works as well as self-knowledge and knowledge about the world is personally and collaboratively constructed around the texts.	Students respond to texts which are cast as catalysts for discourse and the development of meanings and literary understanding.	Students are encouraged to respond to texts in a variety of media and to collaboratively develop meanings around them.	The teacher is cast as both on and off-line collaborator and facilitator in the processes of meaning making through reflective discourse.
Links	Knowledge is recursively developed through explorations of interpretive threads which give meaning to the works.	Students link images and literary devices within and among texts and background information to develop defensible interpretations	Students are encouraged to discover and explore links between various materials found in and around *the Beats*.	The teacher is cast as both on and off-line collaborator and facilitator in the processes of meaning making through reflective discourse.
Media Tools	Knowledge is personally and collaboratively constructed around the texts through visual and aural annotations.	Students reflectively respond to texts with visual and aural media; texts are cast in the role of catalysts for affective response.	Students are encouraged to respond to texts and to develop and defend their own interpretations.	The teacher is cast as off-line guide, facilitator, responder and supporter of student explorations.

Table 10
Tools in *the Beats* in Relationship to Response-based Criteria

	persnl. notes	notes	links	media tools	texts	disc. pages	bkgrd. info.	audio tracks	photo file
transparent format	*	*	*	*	*	*	*	*	*
intertextuality & juxtaposition	*	*	*	*	*	*	*	*	*
facility to share responses		*	*	*	*	*	*		
support for non-text responses				*	*	*	*	*	*
facility to make links			*		*	*	*		
support for envisionment	*	*	*	*	*	*	*	*	*
access to multiple perspectives	*	*	*	*	*	*	*	*	*
support for discourse		*			*	*	*		
support for student ownership	*	*	*	*	*	*	*	*	*
provis. of background knowledge							*	*	*
facility to explore author's craft	*	*	*		*	*	*		

Table 11
Response-based Features Found in Tools and Pages of *the Beats*

The Beats was designed to enhance discourse among students in ways we hoped would complement regular classroom conversations. In particular we hoped it would:

1. Support the voices of reticent students,
2. Encourage more reflective conversations,
3. Free discourse from time constraints,
4. Encourage discourse by providing concrete representations of conversations, and
5. Encourage the linking of ideas and interpretations to text by providing concrete representations for such links.

PILOT STUDY

The Beats, then, was specifically designed to focus on the features previously identified as supportive of response-based teaching and learning. Our goal in pilot testing the program was similarly focused on the capacity of such features to ellicit and support student responses (Meskill & Swan, 1997).

Students and Procedures

A class of twenty-six undergraduates enrolled in a creative writing course at a community college in upstate New York participated in the initial piloting of *the Beats*. The class was selected because of the availability at

that institution of appropriately equipped computers, the applicability of *the Beats* to the course syllabus, and the pedagogical orientation and willingness of its instructor. Students in the class, who were not aware of its computer-related aspects when they registered for it, ranged in age from 18 to 38, and in computer experience from novice to expert. They consisted of approximately equal numbers of men and women, about one-third of whom belonged to ethnic minorities, and were generally representative of students found in similar classes at the community college level.

The instructor, himself a practicing poet, generally adopted response-based approaches in conducting his classes. Believing that students' responses to literature need to be valued and made central to classroom processes, he worked to model effective modes of literary discourse, to facilitate and support student participation in it, and to weave student responses into a coherent, on-task stream. Typical classroom discussions focused on the forms and functions of poetry, historical contexts, and students' aesthetic and critical responses to texts. The resulting classroom dynamic was one of instructor-led exploration, with a tacit invitation to students to contribute their thoughts and ideas. With twenty-six students, however, opportunities to join whole class discussions were limited. Indeed, three more vocal students typically dominated classroom discussion.

The pilot study took place over the course of five regularly scheduled class periods. In the first session, the instructor oriented the whole class to *the Beats*, and split it into two sections so that students, who were paired for the orientation, could work individually with the program during the remainder of the pilot period. During the next four classes, students in both groups alternated between such individual work with the program and whole class discussions of the materials it covered in their regular classroom setting. Students thus used *the Beats* for two 50-minute class periods split and followed by a whole class discussion period. As the computer lab in which the study took place was not accessible to them outside of class time, each student had equal time in which to complete their online assignments. These were similar to off-line assignments given previously during the semester -- read selected works, think about the techniques used, and come to class prepared to discuss those thoughts. The only change from normal procedure was that students' thoughts were to be recorded and shared with the class via the computer.

For the first of these online sessions, students were asked to read two poems at home and record their response to them on the discourse pages associated with them in *the Beats*. They were also encouraged to respond therein to each others' comments. Student responses were printed, copied and distributed to the whole class. These printouts served as the basis for the whole class discussion that took place between the computer-based classes. During the second set of online sessions, students were asked to compose original poems in the style of the Beat poets and to enter these in *Notes* in the margins of the poems they imitated. Students then rotated

computers to read and comment on each others' compositions. Poems and comments so produced were again printed, copied and distributed to students, who discussed them during the final whole class period of the unit.

