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ABSTRACT

Noting that teachers and students who actually use an educational innovation in a classroom setting recreate it, this paper analyzes the implementation of ENFI (Electronic Networks for Interaction), an innovation that uses computers and local area networks in the teaching of writing. The paper presents ENFI's idealization in terms of its technological features and original visions for its use, and then its realizations. The paper identifies 16 distinct realizations of ENFI, and presents case studies of 2 of them in detail, relating each to characteristics of the setting in which it appeared. (Figures representing the conventional model of implementation, re-creation of an innovation in a social setting, two examples of ENFI computer screens, and six samples of student writing are included: 27 references are attached.) (RS)

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Abstract

When an educational innovation is implemented in a classroom setting, it is re-created by the teachers and students who actually use it. This re-creation is an essential element in the process of educational change. In this report we analyze the implementation of ENFI, an innovation that uses computers and local-area networks in the teaching of writing. We present first its idealization in terms of its technological features and original visions for its use, and then its realizations. We identify 16 distinct realizations, and discuss 2 of them in detail, relating each to characteristics of the setting in which it appeared.

A Situated Evaluation of Computer Networking to Teach Writing

New technologies in education arrive wrapped in ideologies for change that represent challenges to established beliefs, values, and practices. These challenges create tensions between old and new ways of doing things that can be resolved in various ways. For some people, the resolution is to reject the new technology. For others, it is to abandon old practices. But more generally, people create new practices that reflect complex and situation-specific compromises between the old and the new. Because the new practices were not even envisioned in the original conception of the technology's use, and because this development of new practices is a common occurrence, their very existence raises serious questions for models of educational change, evaluation of innovations (cf. Cronbach, 1982), the role of teachers in implementing innovations (cf. Hord, Rutherford, Huling-Austin, & Hall, 1987), and even the basic notion of what an innovation is.

As a step toward addressing these questions, we discuss in this paper what we call a "situated evaluation," which examines how innovations are re-created through use. We first discuss the general issue of how idealized versions of innovations are realized in different ways in different settings. We then take as a focal innovation an approach called "ENFI" (*E*lectronic *N*etworks *F*or *I*nteraction), which uses local-area computer networks for teaching writing. We examine various ways that ENFI was realized in real classroom settings, then focus on two particular ENFI classrooms. Finally, we discuss implications of the evolution of ENFI for evaluation, teacher training, and curriculum development.

Our goal is to understand the process whereby realizations of an innovation are generated and to provide insight to practitioners attempting to implement innovative approaches. The process of adopting an innovation to fit a complex social setting, which may contain contradictory elements, is one that is not well understood. It involves integration of new ideas with well-established beliefs and practices. Teachers and administrators need more support in this process. To provide that support, we need better analyses of what the adaptation process involves.

Technology and Visions of Change

The linking of new technology to a vision of transformed pedagogy is a distinguishing feature in many proposed innovations in education. It is rare that the developer of an innovation would adopt the goal of simply facilitating current practices with a new technology. Instead, the argument is made that the expense of adopting new methods and tools is justified because major transformations, which constitute improvements, will occur. Conversely, proposals to transform teaching practices often incorporate new *technologies*, which might include new media, computers, curricula, kits of *manipulables*, or even catchy step-by-step procedures for teaching or learning. The reification of the developers' pedagogical theories in these technologies is viewed as vital to achieving their pedagogical goals.

That new technologies are linked to visions of major educational change is not surprising. What *is* curious is that the new technology is often viewed as sufficient unto itself to effect the desired changes. The prevailing discourse about technology reveals that we often succumb to the technocentric fallacy (Papert, 1987). We tend to think of technology as a single powerful object and in terms of *its* effects, *its* use, and *its* meaning. With this mindset, we assume that *if only* teachers and students had access to the power of the new technology, all aspects of the wonderful vision would be realized.

Studies of the actual processes of educational change (e.g., Fullon, 1982) show that access alone rarely leads to change. One reason is that the *same technology* or the *same innovation* has different meanings in different settings. The already functioning social system and traditional practices in which the technology is placed shape the ways the technology is understood and used. In fact, those who do adopt

innovations are typically faced with a challenging task of resolving conflicts between old practices that derive from powerful situational constraints and imperatives of the new technology. As these conflicts are resolved by different people in different settings, the original technology takes on multiple forms; the *it* becomes *them*.

Situated Evaluations of Educational Innovations

There is a conventional view of the implementation of educational innovations which informs curriculum development, program evaluation, and teacher education. This view conceives of the innovation (in its idealized form) as a well-defined plan of action, often accompanied by associated objects, such as teacher's guides, student texts, and new technologies. When the innovation is implemented, the goal is that the plan will be executed more or less faithfully. In the best cases, the realization of the innovation in the classroom looks just like the idealization (as shown in Figure 1). Differences from the idealization are considered to be distortions that should not occur, but somehow seem to do so all too often.

[Insert Figure 1 about here.]

The prevalence of *distortions* of innovations is a clue that the conventional model of implementation is inadequate. The distortions arise because the innovation is not the only active element. To the contrary, existing goals and practices of institutions, teachers, and students, as well as the way the technology is put in place, are also agents of change and can be far more salient in determining what happens with the innovation than the features of the innovation itself (Cohen, 1990; Cronbach, 1982; Cuban, 1986; Hawkins, 1987; Kling, 1980; Kling & Scacchi, 1982; Rubin & Bruce, 1990). In reality, the innovation is but one small addition to a complex social system. Instead of seeing it as the primary instrument of change, it is better to see it as a tool that is incorporated into other ongoing processes of change.

We are thus led to a different model for implementation of innovations. In this model, the active agents are not only the innovations themselves, but also the participants in the setting in which the innovation is placed. These participants first develop a perception of what the innovation is and then re-create it as they adapt it to fit with institutional and physical constraints, and with their own goals and practices. What they produce are different realizations (see Bruce & Rubin, 1992) of the original innovation (as shown in Figure 2).

[Insert Figure 2 about here.]

The shift in perspective from the view that realizations are distortions of an ideal to one in which realizations are creations that result from active problem-solving has implications for researchers evaluating innovations. In a method of evaluation known as situated evaluation (defined more fully in Bruce & Rubin, 1992), the social context in which the innovation is used becomes central. In this method, questions such as the following must be considered:

> How do *the institutional staff and the overall goals, practices, and gateposts in the institution* shape, constrain, or direct the use of the innovation?
>
> How do teachers' *pedagogical philosophies, goals, practices, and personalities* relate to the way they incorporate the innovation into their classrooms, the kinds of activities they engage in, and their evaluations of its success?
>
> How do *student characteristics and expectations* affect the implementation of the innovation and their evaluations of its success?

How do *features of the technology--hardware, software, room location and layout*--affect the innovation's use?

How do *available resources--funding, technical assistance, teacher time*--affect the innovation's use?

These elements of the social setting--the institution, the teacher, the students, the technology, and the resources--contribute to the different realizations of the innovation. In order to understand the implementation process, we need both to identify and characterize alternate realizations of the innovation and to understand the context of use as outlined above.

One example of an educational innovation involving the use of computer technology is the ENFI Project, which uses computer networks for written interaction. ENFI (which originally stood for *E*nglish *N*atural *F*orm *I*nstruction) was developed by Trent Batson and colleagues in the English Department at Gallaudet University, a well-known liberal arts university for the deaf. Communication software was developed that allows deaf students to communicate in class, in writing, via a local-area computer network. Since the original development at Gallaudet, ENFI (or approaches similar to it) has spread to more than 30 other colleges and universities, and a precollege version is also in use. The majority of ENFI users are now hearing students.

Characterizing ENFI in Its Idealized Form

In this section we present a crucial part of our situated evaluation, an analysis of the *idealization* of ENFI. We discuss first the technology and then the original visions for its use.

