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ABSTRACT

A pilot study describes the prototype design and classroom implementation of "Kid's Space," a response-based multimedia application for literature teaching and learning. "Kid's Space" was designed around the metaphor of a universe populated by the individual student's world. 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 work and others' work. Two classrooms each from an urban Montessori school (a combined first-second grade and a combined third-fourth grade) and a suburban elementary school (a combined second-third grade and a fifth grade) were chosen. Teachers in all four participating classes used a whole language approach to teaching and learning reading that relied exclusively on children's literature. All teachers classified themselves as "computer literate." Results indicated that (1) technical concerns hampered implementation of "Kid's Space"; (2) students in all 4 classrooms were motivated by "Kid's Space"; (3) not all teachers used "Kid's Space" as intended; (4) teachers' perceptions of the "Kid's Space" activities differed in terms of how those activities were understood and instantiated; and (5) students did not use several of the sections of "Kid's Space" as intended. Findings suggest that, given the right conditions, children write creatively in response to visual and auditory stimuli as well as to each other, and effective methods of integrating and valuing on-line work are essential for the software to be used by students as intended. (Contains 21 references, and 3 tables and 8 figures of data.) (RS)

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Response-based Multimedia and the Culture of the Classroom: A Pilot Study of *Kid's Space* in Four Elementary Classrooms

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BACKGROUND

The popularity of multimedia/hypermedia technology is on the rise. In our schools, the installed base of computer hardware with audio-visual capabilities is rapidly growing. Teachers and students can now interact with more than just text and simple graphics on the computer screen; they can see, hear, and manipulate integrated media. Multimedia, however, is a relatively new technology. As such, there are many questions regarding how such software and the contexts in which it is used can best capitalize on its features to support student learning. Serious investigation of the match and mismatch of system features with what is currently understood about teaching and learning is essential if these technologies are to serve instruction effectively. In the case of response-based literature teaching and learning, it is not only important to consider how software features might complement response-based approaches, but also to examine the actual and potential role of multimedia in school contexts. As the findings of this pilot study will show, the sociophysical and curricular contexts in which a medium is utilized can be the most critical factors in determining its usefulness.

Response-based theorists regard readers as active meaning makers whose personal experiences affect their interpretations of literature (Bleich, 1978; Holland, 1975; Iser, 1978; Langer, 1991a; Tompkins, 1980). 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.

Response-based approaches to literature teaching and learning stand in stark contrast to traditional, teacher-as-interpreter approaches to literature teaching. 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). 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 pedagogies 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 are viewed as both socially and personally mediated.

There are several reasons to believe multimedia might provide a promising enhancement to text for supporting response-based pedagogies. Multimedia/hypermedia technology 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). Multimedia-hypermedia is frequently used to instantiate constructionist views of learning (Papert, 1993) and to support cognitive flexibility theory (Spiro & Jehng, 1990; Jacobsen & Spiro, 1995), which share with response-based approaches such basic notions as student construction of knowledge and the valuing of multiple perspectives, respectively. In addition, multimedia/hypermedia can make accessible the extensive amount of information from which multiple meanings and interpretations evolve (Duffy & Knuth, 1992). Finally, the use of multimedia 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 their 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.

Commercial Multimedia for Literature Teaching and Learning

The National Research Center on Literature Teaching and Learning's "Multimedia and Literature Teaching and Learning" project is concerned with doing just that—with exploring the attributes of multimedia and hypermedia that support response-based practice. The project's first stage 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. In particular, 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 four criteria for specifically evaluating the content of multimedia literature applications in terms of their inherent capacity to represent and support response-based pedagogies. Grounded in response-based conceptions of knowledge, text, readers, and teachers, these include (Swan & Meskill, 1995):

> **What counts as knowledge?** This criterion is concerned with whether a program represents knowledge as constructed or static, as evolving or canonical. In this category, one is 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. Software that treats knowledge as canonical, rather than fluid, does not complement response-based approaches.
>
> **The role of the text.** This criterion is primarily concerned with the way meaning is represented in relationship to the text. In this category, one is asked to consider whether multiple meanings or interpretations are provided when such are given, and whether or not a program makes some provision for students to develop their own interpretations of a work. Applications that give meaning rather than encourage the construction of meaning do not serve the goals of response based practice.

The role of the students. This criterion considers the degree of student control over a program, whether a program contains tools for student construction, whether and how a program validates students' responses to the literary work, and whether or not a program supports student discourse. Applications that do not provide active and constructive roles for students can not be considered inherently response-based.

The role of the teacher. This criterion is concerned with whether software design validates and supports the teacher's role as one of 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. Software that does not explicitly provide roles for teachers does not inherently support response-based practice.

The above criteria were then used by twenty-five teachers/evaluators to review commercial hypermedia literature applications and their role in response-based teaching and learning, and to isolate specific features and multimedia/hypermedia tools that might support response-based teaching and learning. These latter features were reduced to eleven desiderata as follows (Meskill & Swan, 1995):

Transparent navigation. Reviewer teams found early on that if it were not clear how users moved through an application, students and teachers became easily disoriented and frustrated. On the other hand, reviewers found that overly limited navigation, however transparent, could potentially inhibit and even drown out students' and teachers' voices.