Data Collection and Analysis

The pilot study was designed to test the viability of the response-based tools and hypermedia environment of *the Beats*. To these ends, each online and corresponding off-line class was observed by a graduate student participating in the project. The project directors were also present for the initial orientation. In addition, all participating students and the instructor were interviewed at the close of the study, and questionnaires concerning their reactions to the entire process were completed by seventeen of the twenty-six participating students. The data so collected were collated, analyzed, and are presented in the following section according to the ways in which we envisioned *the Beats* supporting student discourse -- by making reticent students' voices heard, by encouraging more reflective discourse, by freeing such discourse from time constraints, by providing concrete representations of conversations, and by providing concrete representations of links to text.

FINDINGS

Both the instructor and the students' responses to *the Beats* were extremely positive. Both believed that the program and its response-based tools offered a unique and interesting environment in which to explore literature. In addition, data collected from the pilot study suggest that students' online response were both quantitatively and qualitatively different from their regular classroom responses.

These were, interestingly, consistent in approach. We found a distinct pattern in which students moved from initially responding to the forms of the poems to very personal responses relating the perceived meanings of the verses to their own lives. For the assignment, the instructor orally modeled the linking of form and meaning, something he also did regularly over the course of the semester. In their online responses, students not only followed his model, but went further in personalizing the links between form and meaning.

> *I like the use of repetition in the "I am waiting". It holds the poem together, on the one hand, and on the other, creates a kind of monotony that speaks to his point.* [form] *I think we are all waiting for the time when the world is as described in this poem. All this stuff that has happened in the past that we are supposed to believe in is kind of confusing. I would like to see all of it happen again. And for the stuff that needs to happen for peace, it would be great if we could wake up one day to a peaceful world.* [meaning]
>
> *I get the point that this person is waiting for things that may or may not happen. Although I found the line breaks and repetition useful in understanding the poem, I also found it boring.* [form] *I think the author should stop "waiting" and start doing.* [meaning]
>
> *I really like the line "America I have given you all and now I am nothing"* [form] *It reminds me of us paying taxes.* [meaning]

And they carried that practice into their commenting of each others' poems.

> *Very vivid imagery. I like the use of repetition* [form] *I do admit that the maggot part did displace me slightly.* [meaning]
>
> *Your description was very vivid.* [form] *It leaves me imagining that place, that feeling* [meaning]
>
> *I like the way you related the schoolbus to aspects of the whole school day.* [form] *It is easy to relate to and I thought it was strong in that it uncovered the almost forgotten emotions of every bus rider.* [meaning]

In our initial pilot study of *Kidspace*, we found that the potential of multimedia to support response-based pedagogies does not guarantee it will be so used. In our initial pilot study of *the Beats*, the program was thoughtfully integrated into an existing curricular stream by a talented instructor. Although the pilot was limited in scope by the availability of computers, good evidence for the capability of response-based programs like *the Beats* to support similar pedagogies was obtained.

Supporting the Voices of Reticent Students

While in-class discussion affords opportunity for the growth of ideas through immediate interchange, online discourse allows expanded opportunity to make one's views public. It gives all students, not just those who are more aggressive or verbally talented, the chance to participate. Whereas during regular class discussions of the selections, only eight of the twenty-six students ever actively participated, every student wrote online responses to each of the selections. Similarly, only one student's poem was discussed during the regular class period whereas all students had the opportunity to give and receive comments on each others' poems online.

The instructor was especially enthusiastic about this aspect of the software program, stating that those who were less inclined to make what he described as "intelligent contributions" to class discussions wrote more freely than they would have otherwise. He described this "free" aspect of the quieter students' online responses as tending to "spice things up" in the online exchange of ideas:

> *The way he puts you inside the mind of a person on the edge of a nervous breakdown is pretty far out -- but he always seems like the "baby Beat" to me, sort of a tagalong.*
>
> *He undressed America and in her nakedness he said, "Put some clothes on before someone sees you."*
>
> *This particular poem reads as if it should be narrated by a wino -- pointless points with occasional interruptions by some cognitive perspective about "the real world."*
>
> *Too cool, I think it's really cool that someone that bright and streetwise manages to keep a sense of humor and a sense of joy about this whole mess.*

The instructor continually told students how delighted he was with the quality and quantity of their responses as well as with the variety of opinions expressed. Having a written record of responses also served a valuable function in that the instructor skillfully used the printouts of these as the basis for a more focused classroom discussion of the ideas they contained.