The ENFI Technology

Our first task was to understand the network technology designed to implement ENFI. On the computer networks at Gallaudet, the students and the teacher each sit at computer terminals and compose messages in the lower, private part of the screen.[1] When they press a key, their message is immediately transmitted to all of the screens in the class, tagged with the name of the person sending it (or whatever name the sender has used when logging on; some students use a variety of creative network names). As new messages are typed and sent, they scroll up the screen in a continuous dialogue, like a play script. The computer stores the entire discussion, which can be reviewed at any point during the class session or printed out in its entirety at the end. Discussions occur on different network channels, each of which can include from two participants to the entire class. Using a video switch the teacher can at any time view the writing of an individual student or of a group of students on a channel, or can display the writing of one student to the entire class. Figure 3 shows a sample student screen, with a student's privately visible message in the bottom window ("The Dead" was one of the deadest stories I have ever read.) and publicly visible teacher and student messages in the upper window.

[Insert Figure 3 about here.]

This particular use of a local-area computer network was developed at Gallaudet to give deaf students opportunities to use written English in ways they are otherwise deprived of. The problems that deaf people have reading and writing in English are well-documented (cf., e.g., Quigley & Paul, 1984), and at least part of this difficulty can be attributed to lack of opportunities to interact in English (Charrow, 1981). With a computer network and software that allows for interactive writing, deaf students can use written English not simply to complete grammar exercises or to produce compositions to be evaluated, but also to communicate spontaneously ideas that are meaningful to them with a community of other writers who are interested not in evaluating, but rather in understanding what they are saying. Written

English can be used to joke and play with language, to discuss literature or serious social issues, to brainstorm ideas or collaboratively produce a draft for a paper, and to critique writing in progress. In short, written English can be used in many of the ways that oral English is used by hearing people. When a competent English user (such as the teacher) is writing on the network as well, correct forms and structures can be modeled immediately, in the context of a genuine communication (Peyton & Batson, 1986).

As information about the Gallaudet ENFI Project was disseminated, other colleges and universities became interested in the potential of real-time interactive writing for hearing students, for whom writing is also often difficult. A consortium of five colleges and universities was formed to implement and study computer networking with both deaf and hearing students.[2] As schools across the country began to set up ENFI classrooms, the original ENFI technology began to take new forms. New software configurations were developed within the consortium; distance as well as local networking was implemented at one of the sites; and parallel efforts (such as Daedalus Interchange at the University of Texas at Austin) were begun outside of the consortium.

Even within the ENFI consortium there was variation in the software used. Figure 4, for example, shows the computer screen for the CECE Talk program on the Andrew system at Carnegie Mellon University, which was already in place there and adapted for the ENFI Project. In CECE Talk, each student has a window, which is visible to all members of the discussion at all times. This window contains and continually scrolls that student's contributions. In the example, Larry initiates a discussion with Wilma about a paper he is writing on problems with the food service.

[Insert Figure 4 about here.]

A Vision of the Ideal ENFI Classroom

Our next task, after understanding how the technology worked, was to try to understand what the developers had envisioned for the innovation. We did this by reviewing the extant literature about ENFI.

Since the early days of the ENFI Project at Gallaudet, developers have expressed clearly their vision for how ENFI, a "total immersion method" of teaching writing to college students (Batson, 1987, p. 4), can transform and revolutionize the traditional writing classroom. Where before students wrote to a single audience, the teacher, now they would participate in a full-fledged writing community, which included their peers. Where before their sole purpose in writing was to be evaluated, it would now include all the purposes of speech: "to inform and persuade, to entertain and enlighten, to develop social relationships, to explain experience (as much to ourselves as to others), and to create and develop ideas" (Batson, 1987, p. 15). Where before students would associate writing only with English class, now they would write across the curriculum. And where before only formal writing would be allowed, now teachers would encourage freedom and variety in writing. As in speaking, students would "adopt different accents, throw in slang, include personal elements, think aloud, talk . . . through tasks, and work out new ways of saying things" (Batson, 1987, pp. 13-14). In the discussions of this vision in various articles and reports, we have identified five major threads, which we discuss here.

New social dimensions in the classroom. An important premise of the original ENFI Project, articulated in a number of ways, was that writing on a computer network would blur social distinctions in the classroom. This would result in "entirely new pedagogical dynamics" (Batson, 1988, p. 32) and changed roles for both teachers and students. The role of the teacher would shift from lecturer and director of discussion to collaborator in writing, and student participation would be more equally distributed. In short, it was hoped and hypothesized that traditional classroom interaction patterns would be radically altered when classes began to communicate on a network, in writing.

Writing for authentic purposes. The original vision for ENFI was that all communication would take place in writing--greetings and closings, procedural details, and requests for elaboration or clarification, as well as formal lessons and composition-related activities. Students would make and negotiate meanings through writing, and their classroom personalities and roles would be established in writing. The hope was that writing would therefore come alive for students, that they would use writing for their own purposes and see it as an important means of lively communication, not simply as a performance for others, to be evaluated (Peyton & Batson, 1986). In this context, writing would become less formal and more conversational, and students would move easily in writing from one type of communication to another. Conversation and composed text would, in a sense, become merged (Langston & Batson, 1990).

Immersion in a writing community. The original goal of ENFI at Gallaudet was to immerse deaf students in the English language. As ENFI practice expanded to include hearing students, the goal was to immerse them in writing--their own, the teacher's, and other students'. The classroom would become a writing, rather than a speech, community. It was hoped that this immersion in writing would change the nature of the writing class in a number of ways. Students would have many more opportunities to write than they do in other types of classes. Writing would be done for a present audience, and students would receive immediate feedback on their ideas. The writing process would be made visible to students; they would see their own writing mingled with that of the other students, the teacher could demonstrate various aspects of the writing process for students, and students and teachers could watch and comment on each others' writing while it was being produced.

Collaboration in writing. Whereas many current approaches to writing instruction emphasize the importance of a writing community, the creation of a community that writes to each other in order to communicate shows promise not only for developing new views of writing, but also new approaches to writing; especially, increased collaboration in the act of writing--"most collaborative learning classes stop short of actual group writing. They may think together and plan together and then, after they write individually, critique their writing together, but they probably won't write together. They don't observe each other's writing process. ENFI makes this last step possible" (Batson, 1987, p. 26).

Writing across the curriculum. Finally, although ENFI was first implemented in English classes, it was hoped that writing to accomplish a range of purposes, in collaboration with a teacher who also wrote, would be useful as well in other subject areas like math and science, where students might have particular difficulty expressing themselves. Thus, the vision was that ENFI might promote writing across the curriculum.

These five threads, when considered together, point to a powerful context for writing, and one that reflects much of current theory about writing pedagogy and development. We saw our next task as evaluators to determine the extent to which these visions for ENFI were actually realized in various settings.

Characterizing the Innovation in Use

Early in this part of our evaluation of ENFI, we encountered definitional problems. First, we found that within the consortium three different software systems were in use:

- RealTime Writer, from RealTime Learning Systems in Washington, DC, running on 10-NET and Novell networks with IBM PCs;
- CECE Talk, running on the Andrew System in a Unix environment, using high-function workstations;

- The CB Utility included with the 10-Net local-area network from DCA, running on IBM PCs.

Another system, CT System 3, also from RealTime Learning Systems, had been used previously at Gallaudet. There were also many different network configurations, including distance networking and non-real-time uses, such as electronic mail and bulletin boards. Outside of the consortium other sites appeared to be doing ENFI-like work as well, using yet other hardware and software (for example, Interchange, from the Daedalus Group of Austin, Texas, was used at the University of Texas and other sites, running on Novell and other networks with IBM PCs).

Thus, we could not identify ENFI with a single technology. For a time, we considered thinking of ENFI as a pedagogy, a particular approach to using computer networks for learning, or as a theoretical orientation, for example, that writing develops in communities. But as we compared elements of the idealized ENFI with what teachers were actually doing, the network activities they implemented, we encountered major discrepancies. Across the ENFI sites there were differences in student populations, varying from pre-college deaf students at Gallaudet to sophisticated juniors and seniors at Carnegie Mellon University (CMU); in the physical layout of networked classrooms; in types of network activities; and in learning goals, including developing basic English proficiency, improving critical reading, and honing argumentative writing. Under a narrow conception of ENFI there were no real ENFI users. On the other hand, a conception broad enough to include most of the network activities implemented in the ENFI consortium would include a vast array of networked activities and many people who had never heard of ENFI.