Intertextuality and juxtaposition. It developed that a desirable attribute for supporting response-based practice was some mechanism whereby a variety of media elements could be interrelated and/or juxtaposed to represent contrasts, similarities, and relationships between and among texts.

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 on-line. The medium, reviewers believed, could represent multiple threads of conversations around students' reading and writing experiences in ways that would not be possible, or at best cumbersome, in traditional paper-and-pen formats.

Facility to support non-text responses. The empowering aspect of adding visual 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 reviewers felt multimedia might nicely complement, therefore, was the use of visual and aural media to illustrate and reflect student envisionment.

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 is potentially 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.

Support for envisionment. 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.

Access to multiple perspectives. Another key tenet of response-based approaches is the open-ended nature of text as regards individual interpretation. A desirable feature for applications, then, is that no single authorial voice predominate. Instead, reviewers felt that multimedia/hypermedia technology was well suited to the provision of multiple voices.

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

Promotion of student ownership. Reviewers felt strongly that applications which represented canonized knowledge about, 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 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.

Presentation of background knowledge. One of hypermedia's strongest features is its capacity to store and display large amounts of textual, aural, and visual information. The technology is thus well suited to the provision of large stores of supporting information that can be accessed by students, as needed, to fill in gaps in their experience. As such, it can help stimulate and enhance student envisionment.

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.

When critical review criteria and response-oriented desiderata were applied to popular commercial products for literature teaching and learning, they fared 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.

In particular, on a scale of 1 to 10, average ratings on response-based criteria for the applications we reviewed were 4.69, while the same software packages averaged 7.26 on a similar set of 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," then, from a response-based perspective, fully 23 of the 45 programs we reviewed were rated as "poor," and only 5 were considered "good" to "excellent." On the other hand, from a technical point of view, only 5 applications were considered "poor," while 22 were rated as "good" to "excellent."

In terms of response-based features, 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 dialogue—was, in all but a very few cases, essentially an off-line, rather than an on-line, feature.

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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. The majority of the multimedia applications we reviewed adhered to this transmission paradigm. What was sorely missing from most of the commercial applications we reviewed was a constructive role for the learner in consort with both texts and others. In the second phase of the "Multimedia and Literature Teaching and Learning" project, we set out, therefore, to design and test multimedia tools that addressed this shortcoming. Based on the strengths, weaknesses, and potentiality we found in commercial products from a response-based perspective, we designed a prototype application, *Kid's Space* (Figure 1), for elementary students. We then piloted the application in four elementary classrooms over a two-month period. This report describes the prototype design and presents the results of these classroom pilots.

Figure 1: *Kid's Space* Title Screen

METHODOLOGY

The "Multimedia and Literature Teaching and Learning" project was instituted to explore the potential of multimedia for supporting response-based practice in literature

classrooms. Because our review of existing commercial applications revealed a serious lack of response-based features therein, most especially with respect to the critical issue of support for student reflections on, and discourse around, texts (Meskill & Swan, 1995; Swan & Meskill, 1995), the project's second phase focused on developing prototype tools and applications that provided explicit on-line support for the same. The first of these was designed for students in grades one through five. As described below, it evolved into *Kid's Space*. A second application and response-based set of tools is being developed for high school and community college students.

Kid's Space 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 five "spaces" available to students in the current version of the application. Because of the young age of its target population, we created cartoon-like formats in which students could constructively explore literary elements (narrative, dialogue, character, etc.) in simplified forms. The two designs that seemed to work best with children were retained and refined. After several iterations, a very simple, open-ended frame in which students could combine text and pre-selected graphics was created and found suitable for the creative presentation of favorite poems or stories, for reflections on off-line reading experiences, and for original creative writing. To these we added tools for on-line discourse and for private reflection, which were likewise developed and refined through formative experience. Finally, these five spaces were combined into a single application, and organizational and navigational devices and mechanisms for protecting student ownership were built in. The whole program was then again tried, evaluated, and refined to produce the version of *Kid's Space* we pilot tested in elementary classrooms, and which we describe below.

Kid's Space

Kid's Space was designed for children in the first through fifth grades. Our 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. Children could, for example, make connections between what they

created and discussed with a story the class as a whole was reading, or use the Exploratory Mission and Communications spaces to discuss individual reading experiences or shared texts. In piloting the prototype in classrooms, we naturally were interested to see whether students and teachers 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.

Kid's Space is 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.