Most students were equally enthusiastic about this feature of *the Beats*. Indeed, students who stated that they never participated in regular class discussions said they would rather work only online, indicating their appreciation for the tools that helped them express themselves, and a majority of the students interviewed stated that they found the online experience a "freeing" one. Several students believed they were more honest in expressing their thoughts and ideas in this way. Only one student stated that he would prefer only in-class discussion. Most students said they would like classes to consist of both online and in-class work.

Encouraging More Reflective Conversations

In response to questions concerning their thoughts and experiences using *the Beats*, and in their actual online responses, it was clear that this group of students was equipped with the conceptual and linguistic skills needed to articulate their reactions to literary works. Online responses reflect a mode of discourse that is personal, reflective, and far more focused and extensive than would be conceivable in fast-paced, multiparticipant conversation, indicating that online work gave many students an opportunity for reflective self-expression not available in the literature classroom.

On the other hand, an advantage of classroom discourse is that the instructor can guide students to a greater depth of inquiry -- keeping students on track while moving through what he or she deems critical considerations in understanding literary works. The observer noted that the level of discourse on the computer was not as critical nor as deep as it was in class for those (a small minority) who consistently participated in regular class discussions. The instructor's questions, responses, and leadership in classroom discussions explored at greater depth the poets' techniques and made more connections between the Beat authors and other contemporary writers. However, the observer also thought that had the entire class (including the instructor) had more time to use the program, it might have been used to similar effect.

The instructor himself thought that student exchanges were, for the most part, reflective, and believed they would have been even more so had there been more time for them to work on the computers. Most of the students interviewed felt that the program helped them to write more reflexively, stating that they could "write our first thoughts, read the poem again, and go back and see things we didn't see before." They also thought that being directly privy to a fuller range of viewpoints and perspectives encouraged a more reflective attitude.

really makes the poem flow and kept me wanting to read more to find out what else he could be waiting for.

The unsolicited development of such connections suggests that the *Links* tool might be very well utilized. It remains to be seen, however, whether or not the *Links* and *Media* tools might encourage even greater and more in depth explorations of commonalties and differences in the texts.

DISCUSSION

The results of our survey of commercially available hypermedia literature applications revealed that while such programs are generally of high technical quality and linked to works commonly taught in schools, the pedagogical approaches taken are not response-based. Programs designed for elementary students commonly equated literature education with reading instruction; programs designed for high school populations generally adopted a traditional, text-centered approach.

What was conspicuously absent from commercial applications at both levels was support for student responses. We therefore created two prototype applications, *Kidspace*, for students in grades one through six, and *the Beats*, for high school and college students, whose primary focus was to provide explicit online support for student responses to text. Our preliminary pilot testing of these applications suggests that they can uniquely enhance response-based teaching and learning given complementary instructional and technological environments.

Judith Langer (1990) breaks literary understanding into four stances people take when engaged in the reading process -- being out and stepping in, being in and moving through, stepping out and rethinking what one knows, stepping back and objectifying the experience. Ideally, hypermedia literature applications should support each of these stances. One way to summarize our findings concerning multimedia and literature teaching and learning is to examine the features of hypermedia, both currently commercially employed and potentially available (as demonstrated in the pilots), with respect to each stance. This is done in the sections which follow.

Being Out and Stepping In

In this stance, readers make initial contacts with the genre, content, structure, and language of the text by using prior knowledge and surface features of the text to get sufficient information to begin to build an envisionment. With literature, readers try to make initial acquaintance with the characters, plot, and setting, and how they interrelate. They use information from the text in concert with their background knowledge to get enough information to "step in."

This first stance, then, involves readers being drawn into the text world, and it is where the hypermedia literature applications currently commercially available are strongest. They invite access. Interactive graphics, sound, and video not only engage students in ways text alone cannot, but offer alternative, concrete representations of characters, plot, and setting that bring these in focus for students who might otherwise struggle to envision them. In addition, nonlinear links to background information concerning these and such literary elements as genre, structure, and language increase understanding and accessibility.

Indeed, evaluators who observed students using commercial hypermedia programs were very impressed by its power to draw students into a literary work. They report that the use of such features as interactive pages and links to video enactments of text passages encouraged an exploratory approach to literature. Many also found that the use of such programs generated interest in and enthusiasm for the print versions of the works they explored; that students were not only interested in comparing print with hypermedia versions of a work as they used the latter, but that they searched out these other works by the same authors on their own time.

In our pilot studies of both *Kidspace* and *the Beats*, we were consistently impressed by the capacity of even our homemade hypermedia to draw students into the exploration of literature. Indeed, the response-based features of the prototypes we designed seemed particularly effective in this regard. Students (and teachers) who had previously expressed little or no interest in multimedia, were very enthusiastic about the use of *Kidspace* and *the Beats*. The result suggests that support for online student responses can be highly motivating as well as pedagogically sound.