It began to appear hopeless to cope with the diversity within the ENFI consortium. How could we evaluate ENFI's effectiveness if we couldn't say what it was? It seemed we needed to adopt an arbitrary definition of ENFI or to abandon entirely the objective of assessing the changes brought about by ENFI's use. But two factors encouraged us to go further in analyzing ENFI's use.

First, despite the diversity, participants in the consortium believed they were in some sense "doing the same thing," which they called "ENFI." We were obligated to probe deeper to see what commonalities lay beneath the surface diversity. Second, the ENFI situation exemplifies what happens when any innovation leaves the hands of primary developers and moves into diverse settings (see Rubin & Bruce, 1990). The fact that there were many ENFI's, not just one, complicated our task, but by no means made it unique. For these reasons, we decided to stop searching for a central conception of ENFI and to begin instead to look at what happens when teachers at various sites set out to use written interaction on a computer network in their classes. To this end, we began to document and attempt to understand the various implementations of network use that were called "ENFI" at the five institutions involved in the ENFI Consortium.

Research Design

During the spring semesters of 1988 and 1989 we visited the five consortium sites at least once, and if possible, twice. On each visit we observed ENFI classes and interviewed site directors, ENFI teachers, and ENFI students. Our primary goal was not to say whether ENFI was good or bad, nor even to verify the extent and correctness of ENFI implementation. Instead, we wanted to be able to say what it was that people were doing when they claimed to be "doing ENFI."

Research Questions

We worked with a large set of research questions, starting with fairly simple ones about room layout and time spent on the network and moving towards more interpretive ones. First, we focused on the basic network configuration:

How is the network room arranged?

What computer software and hardware are used?

How often and for how long is the network used?

What activities is the network used for?

What is the configuration of use: pairs, small groups, whole class?

What is the teacher's role in the network interaction?

We also had questions about the nature of the online discourse when the network was used:

What are the participation patterns on the network? Who participates? How much? What do they "say"?

What is the content and quality of network discussions?

Who has control of the interactions?

Who is included in the interactions and who is excluded?

How are these patterns similar to or different from those in more traditional classrooms, conducted orally?

Because the original goal of ENFI was to enhance overall writing development, we also examined network writing in relation to other reading and writing activities in ENFI classes:

How does network interaction relate to other writing for the class and other activities in the class?

What kinds of literacy skills are practiced on the network?

What kinds of literacy skills are not practiced?

Finally, we assessed as well as we could students' and teachers' interpretations of ENFI:

How do different students and teachers interpret what "ENFI" is?

How do the students and teachers react to the use of the network for teaching and learning writing?

Data Sources

We made use of several kinds of data to approach these questions, none of which would have been sufficient alone:

Classroom observations. We observed, and in some cases participated in, selected classrooms using the network at each of the five consortium sites. In most cases, we were able to visit at least two classes. Our site visits were planned according to the convenience of the site directors and teachers involved, but we did make sure ahead of time that we were visiting classes in which ENFI was

well-established. We did not use a classroom observation guide, primarily because we did not yet know what we would find and did not want to limit what we saw with preconceived ideas of classroom processes. We wanted to be completely open to observe novel phenomena in this inherently new mode of discourse. We thus decided that our visits would be very open-ended, and we took open-ended fieldnotes.

Interviews. We conducted formal interviews with site directors, teachers, and students. We interviewed all of the teachers involved if we could, in group interviews if time did not allow one-on-one interviews with everyone. Among the students we tried to interview at least two who had claimed to their professor to "like ENFI" and two who had claimed not to like it. There were standard questions we asked at each site and common areas we wanted to explore, but we did not have a set interview protocol. Instead, we remained open to whatever people said, probed in the areas that were the most salient to the participants, and then documented carefully what was said. Most of the interviews were tape-recorded and transcribed. However, some took place informally during class time and were not tape-recorded; for those, we relied on our notes.

Network transcripts. We also collected transcripts of network interactions for all the classes we observed. At some of the sites, we were told of other ENFI approaches that we were not able to observe, and were given an illustrative transcript. Thus, we feel confident that we have a comprehensive and nearly complete sample of ENFI implementations.

Survey data. To obtain a broader view of network use and the reactions of students and teachers in all of the classes at the consortium sites, data were collected each semester by questionnaire on such things as room layouts, course descriptions and goals, student characteristics, network activities, and teacher reports of strengths and limitations of ENFI. We have made extensive use of these data, particularly teachers' written responses to open-ended questions about ENFI.

Electronic mail communications. An electronic mail conference was set up for ENFI teachers and site directors in the consortium, and used regularly to discuss activities, successes, problems, and solutions associated with ENFI use. As participants in this conference, we had access to all of the messages, which provide a rich corpus of information about ENFI implementation.

Reports by consortium members. We made use of reports and articles written by teachers and researchers at each site, and checked our perceptions against participant accounts in these documents.

Participant feedback. Finally, we have made several reports at consortium meetings and circulated drafts of our papers, and have received feedback on the accuracy of our categories and descriptions. By soliciting the concerns, issues, and critiques of participants in the study, our evaluation was to some extent "responsive" in the sense defined by Stake (1990).

Data Analysis

The first step of our analysis occurred during our site visits, when it became clear that ENFI took very different forms for different classes, teachers, and students--that they were not all thinking of the same thing when they thought of "ENFI." For example, the next section of this paper gives a brief snapshot of ENFI-IN-USE at two of the consortium sites.

As we collected and processed the data listed above, we began to identify and categorize the various realizations of what the participants themselves called "ENFI" and to verify and revise our categories across data sources. Our criteria for identifying different realizations and a brief description of each realization are outlined in the next two sections of this paper.

Finally, we are working with the participants themselves to assess the success of the realizations they have implemented. Thus, the final step of a Situated Evaluation can be to begin summative assessments of each realization, keyed to the setting and the goals of the participants. The results of this step will appear in a later publication (Bruce, Peyton, & Batson, in press).

Realizations of ENFI

As discussed, the disparity between traditional values and practices and the values and practices embodied in an innovation may present a challenge for those who decide to adopt that innovation. ENFI teachers embraced the innovation because they believed in the values and practices that it claimed to promote, but they were already working within a well-established set of values and practices that must be accounted for in some way. As with any innovation, implementing ENFI involved resolving conflicts between old values and new possibilities. Not surprisingly, solutions are diverse and often vary greatly from the original vision of ENFI. Each of the solutions represents a separate realization of ENFI, an ENFI-IN-USE which might differ from others in terms of pedagogical goals, participation structures, teacher control, writing genre, or use of the technology. The existence of some variation is not surprising; what is significant is that the difference between any two realizations is often greater than that between the ideal ENFI classroom and the "traditional classroom."

For example, at CMU, ENFI exists in a computation-rich environment. There are many excellent, competing technological resources for teachers and students to use. The students are in general academically successful. What they need to learn in the area of writing is not how to write a sentence or even a paragraph, or to overcome initial reluctance to write or to use computers. Instead, they need work on how to make a persuasive argument, how to step back and reflect on what they have written, or how to organize larger pieces of text. Concern for addressing needs such as these has been a hallmark of much of the writing research at CMU (Kaufer, Geisler, & Neuwirth, 1989). Given this setting, it is not surprising that ENFI-IN-USE at CMU has emphasized critical response to texts. Students typically work in pairs, critiquing each other's work.

In contrast, in a course for basic writers at New York Institute of Technology (NYIT), ENFI is realized in very different ways. In that setting, the ENFI technology is a significantly new element in the classroom. NYIT is essentially an open-enrollment institution with many nonnative English-speaking students. Many of the students are in the process of learning English, and many are not fluent writers in any language. It is consistent with this setting that realizations of ENFI tend to have more significant teacher involvement, and that the original ENFI idea of the whole class as a writing community has been seen as appropriate.

These two settings thus have led to realizations of ENFI that differ in terms of the hardware, the software, the teacher's role, the number of participants, the activities, the topics of discussion, the amount of use, and the relation of ENFI work to other classroom activities. Variations along these dimensions led us to identify four different ENFI realizations at NYIT and one at CMU.