Figure 2: *Kid's Space* Universe

The spaces in *Kid's Space* are accessed through each student's control panel (Figure 3). From this panel, one can move to any one of the five 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:

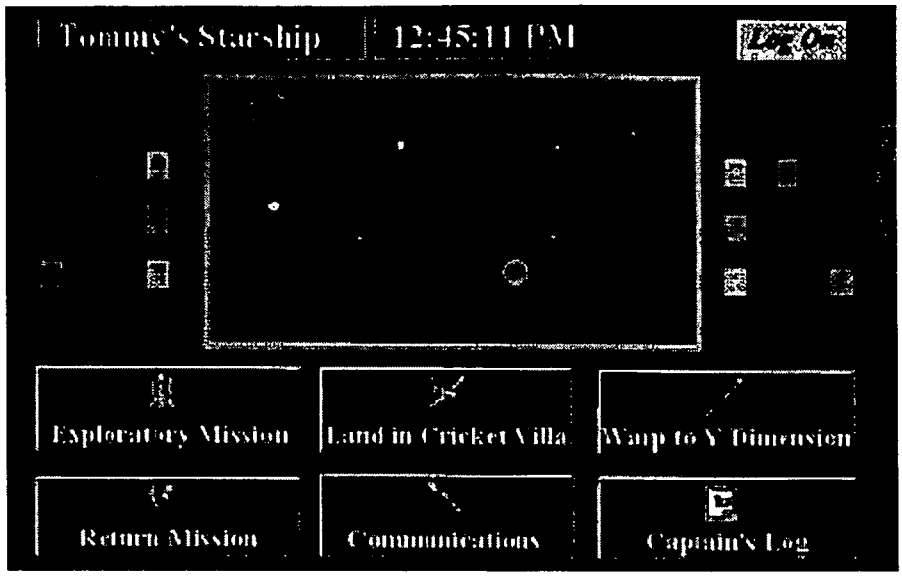

Figure 3: Control Panel

Cricket Village. Cricket Village (Figure 4) was designed as a space for students to explore narrative and narrative sequencing. 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 which students can position within a scene). Students can develop and sequence several such scenes to produce an extended narrative. 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.

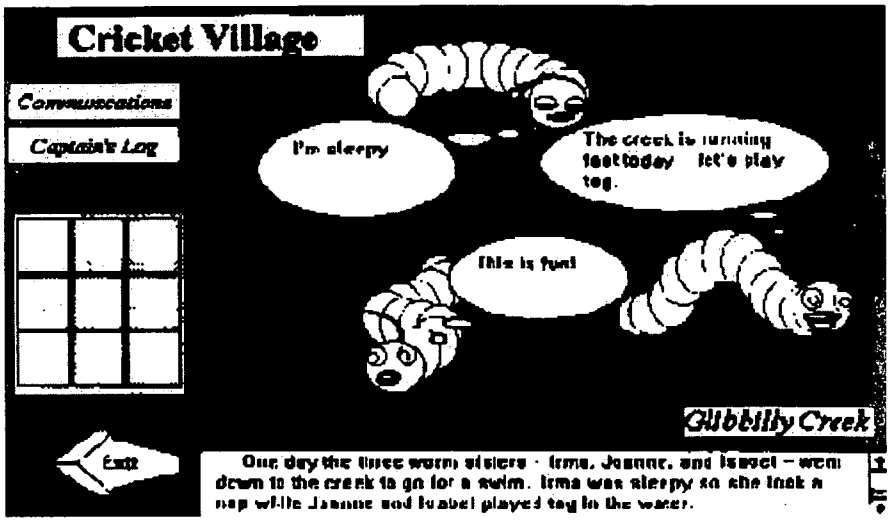

Figure 4: Cricket Village

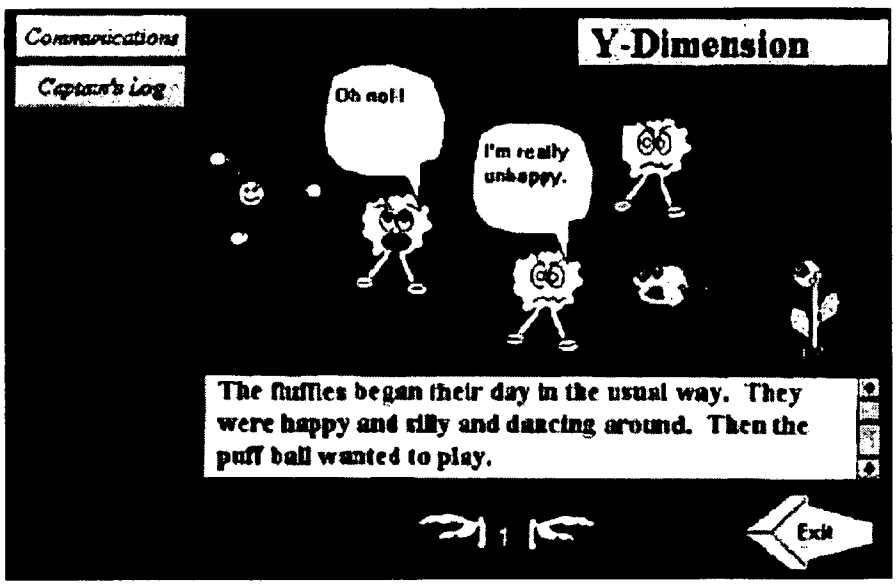

Figure 5: the Y-Dimension

Y-Dimension. The Y-Dimension (Figure 5) was designed as a space for students to explore character, dialogue, and plot development. It provides children with tools for creating their own stories by cutting, pasting, and writing dialogue (in bubbles) for ambiguous cartoon-like characters. Narrative text can also be developed in a space provided, and multiple screens created and sequenced to produce simple stories. As in Cricket Village, Communications and the Captain's Log are always available so that students (and teachers) can comment on both their own and others' Y-Dimension stories.