Being In and Moving Through

In this stance, readers are immersed in the text world, using both text knowledge and background knowledge to develop meaning. They take new information and immediately use it to go beyond what they already understand, asking questions about motivation, causality, and implications. This stance, then, involves immersion in the text world; hence, it is an arena where a printed text is probably superior to hypermedia.

Indeed, in general, the hypermedia literature programs currently commercially available are weak on this stance. They make little or no provision for students to develop meanings around texts. Many high school applications have a "notes" feature which provides a space where students or teachers can write comments or questions, but these are not linked to the text and often not even linked to a particular "page" in a document. Elementary school applications do not even provide space for "notes." Another feature that might be considered useful is the open-ended questions integrated into some programs. These prompt off-line student comments and reflections on the text, but both the fact that student answers are completed off-line and the fact that neither students nor teachers can enter their own questions tends to devalue such responses.

In this stance, hypermedia programs might best serve functions similar to reading journals; that is, students might read from a printed text but link comments and questions to text in hypermedia environments as they occur to them. Such usage will have to wait, of course, until student access to computers improves. Until that time, students might write comments and questions in reading journals and transfer them to hypermedia applications when they are available. The use of hypermedia applications would then have an advantage over

written reading journals to the extent that they encourage the linking of comments and questions to the text, and to the extent that they promote reflective public discourse around such links.

The pilot testing of our prototype applications, *the Beats* in particular, suggests that response-based hypermedia can indeed do both. All students in the class linked comments to texts in *the Beats* and many began online conversations about them. Even more intriguing, in this pilot, was the way the instructor used print-outs of these online responses to spark regular class discussion. Such usage suggests a way we had not imagined in which hypermedia can be used to help students develop meaning about texts. It certainly deserves further investigation.

Being In and Stepping Out

In this stance, readers use their text knowledge to reflect on personal knowledge. They use what they read in text to reflect on their own lives, on the lives of others, or on the human condition. Whereas the previous stance was primarily concerned with shared text knowledge and discourse around it, this stance is primarily concerned with private knowledge and personal reflections. Ideally, hypermedia literature applications should provide both public "discourse" spaces where students can question and comment on the text as well as reflect on others' observations; and private "journal" spaces where they can reflect on their own understandings without worrying about others' opinions of these. None of the commercial programs we reviewed did so. The creation of such spaces thus became a major focus of the design of the prototypes.

Our pilot testing of the prototypes indicates that this stance can be very much enhanced by appropriate use of hypermedia. Both the elementary and community college students with whom we worked used them to develop personal meanings from texts, and did so with little encouragement, beyond our expectations. The instructor who used *the Beats* with his class was above all amazed and delighted at the range and personalized nature of his students' responses, which typically began with initial comments concerning the forms of the poems and moved to very personal responses relating the perceived meanings of the verses to their own lives. Elementary students also found hypermedia a safe environment for exploring personal meanings. This was well expressed by a second grader who, when asked what she would like to do with the computer if she could do whatever she wanted, wrote;

> *I would go inside the computer and live inside one of my stories.*

Stepping Back and Objectifying the Experience

In this stance, readers distance themselves from the text world, reflecting on and reacting to both the content and the experience. They objectify the text, judge it, and relate it to other texts or experiences. This evaluation

and generalization is based on their notions of the specific genres as well as the content covered or the literary experiences they have.

This stance is one in which readers relate the text to other texts and other experiences. Here, then, the ideal functions for hypermedia to provide would be linking mechanisms similar to those imagined by Vannevar Bush (1945) and described by Ted Nelson (1974, 1987) when he coined the term *hypermedia* -- links that readers could create between what they were reading and other literary texts and other media, links that could be annotated with text and graphics, perhaps even sound and video. Other useful tools might be ones for plotting such literary elements as story lines, themes, characters, setting, and imagery. None of the applications we reviewed had such tools, and we do not quite have such capabilities yet. But experimental environments such as *Intermedia* (Landow, 1992) and *Story Space* (Bolter, 1991), and most especially the exponential growth of the World Wide Web, indicate such capabilities are at our doorstep. Preliminary results from the pilots showing tentative linking of texts suggest they would be well used.

As schools see more and more students coming to the learning process equipped with skills and predispositions for electronic communications, it becomes clear that issues surrounding such new media need to be addressed. For example, the assumption that ways of knowing, using, and understanding text are a consequence of print-based literacy may need to be reconsidered. The findings of the "Multimedia and Literature Teaching and Learning" project suggest that electronic media support unique and important forms of meaning making that need to be included into a necessarily broadening view of literature study. Thus, while there is without question a need to design and test hypermedia applications that are based on pedagogical theory (Jacobson, 1994), we believe there is also a need to re-examine pedagogical theory in light of new media. Our studies also made it clear to us that there is an overwhelming need to carefully examine the social and philosophical contexts in which new media are used. Our future work will explore such directions.

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