Identifying Realizations

How did we decide that two approaches to ENFI should be designated as different realizations? There was no simple criterial test nor list of distinguishing features for making that designation. Instead, we judged whether two realizations differed enough that we were no longer comfortable with the claim that they represented the same innovation. As we reviewed the classroom practices we observed, we applied five heuristics to decide whether to designate a given practice as a separate realization:

1. Substantially different. The practice differed enough from all previously-identified realizations that it was less plausible to include it within a previously-identified realization than to place it in a new category.

2. Multidimensional. The practice was significantly different from others on more than one dimension. Thus, if nothing more than the topic of the discussion changed, we did not conclude that we had found a new realization. On the other hand, if the change in topic were accompanied by a change in the network configuration, a new role for the teacher, or new goals for the activity, we would be more likely to think that we were seeing a new realization.

In our analysis of the ENFI classrooms, we observed significant variation along several dimensions, including: purpose for the activities; degree and manner of teacher involvement; roles of participants in the interactions; adoption of network personas; group size; room layout; hardware characteristics; software features; physical proximity of participants, varying literally from long distance networking to shared-chairs; degree of face-to-face interaction, shaped by the teacher directly and by apparatus such as carrels; amount of off-network talk (in sign or orally); discussion topics; formality of discourse; interactivity; degree of focus on a text and whether that text was student-written.

3. Coherent. The practice itself was coherent with identifiable elements within the setting of use. In other words, when a practice made sense in terms of characteristics of the institutional setting, the teacher's goals and practices, or the student population, there was more reason to think of it as a separate realization than when there were no independent reasons for its existence.

4. Supported by evidence. The practice was neither a characterization of desirable practices nor a mere logical possibility of use; it really happened. Evidence for the existence of a realization could be found not only in the occurrence of a particular activity, but also in other observational and interview data such as the physical layout of the room, course descriptions, and in the discourse of students and teachers.

5. Persistent. The practice persisted through many class sessions. Activities that occurred only once did not usually count as a separate realization.

These heuristics served as a rough guide to identifying realizations. Note that certain constraints were *not* required. Even though no two classrooms were alike in every way, we did not think of every classroom (or every class period) as a distinct realization or as only one realization. One setting can give rise to more than one realization and one realization can occur in several settings.

In our study it was actually relatively easy to identify separate realizations because the differences were not arbitrary; they were expressions of fundamental differences in pedagogical goals and practices, student backgrounds and needs, institutional constraints, or technological and physical factors.

Realizations in the ENFI Consortium

Across sites we have identified 16 substantially different realizations of ENFI, which we grouped into seven families. In this section we present brief descriptions of each of the realizations. Within a family of realizations the differences are less extreme than between families. One might, for example, more easily argue that two realizations within a family should be combined than that two realizations in different families should be.

A. Discussion. This family includes the realizations that we observed in which students engaged in conversations. They appeared as themselves on the network, or they used a pseudonym, but they did not adopt a formal role, as in a play. Although the purpose of the discussion may have been to support writing in some way, the discussions did not focus directly on students' written texts. Instead, the focus

of the discussion included open topics, controversial issues, data, or reading texts. Except for A-2, all of these realizations took place among the whole class or smaller groups on separate channels.

A-1. Open discussion. Open discussions had no pre-set topic and little teacher direction. Students conversed on the network about personal issues, such as plans for the weekend, interacted with visitors to the classroom, or discussed current events, as those topics arose. The discussions we saw involved the whole class.

A-2. Cross-age tutoring. The topics here were the same as in A-1, but the participants were of two different ages (college and elementary school), or English proficiency levels, the intention being that one participant would provide a writing model for the other. Students typically worked in pairs on separate channels.

A-3. Confrontation of issues. This realization is similar to A-1 except that one topic, some controversial issue, was identified and focused on. The teacher played a more dominant role than in open-ended discussions, introducing an issue and leading students to confront the questions it posed. The teacher also pushed students to articulate reasons for ideas that they might have stated first in personal or emotion-laden terms.

A-4. Small-group analysis of data. This is a special case of discussion in which the purpose was to analyze data, such as a table of employment figures by gender and ethnicity. Students were grouped on separate channels (3-5 per group) to allow for focused discussion designed to reach reasoned interpretations of the data.

A-5. Discussion of reading texts. This was a common realization, which like A-1, typically involved the entire class. Unlike A-1, there was a specific topic, namely to critique or otherwise respond to a text all the students had read. Students typically had the text at their desks and consulted it for exact quotes and page references.

A-6. "Therapeutic discourse." We chose this name for this realization because the discussions were akin to those that might occur in a group therapy session. Students were assigned to channels on the basis of personality types, using assessments such as the Myers-Briggs personality inventory. The teacher guided the discussion towards feeling statements ("This story makes me feel. . .") and away from intellectualizing ("I think that. . . ," or even, "I feel that. . .").

A-7. Brainstorming and prewriting. As in A-1, topics in this realization could be open-ended, but the specific purpose was to generate ideas or preliminary text for subsequent student writing. This definition of purpose shaped the discussion (emphasis on getting ideas out, not on critical analysis) and the teacher's role (minimal, usually as questioner).

B. Role playing. A second family of realizations is strikingly different from the above in that participants on the network did not speak as themselves, but rather, in the guise of roles they had adopted. These roles might come from plays such as *Oedipus Rex* (see case study below), or from constructed scenarios. Accompanying the shift from direct participation to participation via a persona were shifts in the purpose of the discussion and the teacher's role.

B-1. Dramatic production. In dramatic productions on the network, participants adopted specific roles that they maintained throughout a session. The roles could be from a play the class had read or one they created on the network. The purposes were to reach a deeper understanding of the existing dramatic literature or of the art of dramatic production and to encourage student creativity in language use. This realization is discussed in more detail later in the paper.

B-2. Scenarios. This realization is similar to dramatic production, except that instead of adopting roles from dramatic literature, students took on stereotypical roles for discussion of business or public policy questions. For example, a scenario that we observed involved a description of the destruction of the Amazon rain forest. Students assumed roles such as "environmentalist," "land baron," or "government agent." In another scenario, students assumed the roles of executive officers in a business and solved problems as they arose. The purpose was to understand the positions of various parties, and to learn how to formulate and criticize arguments. For all the scenarios we observed, students worked in small groups on separate channels.

C. Response to student writing. A third family of realizations differs from the first two in that the network discussions centered on response to student writing. Realizations in families A and B may support student writing, but they do not involve a direct focus on the students' own texts.

C-1. Socratic tutoring. In this realization (named by Marshall Kremers at NYIT), the whole class was on the network together, but the teacher engaged in dialogues with each student, shifting from one to the next as a chess master would in playing multiple simultaneous chess games in an exhibition. Students restated arguments they had formulated in essays they were writing and the teacher asked probing questions to get the students to re-think these arguments. The dialogue was thus totally teacher-directed, and over half of the network talk was by the teacher.

C-2. Peer response groups. In this realization students worked in groups of four or five. One student presented his or her text for criticism and help from others. The teacher was usually absent from the discussion.

C-3. Devil's Advocate. Devil's Advocate (a name developed at CMU) is a highly structured variation on peer response (C-2). Students typically worked in pairs with one student presenting a text he or she was working on and the other adopting the role of the "devil's advocate." The second student took a consistently critical stance towards the first student's text, pushing and probing on weak points in arguments to ensure that the writer considered all the possible objections to the text and strengthened it accordingly.

D. Games. We consider network "games" as a separate category of realizations even though we saw only one realization of it, because it was clearly different from all of the other realizations. We observed a language game, Twenty Questions, in which all of the network discussion was in the form of yes/no questions ("Is the person a man?" "Is he alive?") and one-word replies, "yes" or "no." There was considerable off-network conversation, in this case in Sign Language.

E. Collaborative text production. A key feature of ENFI for the developers was that it promoted collaboration, and all of the realizations involve collaboration in some way. In this family of realizations, however, the actual act of writing is collaborative. Students (with or without the teacher) produce a text together--a story, a play, an essay--by going around the room and writing one line each, building on previous contributions.

F. Distributed text. A third category with only one realization is "distributed text" (named by Diane Thompson at Northern Virginia Community College). Students compose brief texts (10 or fewer lines, which is what the network software allows) and broadcast them on the network to the class for oral discussion. This realization is discussed in more detail later in the paper.