Exploratory Mission. Of the three constructive spaces, the Exploratory Mission (Figure 6) is the most open-ended. It provides students with an extensive set of pictures (photos and graphics) and a writing space in which they can develop an illustrated poem, story, report, or commentary. The Exploratory Mission was designed as a space where students could explore their own writing and/or develop reflections on their off-line reading experiences. As in Cricket Village and the Y-Dimension, Communications and the Captain's Log are always available so that students can comment on both their own and others' Exploratory Mission writings.

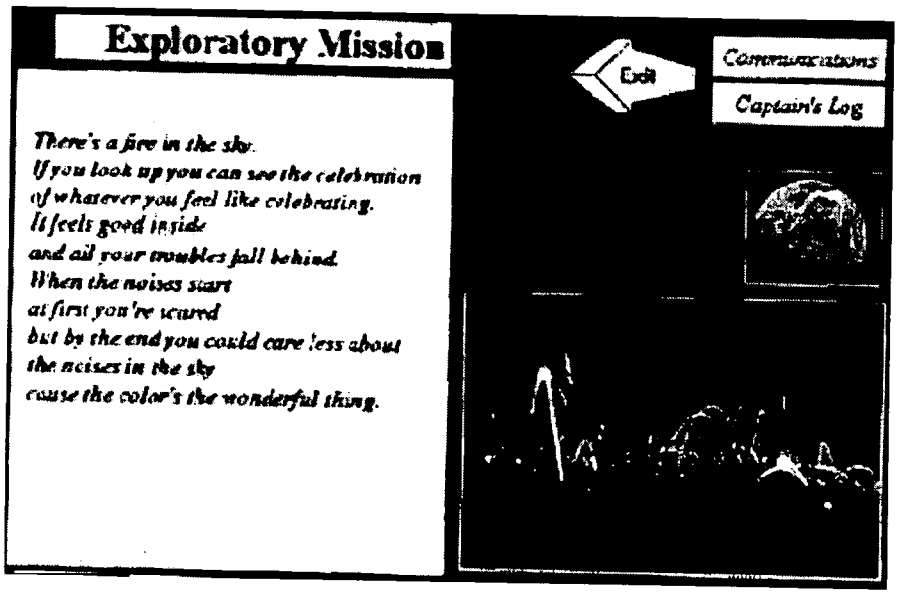

Figure 6: Exploratory Mission

Communications. 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 *Kid's Space* spaces, as well as from the control panel. Communications was designed as a space to support on-line discourse among students and teacher(s) about particular works. It can also be used by a teacher to elicit discourse about a particular work or topic. Comments recorded in Communications can also be copied into individual students' Captain's Logs should they wish to make them their own.

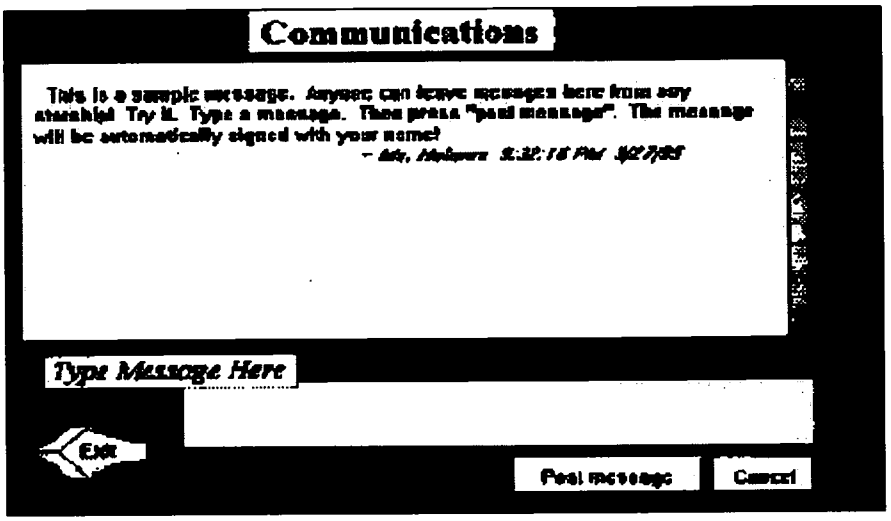

Figure 7: Communications

Captain's Log. The Captain's Log (Figure 8) is a private response space for recording reflections about one's own or others' work. Students each have their own private Captain's Log which they can access from any point in *Kid's Space* to record such responses without worrying about other students seeing them. It is thus designed to function like an on-line response journal. A teacher, however, can access all student logs. This space, therefore, can also be used by teachers to elicit particular student responses and/or for assessment purposes. Reflections recorded in the Captain's Log can also be copied into Communications if and when a student wants to make them public.