G. Distance networking. Distance networking is as much a different technology as a different family of realizations. ENFI activities over long-distance can include any of the realizations above and did include several of them (A-1, open discussion; A-7, brainstorming and prewriting; C-2, peer response groups). We think of it as a separate family of realizations, though, because it arose as a distinct activity in a particular institutional setting, one in which the teacher was skeptical of the value of real-time

networking among people in the same room. It also afforded the opportunity for students at one school (with a stable, working-class, Southern, rural population) to interact with those at another school (mostly military dependents in a transient, diverse population) who had very different values and life experiences.

Case Studies of Two Realizations

In what follows, we describe two of these realizations and show how and why they took the form they did. We chose these particular ones because they exhibit interesting contrasting features, one a major change to the qualities of ENFI itself, and the other a change to the purpose and context for using ENFI. Consortium member Diane Thompson, a composition and literature teacher at Northern Virginia Community College (NVCC), integrated established practices and new possibilities by creating an ENFI-IN-USE that differed markedly from the original model, thus essentially redefining ENFI to fit the needs of her classroom (Realization F). In contrast, Doug Miller, at Gallaudet University, retained essential features of the original ENFI idea, but redefined the institutional setting in which ENFI occurred (Realization B-1).[3]

Case Study 1: Redefinition of ENFI

Diane Thompson was already a veteran at using computers for writing instruction when she first saw ENFI in action at Gallaudet. She had established, and essentially ran, the computer lab at NVCC, and had used word-processing and a variety of other writing software packages extensively in her classes. For her, ENFI offered a new and dynamic way to use the computers she already had in place--an opportunity for students to "use writing to communicate with a present and responsive audience . . . to experience writing as real discourse [with] a purpose and goals negotiated by the persons involved . . . [and] to produce writing in a relaxed, social situation, supported by the visibility of their peers' writing" (Thompson, 1988b, p. 194).

Initially, Diane's version of ENFI looked very similar to the original version developed at Gallaudet--the network was used for whole-class written discussions of readings and paper topics and review of papers-in-progress, in which she took part in a teacher role. However, she soon discovered that these interactions did not look exactly as she had hoped. First, she found that because of her ability to type faster than the students and her eagerness to guide the discussions, she dominated them, making over half of the comments. Whereas she often wrote at length, the students primarily answered her questions with brief, syntactically simple replies. And although she had hoped that the network discussions would promote student interaction with each other, she found that, in fact, all talk was funnelled through her (Thompson, 1988b).

Second, whereas "talking in writing" within the classroom was one of the key features of ENFI with deaf students at Gallaudet, communicating in this way and under these conditions didn't seem to make as much sense to Diane, whose students could engage in oral discussion. She has expressed the problem in different ways at various times:

> I used the network last year without accompanying talk and found the results constrained and rather disappointing. (quoted in Horowitz & Peyton, 1988)
>
> It seems phony. Why should I write to them if I can talk to them? (Interview, April 20, 1988)
>
> . . . this becomes a highly artificial situation, slowing down communication without any "real" reason other than the teacher's insistence that all messages be in writing. Artificial constraints on the practical use of spoken language do not inspire students to put much effort into message writing when it seems more reasonable to speak aloud. (Thompson, 1988a)

Diane eventually set up a distance network communication with a NVCC class in another city, in which writing was essential for communication to occur (realization G discussed above). But within the classroom, writing to communicate didn't make much sense, from her perspective.

Third, although she started out having each student sit at a separate computer, as is the case at Gallaudet, she changed this practice as well. One reason for this change was very practical. Although developmental English classes at NVCC usually consist of around 17 students, Diane initially had only 7 computer terminals. Thus, the high student:computer ratio alone precluded implementing the original version of ENFI. The second reason, though, hinges on Diane's personal theory of writing development. As she stated in a course syllabus,

> working in groups is the way people do most of their adult work projects, and the stimulation and feedback from the group enrich and empower the work of each individual member of the group.

When teaching writing with computers, she had always had students work in groups of two or three at a terminal, to collaborate orally and then decide together what they would put into print. Students sitting alone, each at their own computer, did not suit her collaborative theory and approach to teaching. Thus, even later, when she had enough computers for each student, she continued to have students work in groups, and many computers stood unused.

Finally, the original Gallaudet version of ENFI placed considerable emphasis on the importance of personal investment in writing, using writing for authentic, personally-meaningful purposes. Gallaudet teachers were trying to draw deaf students out of formulaic patterns of writing they had developed in their attempts to pass strictly-constrained assignments and exit tests, away from merely trying to please the teacher with their writing, and to get them to see writing as a way to communicate genuine messages. However, Diane believed that her students, who were basic and college-level writers in an open-admissions school, needed to master the content and conventions of writing for the college. Thus, she believed that she needed to be very active in leading them into that mastery--not dominating discussions as she found she had done on the network, but commenting on the students' writing and modeling *her* views of their writing for the rest of the students. She believed that an appropriately modified version of ENFI could give her back the role of writing coach that she had lost in her stand-alone computer classes.

Because of her knowledge and experience with computers for teaching writing, Diane was not interested in using them for activities that she believed could be better accomplished by other means. Instead, she was determined to find ways the network could be used to accomplish things that couldn't be done without it: "I keep looking for things that make sense" (Interview, April 20, 1988). What she felt the network could offer, which was not possible in an ordinary writing class, was the fast and efficient sharing of written texts for oral comment from students and the teacher--the opportunity for, in her terms, a "tight feedback loop." Whereas students writing on stand-alone computers must make print copies of their texts in order to share them with others, on the network texts can be sent immediately to all of the students in the class. Whereas in classes with stand-alone computers Diane felt that she couldn't monitor closely and comment on what her students were doing, on the network she could:

> The whole interactive system . . . the exposure of each person to each other person with input from me [is important] because ultimately I have to judge what they do. This teaches them what my expectations are; what they and their classmates can do; what good production is; what crappy production is. It teaches them schooling. (Interview, April 20, 1988)

Diane developed an ENFI-IN-USE in which students are given a writing task to complete--a brief text that might later become a part of a composition. They discuss the task orally in groups of 2 or 3 at a

computer terminal, and one student types it in. One by one each group sends their text to the computers of all of the other students in the class, and one group member reads the text aloud. Other students and Diane then comment on the text, expressing their interest in it, asking questions about it, or making suggestions for improvement.

For example, one day the class was working on a creative story in which fictional characters were caught in a time machine. Diane gave these instructions for writing the story:

> *First, decide who you are. Pick someone you have always secretly (or not so secretly) admired and wanted to be--a hero or heroine, a movie or rock star, a famous athlete, brilliant scientist, cartoon superstar, whatever. Write a few words describing who you are.*
>
> *Once you know who you are, guess what is going to happen to you. You got it. An ADVENTURE. And you get to write about it.*
>
> *TIME MACHINE*
>
> *One day as you are doing what you usually do, a mysterious machine suddenly materializes beside you. You, being curious, investigate. You manage to get into the machine, fiddle with the controls, and accidentally start it up. The door closes; YOU ARE TRAPPED!!!! The next thing you know, the door reopens. You are now in another time and/or place . . . Working in groups, create the story of what happens next.*

The groups had four writing tasks to complete and share on the network: Describe the characters in the story, summarize the plot, identify the real and imaginary aspects of the story, and describe the reason for the activity. The groups discussed each task among themselves, wrote a brief text (a maximum of 10 lines, the size of the composing window), and sent their texts one by one to the screens of the other students. Figure 5 shows the character descriptions written and sent by two of the groups.

[Insert Figure 5 about here.]

One group wrote a list of characters, with briefly stated characteristics. Another wrote a more elaborate description of one character giving a sense of that character's part in the story.

The display of each group's writing provided exposure to good examples for those who might be struggling with their own. It also provided an opportunity for Diane to talk about features of good descriptions, plot summaries, and so forth, as a way to show how the writing could be improved.

The activity continued until students had completed and discussed all four tasks. Then they received a printout of each group's writing, which they could use to further develop their story or to compare their work with that of others. One group's contributions to the four tasks are shown in Figures 6 through 9.

[Insert Figures 6 through 9 about here.]