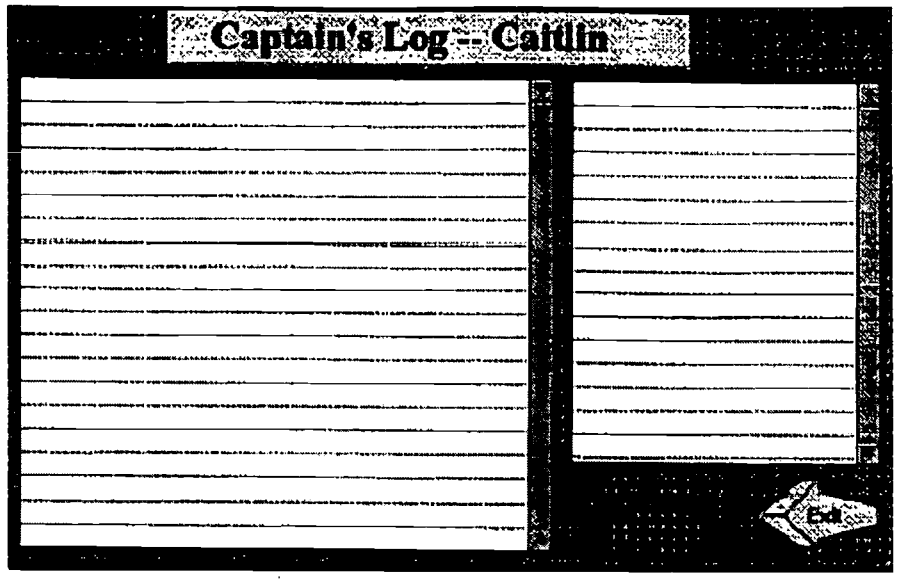

Figure 8: the Captain's Log

Kid's Space 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 these criteria are accommodated and complemented by the spaces within the *Kid's Space* application is outlined in Table 1. Table 2 summarizes the response-based features instantiated in the various *Kid's Space* 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 *Kid's Space*, and the latter could be developed in the Communications space by interested teachers and/or students.

Space	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 on-line 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 graphic and textual elements; 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 on-line and off-line conversations.
Exploratory Mission	Students represent their personal knowledge and understandings through creatively combining media.	Texts are generated by students in tandem with visual media; these can be responded to both on- and off-line.	Students are the discoverers and creators of meanings in pictures and texts.	The teacher can value and facilitate students' creative processes through on-line and off-line conversations.
Communications	Knowledge about student works is collaboratively constructed through on-line 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 of them in reflective discourse.	are cast as collaborators and facilitators in the processes of meaning making through reflective, on-line 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 of them.	Teachers are cast as facilitators of student reflections.

Table 1:

Kid's Spaces in Relationship to Response-based Criteria

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

Table 2: Response-based Features Found in *Kid's Space* Spaces

PILOT STUDY

Kid's Space, then, was designed to include features that met the response-based criteria established by the "Multimedia and Literature Teaching and Learning" project. It was also revised and refined according to laboratory trials. Because what works in the laboratory does not necessarily work in the classroom, it was determined that *Kid's Space* should also be pilot tested in actual classroom settings. Our goal in examining the prototype in actual classroom contexts was threefold:

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

Second, we wished to establish what classroom contexts might be most conducive to the use of multimedia in response-based practice.

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

The sections which follow describe the classes and students used in the pilot testing as well as the data gathering procedures.

Classes and Students

Four elementary classes participated in the piloting of *Kid's Space* over a 2½ month period. Classes were chosen to reflect varying grade levels, student populations, and learning environments from among teacher volunteers who shared a common whole language/literature-based approach to reading instruction and previous classroom experience with computers. Our goal in examining *Kid's Space* in these varied contexts was to explore the contextual elements most conducive to response-based practice involving multimedia. We looked for classrooms that already had established routines which included literature-based reading and the use of computers because we did not want the introduction of such elements to be a confounding factor in that process.

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) were selected. The student population at the Montessori school was multi-cultural, with nearly equal numbers of Caucasian, African-American, and Hispanic students, and came from working class backgrounds. Students at the suburban school were predominantly Caucasian and came from middle to upper middle class backgrounds.

The learning environment in the Montessori classrooms appeared to be in keeping with how we envisioned *Kid's Space* being integrated to best effect, both in terms of their tempero-physical aspects, and, more importantly, in terms of the epistemological beliefs and attitudes of the teachers and students. 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 our prototype response-based software. In addition, 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. As such, giving students tools to create and share their own literary understandings with their classmates seemed to fit with everyday classroom practice. The simple fact that Montessori students were allowed to use the software on a more open-ended basis for longer periods of time than in the more traditional suburban classrooms attests to this.

Indeed, in the suburban classrooms, the use of *Kid's Space* 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 and adhered to. According to their teacher, students in the fifth grade class had an extremely hard time focusing on any activities that were not teacher directed, and she, consequently, had adapted her usual classroom style to one that was extremely traditional and teacher centered. In this case, finding appropriate times for using the software was problematic as students had to be scheduled to use it during whole-class activities. In any case, actual practice in the suburban classrooms favored a knowledge transmission model of learning that we had specifically avoided in designing *Kid's Space*.

On the other hand, the teachers in all four participating classes used a whole language approach to teaching and learning 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 four teachers combined individualized reading and skills development with reading group work.

All four teachers also classified themselves as "computer literate" and had experience assigning math and language arts activities on computers in their classrooms. They all used computers for their own work and had assisted children in using educational software in class. Without exception, participating students had experience using computer-assisted math, word processing, and games on computers, both in school and out, although their prior in-school experiences with computers had been limited to Apple IIe and MacIntosh systems.

In spite of differing classroom learning environments, teachers in all classrooms welcomed the opportunity for their students to use *Kid's Space* as a complement to their work in language arts. They had all witnessed their students' enthusiasm for other kinds of computer work and wished to continue this with what they perceived as more "enhanced" software, that is, software that had colorful graphics, animation, and sound. Each teacher was also oriented to the goals and uses of *Kid's Space* as a tool with which children could create and explore their own and their classmates' understandings of literature.

Finally, because *Kid's Space* runs on a multimedia PC platform, it represented something quite unique and exciting for all these classrooms. In each classroom, both a physical space and a sense of identity had to be established for the new system. For this pilot, numerous constraints and logistical issues particular to each school, classroom, teacher, and student group had to be dealt with on an individual basis. Consequently, each classroom integrated the machine into its individual learning context quite differently. The chief determining factors were: space and physical access, noise, light, electrical outlets, and, most importantly, time during which students could use the system.

Table 3 summarizes the ways in which *Kid's Space* became integrated into the daily routines of the four classrooms. Differences between the socio-physical space, scheduling, instructions given students for using *Kid's Space*, and constraints governing its use are outlined. The four participating classrooms differed in each of these areas.

Data Gathering and Analysis

In order to determine how these ostensibly response-based activities fared with elementary children in general, and, more specifically, what the major factors were that determined how the software got integrated in actual classrooms, we collected both observational and attitudinal data.

Observational data included teacher logs, classroom observations, and student work saved in individual and collective *Kid's Space* files. Participating teachers were asked to keep a daily log recounting how *Kid's Space* was being used in their classrooms. This was supplemented by visits made to participating classrooms by graduate students participating in the "Multimedia and Literature Teaching and Learning" project, who observed students' use of *Kid's Space* 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 into their reading and writing learning experiences. Participating teachers were also interviewed during the classroom selection process on similar issues, and their attitudes recorded.

Site	Socio-Physical Context	Scheduling	Instructions	Constraints
Montessori 1st and 2nd	System brought into room on cart as one of many hands-on centers in room; children worked in mixed pairs.	Teacher scheduled pairs to work in 45-minute sessions throughout the school day.	Children were told to work in pairs to write and respond to others' work.	Time allotted each child; first graders' lack of writing skills.
Montessori 3rd and 4th	System represented an additional learning center situated next to the reading center; children worked alone and in random pairs.	Teacher scheduled individual students and, later on, pairs to use the system for 45-minute periods.	Children were directed to write stories and dialog as they wished and to examine the work of others. Communications space was to be used to express opinions.	Distractions from room noise and other students doing other things; competition for mouse and keyboard control.
Traditional 2nd and 3rd	Computer placed in the back of teacher-centered classroom that engaged in periodic small groupwork; teacher scheduled students to work individually.	Individuals worked for 20 minutes at a time whenever scheduling permitted; a timer was kept on top of the computer monitor.	Children were encour-aged to familiarize themselves with the spaces, then to compose, and finally to respond to each others' work.	Teacher-directed activities distracted individuals; time allotted was too short.
Traditional 5th grade	Computer was put in the back of a teacher-centered classroom; individuals were scheduled to use it three times per week.	Individuals worked for 20-minute periods, three times per week.	Teacher directed students to read and respond to each other's writings.	Students unaccustomed to individualized work; distraction from teacher-led activities; time allotted was too short.

Table 3:

Classroom Implementations of *Kid's Space*

FINDINGS

A major finding of the pilot study, and one that occupied a good bit of the time it covered, involved technical concerns. Although both schools were chosen for, among other considerations, the availability of personal computers, those computers turned out not to be big enough or fast enough to support *Kid's Space*. Thus, computers had to be leased for all the classrooms involved, and some time was lost in the process. In addition, *Kid's Space* itself, as originally configured, overwhelmed even these machines when used in a classroom situation by many children at one time. Thus, the graphics within the program had to be reduced (to those illustrated above), and the various spaces within it had to be configured separately for each student. We also discovered some features that might enhance its classroom utility, most notably spell checking and printing functions.

These technical problems, together with platform considerations, may indicate directions future development should take. To begin with, it is unlikely that many schools will have enough powerful computers to accommodate applications like *Kid's Space* in the near future (Becker, 1995; Swan & Meskill, 1995). In addition, different schools employ different kinds of hardware, making choice of a hardware configuration for development difficult. We believe, therefore, that it might make sense to explore use of the Internet and World Wide Web as a platform for future development efforts. Such a choice would also enable communication between classes and schools.