Thus, in Diane's implementation of ENFI, real-time written interaction was replaced by the broadcasting of extended texts to others' computer screens, followed by oral discussion of those texts. This type of activity is very different from the original ENFI activities at Gallaudet. In fact, when asked in an interview what she liked best about ENFI, Diane said, "What I like best about ENFI is also what's most different." Thus, she appears to have created a new, and successful, innovation, one that bears little resemblance to the ENFI idealization. Nevertheless, her approach does accomplish some of the original

goals of ENFI--to create a bridge between speaking and writing, to give interaction a central role in learning, and to promote collaboration among students:

> Sharing writing with other groups on the network helps students to create a discourse community of active writers who are writing to and for one another, not for the teacher, and learning a great deal about their audience as they receive responses to their writing and as they study the transcripts which include both their own writing and that of the other groups. Because they share a general task . . . they add to their knowledge about the subject matter by reading the contributions of the other group and discussing their writing within their group. All of these activities should make them increasingly aware that writing is done in and for a discourse community. (Thompson, 1988a)

If Diane had felt compelled to be faithful to what she understood to be the original conception of ENFI, she might have struggled for a while and then dropped it, deciding that ENFI was not appropriate for her students and situation. But her considerable experience and confidence with using computers in writing allowed her to make principled decisions about adapting ENFI for her purposes. She retained the original focus on interaction and collaboration as keys to good writing, concepts that had always been central to her own teaching, but changed almost everything else. Instead of removing the teacher from control over students' learning, Diane put herself back into a central role she felt she had lost in the stand-alone computer classroom. She became an active coach and critic, who comments on students' texts as they emerge. And instead of providing a context for students to write "for their own purposes" and in their own ways, she actively modeled what and how *she* believed they needed to write. ENFI became what she believed it needed to become in that context and with those students.

Case Study 2: Redefinition of the Institutional Setting

Doug Miller, one of the first ENFI teachers at Gallaudet University, was initially one of the most enthusiastic ENFI teachers there as well. He saw in ENFI the opportunity for his deaf students, for whom written English is often a second language and whose writing is often stilted and formulaic, to write in a context that is free from the strictures of teacher-assigned essays and departmental exit tests and thus to develop fluency, originality, and creativity in their writing. When using the network in his freshman composition classes, he noticed that his hunches about this kind of communication were confirmed. In this context, the students showed an urgency to write well and correctly that he did not see when they were writing essays to please him or to get a grade.

> This is real communication. It's not the kind of [writing] that typically happens in a classroom, [where]. . . people are rehearsing for something else which is not real.
> . . . ENFI communication . . . is absolutely urgent and they feel the urgency. Their ego is at stake. They want to assert themselves. They want to function within this little social context. (Interview, September 1, 1988)

He also noticed language behaviors on the network that he had never noticed before. There seemed to be a lowering of inhibitions and "an intense urge to 'show off,' to play with language, to use showmanship in communicating . . . ENFI taps a latent urgency to communicate freely, openly, and without the inhibitions and controls found in natural, face-to-face communication" (Miller, 1989).

There was also a considerable amount of "flaming," often taking the form of sarcasm, insults, sexual innuendo, and obscene language, a tendency that others have noticed in computer conferences in businesses (Kiesler, Seigel, & McGuire, 1984; Rice & Love, 1987). Students also used the system to change their identities regularly by logging on and off under different names. On the surface these behaviors are intrusive and frustrating, especially when the teacher is trying to conduct and maintain

control in a strictly orchestrated class. But Doug found in them tremendous potential for the creative exploration of ideas and use of language, if they could be channeled into a constructive activity.

The ENFI activity that seemed to Doug to make the most sense was what he called "script writing." He gave the students rough scenarios and character roles and asked them to work as a "dramatic cast" to create a play script. If possible, they were to initiate a story line, generate conflict, build to a climax, and create a resolution to the conflicts and an end to the plot, playing the roles of the characters to which they were assigned. Doug signed onto the network as one of the characters, and often the students didn't even know which character he was. The idea retained key features of the ENFI idealization, and the students participated vigorously and creatively.

The problem was that Doug was attempting to use this approach in his freshman composition class, a carefully orchestrated course at Gallaudet with an exit test consisting of tightly structured opinion and compare/contrast essays. He had hoped that the ENFI script writing could be integrated into the goals of the course, that the network interactions could be a mechanism for discovering and developing ideas that could then be used in the more formal and carefully constructed essays. However, he was not able to make the connection. The network interaction was creative and rich and seemed valuable, but it was a completely different kind of writing, and the students had to pass the exit test. Doug expressed the problem thus:

> Those essays are so tightly structured . . . you have to have an introduction; you have to have a thesis; you have to have a main body . . . when you try to [take] this very powerful communication tool, that lets students talk to each other, swear at each other, insult each other, . . . and say, "you're going to write an essay . . . you're going to write an introduction" . . . that's not the way people communicate . . . the essay is too controlled and structured. (Interview, September 1, 1988)

As the semester drew to a close, Doug felt compelled to abandon any activity that did not contribute directly to the students' passing the test; accordingly, he dropped all ENFI activities about a month before the end of the course.

> The problems that I anticipated with finding ways to incorporate the ENFI activity into the objectives of the class are becoming more apparent . . . I'm getting nervous and I feel responsible to give them . . . more coaching. I don't want to use ENFI as a way to coach them about how to write their essays. (Interview, November 1, 1988)

> I just feel very limited. I don't know what you can do with ENFI [that relates to the course objectives]. I always feel guilty about wasting or using class time that isn't immediately somehow helping them to write essays, to perform for the standards of the test. (Interview, December 12, 1988)

> The writing evaluation is the thing that is sort of shaping it. It's the big monster that's lurking in the shadows, that terrifies everyone, including me. (Interview, November 1, 1988)

In short, Doug had developed an ENFI-IN-USE that capitalized on what he saw to be ENFI's unique qualities by taking the teacher out of the role of lecturer, adopting instead the role of collaborator and encouraging vigorous and uninhibited participation, creative imagination, and the taking on of various roles. But he found that this realization of ENFI did not fit the institutional constraints he was working within nor his own goals for his students in this context. So he abandoned ENFI, and has not used it in a composition course since.

But the story doesn't end there. Doug decided to try ENFI again, this time for "script writing" with a group of students in his Introduction to Drama class, which doesn't focus on writing development and

doesn't have a writing exit test (cf. Peyton & Miller, 1989, for a more detailed description of this realization). The students re-enacted on the network plays they had read and discussed in class (*Oedipus Rex, Hamlet, A Doll's House, The Cherry Orchard, Six Characters in Search of an Author, The Good Woman of Setzuan,* and *Death of a Salesman*) as a way to get involved with the plays, understand the conflict, and think and react the way the characters would. Again, he played a character role along with the students. As they re-enacted these plays, the students had the chance to represent a wide range of characters in a wide range of cultures, contexts, and historical periods and to experiment with linguistic ways to show action, portray characters, and express thoughts and emotion without having to dress up or be "good actors." They could invent worlds together, completely out of their own creative thoughts and language, and they generated some stunningly imaginative and inventive scripts, as shown in these excerpts from network recreations of *Oedipus Rex* and *A Doll's House*:[4]

Oedipus Rex

(Doug is the Priest)

12	Child Oedipus	(Spirit inside of Oed walking up to stage center) The story may begins.
13	Chorus #2	Alas !! Alas !! for our fair city is taken over by plague what shall our fair king do to calm the anger of the gods?
14	Oed Rex	(Oedipus Rex, in full regalia, ponders the plague and pyre which have befallen his City. Though there are accolades for his past accomplishments, Oedipus knows that this is one plague that he will have to await an explanation.)
15	Teiresis	(Teiresis paces the floor of his home, worried about the outcome of the day since the owls tell him something bad will happen very soon in the city of Thebes.)
16	Priest	Golly, Gee, This is great stuff, good work, guys!
17	Chorus	The plague is spreading rapidly. A murderer is lurking somewhere. . . . Oedipus upon learning about the prophecy swears to find justice against the invisible person responsible.
18	Merope	Merope, with a sixth sense, knows that something is wrong with her son, even though she has not seen him for a long time.
19	Laios	I AM HERE TO HAUNT YOU ALL MORTALS!
20	Oed Rex	Where is my good brother-in-law, Kreon? My people are dying and the Gods have not answered for this undeserved plight.
21	Teiresis	I'm awaiting for the summons of the king. Oh, god Apollo spare me from this anguish!
22	Oed Rex	Teiresis, talk less and tell me more. You heard the oracle. What news have you? . . .