Although technical difficulties did, in a very real sense, limit findings from the pilot study, we were able to learn a great deal. Indeed, like the finding concerning technical limitations itself, these are very informative. Findings can be grouped as follows—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 *Kid's Space*. 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.

In fact, teachers and observers in both schools noted that, when paired, students often competed for access to the mouse and keyboard—both members of the pair being quite anxious to read and respond themselves. A contrasting pattern emerged when collaboration was framed and motivated by the teacher. In the case of the combined first and second grade Montessori classroom, the teacher found that pairing second graders with first graders was advantageous. The second graders were able to assist the first graders with reading and writing—sometimes she found first graders having some frustration as their ideas outpaced their ability to type in words and sentences. The first graders enjoyed responding to the pictures on the screen and having their thoughts and ideas typed in by the older students.

When observed and interviewed about their experiences with *Kid's Space*, participating students unanimously praised the software. The most typical response was that it was "fun." This was especially true of the traditional fourth grade class who saw the software as something different, a "treat." Several students also liked the fact that their work looked "big" and "neat" and "better than my handwriting" and that everyone could see it and read it.

When asked about the value of *Kid's Space* 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 on-line 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 for the characters with story-appropriate conversations. Although they did not create stories using sequences of the available scenes, for the most part, students used the space as designed to explore plot development, setting, characterization, and dialogue.

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, arranged, and assigned plot and character to two-dimensional cartoon characters. Again, students in only a very few instances carried stories across a sequence of frames. They did, however, generally use the space as intended—to constructively explore dialog, character, and plot development. A good percentage of students also explored and commented on each other's creations.

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. Both Cricket Village and the Y-Dimension provide an initial sense of place and identity for characters that children can use as a starting point for their creativity; the Exploratory Mission does not. The pilot study suggests that for the Exploratory Mission to be used as intended, teachers need to give students more direction in its use, and that teachers, in turn, need to be given more guidance concerning ways of integrating that use with regular classwork.

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 *Kid's Space* work. Thus, although these students were more likely to produce extended discourse, they were not about each other's, or indeed any, writing. They may have needed more prompting from their teachers. These same students, under their teachers' direction, used the Captain's Log as a composition space for writing stories. The teachers' purpose seems to have been to encourage more student writing. However, the Captain's Log, alone among the various spaces, is accessible only to individual students, inhibiting "publication" of such writing and discourse around it. The usage patterns we observed suggest that students respond well to teacher direction in the use of the spaces.

In general, then, students tended to use *Kid's Space*, especially its Cricket Village and Y-Dimension spaces, as we envisioned. The cartoon-like formats of these areas 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—the sequencing of Cricket Village and Y-Dimension frames, for example, and/or extended discourse in the Communications space—might reasonably have been expected to develop given a longer pilot period.

On the other hand, not all teachers in the participating classrooms used *Kid's Space* 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. Indeed, teacher misdirection and lack of direction may account for the fact that no student used the Captain's Log for the purposes for which it was designed. It is very likely that, at least in the near future, 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. This issue is considered more fully in the section which follows.

Classroom Contexts

While all four participating teachers had some training and experience in computer use and prior experience having students use computers in their classrooms, their perceptions of the *Kid's Space* 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 *Kid's Space* was perceived more as a result of the software than of the individual child's thinking. This was evidenced in teachers' logs, which consistently described *Kid's Space* and the machine as "doing" or "not doing" something for the children's writing, and in the ways in which they assessed its usefulness. Indeed, traditional teachers' assessment of their students' work seemed framed by a belief that the software had agency. After hours, for example, these teachers would go into each child's world to determine "how much

time [children were spending] on what, and how much they'd written," as if such quantitative measures were somehow representative of an amount of literary understanding acquired.

In contrast, in the Montessori classrooms, *Kid's Space* 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 as such, exploring with their students their responses to it, ways in which *Kid's Space* could be used, and ways in which it might be improved. These discussions were in terms of students' work, rather than about improving *Kid's Space* as an end itself.

Teachers and students in the Montessori classes also seemed more accustomed to the notion of public writing and public response to that writing. 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 other's efforts on the machine and consistently took advantage of the Communications space to write comments about it—e.g., "That was a very nice poem," "Look in the Y-Dimension for my story." Montessori teachers also used the Communications space to respond to students' comments and to encourage student writings—e.g., "I'm glad that you are really enjoying this program. Continue to use it."

In contrast, in the traditional classrooms, teachers were concerned that students working on the computer would get distracted by surrounding classroom activity, and vice versa, and so an effort was made to keep other students away from those involved with *Kid's Space*. As previously noted, teachers in the traditional classrooms reviewed their students' work and gave them no feedback about it, and students in these classrooms were less likely to explore each other's worlds. Rather than using the Communications space to comment on each other's work, they used it to communicate thoughts about the school life and life in general—e.g., "Working on this computer is better than being in class," "Want to come over after school?" It should also be noted that teachers in the traditional classrooms encouraged their students to work on extended writings in the Captain's Log, the only private space in the program.