* * * * * * * *

A Doll's House

(Doug is Daddy)

27	Daddy	(The voice of Daddy) Ooooocooooo!
28	Rank	May the doctor ask why two fine young women like you are in on such a beautiful day?
29	Nora	Oh it is so great to be alive!! I just adore Torvald. I don't want to be selfish, tell me about yourself what have you been past 9 years??
30	Rank	How are you, my dear Nora? (Winks flirtatiously her.)
31	Nora	Daddy?
32	Nora	I am just fine, (winking back) and you?
33	Daddy	(Voice) Yes, my darling little girl. You do remember me, my sweet little thing, but you have done something naughty.
34	Torvald	Hey, Froggy. . . I haven't meet Ms. Linda yet. Please hold your pants before you can jump to conclusion. I must tell my wife that I have been promoted. (Opened the door while his wife is standing in front of him) (he scared Nora by grabbing her around the waist.) No more Kisses, darling!
35	Linde	(upon being introduced to Mr. Rank, Linde being in an extroverted mood. . . .) Say, your name sounds noble are you by the way of a particular "rank" low, or middle, or high class?
36	Rank	I am a doctor, Linde, not a Mister!
37	Nora	Please Daddy, I know you are very much like Torvald, but please understand my situation. Just don't scare me.
38	Rank	(to Dad) Remember, any trouble Nora gets in, you are to blame!
39	Nora	I already know you are promoted, darling, that's what I am so happy.
40	Rank	(In front of Torvald) By the way, Nora, do you have any macaroons to pass around?
41	Daddy	(A tiny voice floats across the stage) Nora Nora Nora, you have hidden something from Daddy!
42	Linde	(Witnessing Torvald's affection towards Nora) Oh, how nice to see such a couple that's so open with each other. . .
43	Torvald	Who are speaking to, Nora? That is just like you to pretend to have some playmate. . . why, I would declare that you speaking to air a while in this doll's house.
44	Nora	What??? I don't have some macroons but I do have some Hersey Ki. . .

45	Rank	(To Linde) That's the way it ought to be between us.
46	Daddy	(The spectre appears against a white curtain at the rear of the stage -- the face is sad yet wistful.)
47	Rank	(To Torvald) Would you happen to have any fine Havana cigars before I go?
48	Nora	Daddy, stop being a pest, you cannot hurt me. Oh, Torvald, I am not speaking to anyone. You must have heard something else.

Doug believes that with script writing, he has tapped one of the central benefits of ENFI--the opportunities that network writing provides for creating realities with words and ideas--"we are in one sense going into some other place . . . we have to imagine ourselves being there, what it looks like, what it feels like, and so on . . . it is really constructed reality" (Interview, November 1, 1988). His hope is that when students begin to live inside a piece of literature by enacting the roles of the characters in it, they will become intensely involved with it and better understand its meanings and complexities.

Doug now believes that ENFI is not appropriate for the highly structured setting of the conventional composition course. In order for ENFI to be successful from his perspective, Doug had to change the context in which it was used. Instead of ENFI revolutionalizing his traditional classroom, he took ENFI out of that type of classroom and created a new context for it.

Conclusion

Both Diane and Doug saw in ENFI the strengths offered by its idealized form--a way to use written English in a collaborative, interactive context, which they believed would have beneficial effects on their students' writing. However, as they worked and sometimes struggled to fit ENFI into already well-established institutional demands, their own philosophies of effective teaching and writing, their past experiences as teachers and preferred teaching styles, and their students' needs, they re-shaped ENFI. Interestingly, they are both still totally committed to ENFI, but in the forms in which they have re-created it. Their two realizations thus stand as interesting and very different constructions of interactive learning environments, linked only through the ENFI idealization. In other ENFI classrooms we observed similar dynamics--experienced teachers with well-established goals and practices taking the ENFI ideal, recreating it for their own purposes, and considering their recreation "ENFI."[5]

We see this diversity as a problem for traditional approaches to evaluation, which conceive of an innovation as fixed and well-defined, and evaluated by a set of uniform measures. These approaches are rightly concerned with precise assessments of performance before and after the use of the innovation and with selection of appropriate treatment and control groups. But methodological care in these areas is worth little if we cannot say what the innovation is or whether there is any consistent sense to the notion of the "treatment." Good evaluations of educational innovations need to include a "situated" component, which seeks to understand how that innovation looks in each of its different contexts of use.

Following the situated evaluation, one may address the traditional goals of judging the innovation's effectiveness (summative evaluation) or improving its design (formative evaluation). These analyses can then be done with a deeper understanding of the innovation as it exists in use. For ENFI, summative assessments are being done at individual sites, taking into account pedagogical goals, student populations, and institutional realities (see Bruce, Peyton, & Batson, in press).

The inevitable diversity of use for innovations also presents problems for traditional models of teacher education in which teachers are "trained" in the use of specific methods, approaches, or innovations. Such models miss the most salient fact about implementation; that it is a creative process involving

critical analysis of the innovation's potential in the light of the institutional context, student needs, and pedagogical goals. The innovation process doesn't end, but begins with the teacher.

Implications for curriculum development follow from this view of the teacher's role. Because the innovation doesn't even come into being until it is realized in an actual setting, the goal should not be to establish the endpoint for instruction, but rather, to supply the most useful tools possible for the re-creation process. That is, although a curriculum may include technologies, activities, assessments, sequencing, and so on, it should be conceived as only a rough guide, to be actively shaped and re-defined to fit classroom realities and alternate goals.

When an innovation that calls for significant changes in teacher practices meets an established classroom system, "something has to give." Often, what gives is that the innovation is simply not used. Rarely is an innovation adopted in exactly the way the developers intended. Our study shows that the process of re-creation of the innovation is not only unavoidable, but a vital part of the process of educational change. Critical analysis of re-creations needs to be an important part of any evaluation. We suspect that a deeper understanding of the process will highlight the fact that teachers need more support in attempting these re-creations. Their role in the innovation process is as innovators, not as recipients of completed pedagogies.

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Footnotes

[1]Gallaudet has used three different versions of ENFI software: DCA's 10-NET CB utility, and CT System 3 and RealTime Writer developed by RealTime Learning Systems. There are minor variations among the three, but they all fit the description given here.

[2]The consortium includes: Gallaudet University, Carnegie Mellon University, University of Minnesota, New York Institute of Technology, and Northern Virginia Community College. It is funded primarily by the Annenberg/CPB Project.

[3]These professors have reviewed and given us feedback on these descriptions of their ENFI practices. They also granted us permission to use their full names.

[4]These transcripts have not been corrected for punctuation, spelling, or grammar. Participant turns have been numbered to show how far into the transcripts the excerpts were taken.

[5]It is important to note that this process of recreation is not unidirectional. As new ENFIs come into being, the idealization of ENFI continues to change as well to acknowledge realities and encompass new possibilities. Nor is it static. The realizations of ENFI are constantly changing and spawning new realizations.

Author Notes

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This report appeared earlier in *Interactive Learning Environments*.

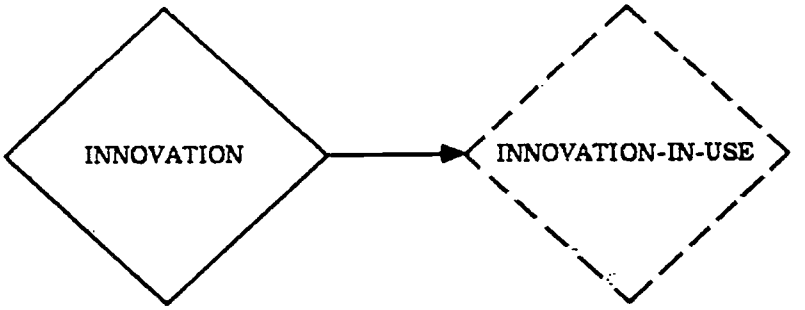

Figure 1. Conventional model of implementation

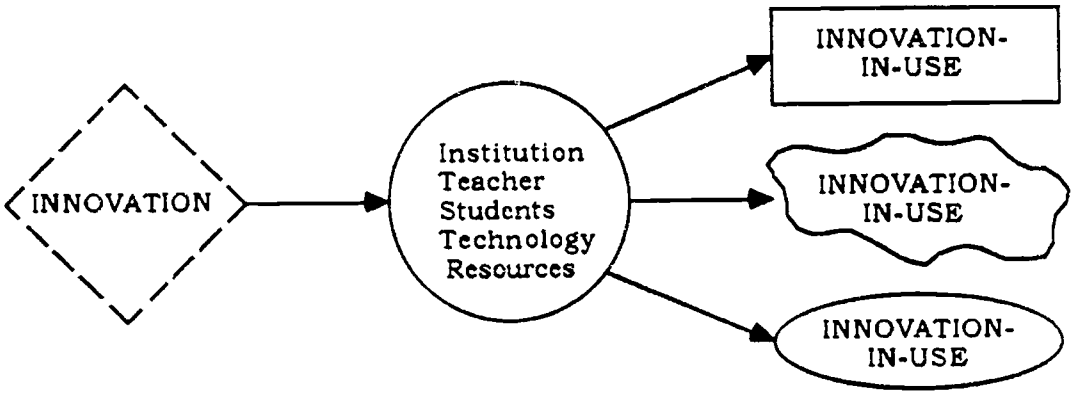

Figure 2. Re-recreation of an innovation in a social setting

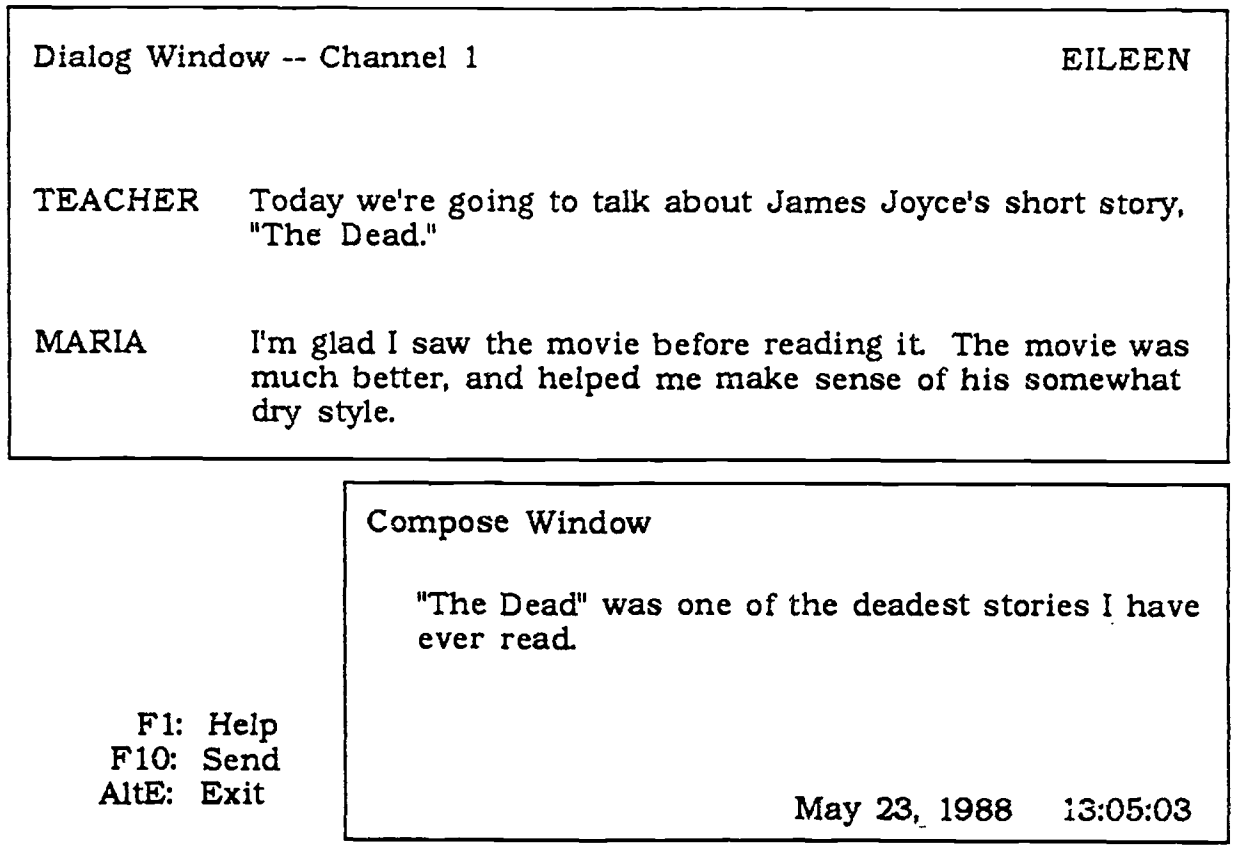

Figure 3. Example of ENFI computer screen at Gallaudet

LARRY

Hello. Do you want to discuss your paper or mine?

Okay.

I'm having some trouble narrowing down my topic. I'm writing about problems with food service.

That's the thing. I'm not really sure yet.

WILMA

Why don't we talk about yours?

What is your topic?

Problems with options or problems with quality or what?

Figure 4. Example of ENFI computer screen at Carnegie Mellon

THE STAY PUFT MARSHMALLOWMAN: Huge, white, puffy, tasty, cute and aggressive marshmallow dude. KINDA FAMOUS

courtney

MICKEY MOUSE: Short, cute, black, white gloves, yellow shoes, red shorts, big ears, squeaky voice, and generally resembled a mouse. VERY FAMOUS

laura

SPEEDY GONZALES: Quick, short, Mexican, likes cheese and tequila, wears a big sombrero and a little white outfit. WAS VERY FAMOUS/ QUICKLY LOSING POPULARITY.

lori

James Bond is a man of mystery, strength, and compassion. He has a type of finesse, and his suave attitude attracts women. His wrinkled face shows the many adventures he has experienced in his life as a secret agent. Bond's voice shows a type of courage and his eyes have something of an enigma to them. His slender body and long brown hair leaves you bewildered. Bond's theory is women first; and work later.

Figure 5. Character descriptions composed by two groups of students in a text-sharing activity

The Nutty Professor, Jerry Lou Lou Lewis, is the creator of the Tarvis (a time machine). He is very intelligent but somewhat silly and absent-minded. Jerry traveled back in time and met Mozart, a very gifted and pompous musician. Jerry and Mozart got trapped in the time machine and traveled into the future. At this point they picked up a bat, which later turned into Count Dracula. Dracula, son of the living dead, thirsts for blood and preys upon the living.

Figure 6. A student group's description of characters for the story they are writing

Jerry built a time machine and traveled back to year 1771. Upon his arrival, he meets an excellent musician and was surprised to find out he was Mozart. He talked Mozart into visiting his time machine. Mozart hits the controls accidently which thrusts them forward in time to the year 1815. The door opens and a bat flies in landing on the master control. The bat turns into Dracula and the machine is thrown into the year 2525. Jerry panics, opens the door, and all the oxygen dissipates. Jerry and Mozart suffocate and Dracula sucks their blood after which he disintegrates in the sun, leaving a cape.

Figure 7. A student group's plot summary for the story they are writing

Real: Jerry Lewis, Mozart, Austria, April 1771, year 1959, wires, bulbs, mountain, music, piano, opera, machine, concert hall, 1815, bat, master control lever, cape, pressure gauge

Imaginary: time machine, Dracula, Nutty Professor, year 2525, time travel, blood thirst, transforming bat, bloodsucking dead person.

Figure 8. A student group's listing of real and imaginary aspects of the story they are writing

Because we have to write a journal entry in which we distinguish between what is reality and fiction in the story we have written. It helps us realize that things that seem real are not always so. And those that are not become surprising true.

Figure 9. A student group's "reason for the activity" shared with other groups on the network