Another cultural difference between the use of *Kid's Space* 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, in many instances

passing the keyboard back and forth between them. Montessori pairs also discussed their responses to other students' work and formulated collaborative comments about it. In contrast, students in the traditional classes seemed to be scheduled for individual time with *Kid's Space* as often as they were paired. Even when paired, these students tended to split their time at the computer into individual turns using the program. We observed several instances in these classes in which the pair member not using *Kid's Space* was totally disengaged and 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 intended use of *Kid's Space* than did the shared 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. This conception is most clearly reflected in the way the computer was physically placed—in all four classrooms, the computer was "stationized" rather than made an integral part of the learning environment. Although certainly more evident in the traditional classrooms, where there was concern that students working on the computer would get distracted by surrounding activity, in no classroom was work in *Kid's Space* related to work in the larger classroom community. In all four classrooms, work within *Kid's Space* was assessed as a separate assignment and not incorporated and valued as part of larger reading and writing activities in the classroom. While this was at least partially an effect 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 *Kid's Space* can be used to their full advantage.

Literary Understanding

Kid's Space 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 used as intended, making it difficult, if not impossible, to reach any conclusions concerning the utility of the program for supporting such development.

Nonetheless, there is some reason to believe the Communications space could support extended conversations about literature, in that students did use it: to converse, e.g.,

> *Captain's Log Stardate 4/6/95.*
>
> *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, e.g.:

> *This new* Kid's Space *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, e.g.,

> *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.*

In addition, many students were very enthusiastic about the use of Communications, often going to that area first when using *Kid's Space*. It seems reasonable that, given the right kind of encouragement from teachers and enough time, they could use it to develop

extended conversations, not only about each other's writings within the program, but about what they read both in and outside of class.

Another good indication that *Kid's Space* 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, e.g.:

> *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.*

> *One day I was walking down a hill. I saw a house. It looked locked up so I decided to go into the house. I was in the house and I saw a little man inside. He was in a little bedroom laying down. He was reading a book. It was called Sam the Minute Man. He looked like he was enjoying it. I was wondering what it was about. It was about a little boy.*

> *A couple of friends went into the woods. They all brought some instruments to play. MeMe brought a guitar. BeBe brought a flute. They played until the sun went down.*

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

> *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.

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.

These writing samples suggest that the Cricket Village scenes helped students to focus on details of setting and character in developing well-constructed plots. It would be very interesting to see what kinds of conversations about such stories they might also inspire. Future studies should focus on encouraging this sort of discussion.

Some students also seemed to use the pictures in the Exploratory Mission as inspiration for extended writing, e.g.:

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 the same.

The Y-Dimension was less well used for written expression. In this space, students were preoccupied with creating cartoons by cutting and pasting characters and dialog bubbles. They did, however, spend a good deal of time doing so, indicating that the space was engaging, and some writing resulted, e.g.:

The grumpies sent the wind over to ruin the fluffies day. The grumpies hate the fluffies.

While it is difficult to evaluate visual expression, making it somewhat difficult to assess student work in this area, it seems that students generally failed to develop the hoped-for characterizations and plot in the Y-Dimension. The use of this space, therefore, needs to be reevaluated. Perhaps it should be excluded from future versions of *Kid's Space* to allow students more time in the other spaces.

Because the Captain's Log was in no instance used as intended, its utility could not be assessed. Future studies should consider making the purposes of this space clearer to teachers and students alike.

Prospects

The results of this brief pilot indicate that:

1) Given the right conditions, children write creatively in response to visual and auditory stimuli as well as to each other, and

2) Effective methods of integrating and valuing on-line work are essential for the software to be used by students as intended.

A teacher's orientation to and incorporation of any technology is paramount to successful integration and ultimate usage. Software and hardware are not stand-alone entities. They cannot solve problems. One indication of this pilot is that there may be a potential for promoting teacher reflection on practice: for example, reconsideration of the role of student-student communication around texts may take place in the course of adaptation and integration of response-based computer tools. Technology can serve as an excellent catalyst for teachers to reexamine the issues of the role of the text, the teacher, and the student in their language arts practices. The introduction of technology may thus provide a nudge in the direction of thinking critically about what one does and might do differently to facilitate communication in reading and writing activities. By considering the intended role and purpose of response-based software, teachers can come to understand how discourse can impact understandings, both personal and through interaction with peers. Understanding that the computer can be used to mediate and even encourage that discourse is a plus. Certainly, participating students experienced a form of high-tech validation of their creativity as well as of their responses to others' creativity.

For students, given time, encouragement, and guidance, the best role for technology in response-based practice may be as a place for them to step back—a place to reflect on and enact responses to text—something that may not be feasible in other forms of classroom activity. This was expressed well by a second grader who, when asked what she would like to do with the computer if she could do anything, wrote:

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

There is risk in revealing personal responses. Multimedia may represent a place where personal and public voices can converge.

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