Journal of Social Issues, Vol. 40, No. 3, 1984, 31–48

Encountering an Alien Culture

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This paper applies a cultural perspective to the problem of introducing novices to a new technology: computing. We suggest a general model of initial socialization composed of reality shock, confusion, and attempts at control. Cultural values and ideas contribute to the settings in which this socialization takes place, and one result of this socialization process consists of either cultural recruits or cultural dropouts. In a two-part study exploring the nature of novice encounters with computing in one university setting, reality shock and confusion were quite high and attempts at control were often unsuccessful. In this study when novices encountered computing, they learned more than skills: they learned cultural lessons. Novices acquired perceptions of the social organization of computing; they learned "we–they" distinctions and language; they learned values. This cultural learning, we think, will magnify differential outcomes of organizational socialization to computing.

In this paper we use a cultural perspective to try to understand people's initial encounters with computing. The effort is a first step in developing a general cultural analysis of computing. It may help account for many of the differences between prophecy and experience regarding computers noted in the previous article by Caporael. We begin by exploring some of the ways in which computing is embedded in a larger social order and suggest some of the ways in which it is alien to newcomers. We then draw upon

The research reported herein was supported by a grant to the first author from the C-MU Program in Technology and Society, funded by the Mellon Foundation, and a grant to the second author from the National Science Foundation, Grant # IST-8210701. We are grateful to Tony O'Dea, Ginny Connolly-Manhardt, Kay Hofmeister, Susan Elster, Herb Sendek, Keith Block, Monica Cellio, Jeff Kaminski, and Jeff Jury, all of whom participated in the collection and analysis of the data.

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0022-4537/84/0900-0031$03.50/1

work in organizational socialization to suggest how newcomers respond to it. Finally, we present a two-part study that investigates initial encounters with computing within one organization. The results of this study reveal that newcomers do indeed learn powerful cultural lessons about computing.

Computing as Culture

Cultural Context

It would be difficult for a novice to sit down at a computer or terminal today without encountering the culture that surrounds computing. Ideas about computers, if not actual experience with them, permeate our society. Thus in 1982, *Time* magazine named the computer "Man of the Year"; computer magazines are found on newsstands; managerial publications such as *Fortune* and the *Harvard Business Review* publish numerous articles on managing computing; consultants are offering advice on how to overcome "fear of computing." Schools and universities are requiring their students to take programming courses or to purchase microcomputers. Sales of machines to households are burgeoning. Computer camps are oversubscribed.

Cultural components of these phenomena include generally shared beliefs such as "everyone can benefit from computers," "anyone can use a computer," and "the more powerful the computer, the better" (e.g., Ogdin, 1982). The use of terms like "novice," "user," and "wizard" signal cultural roles and values (e.g., Steele, Woods, Finkel, Crispin, Stallman, & Goodfellow, 1983). Prevailing high evaluations of computing, despite inevitable technical and implementation problems, indicate that norms of the culture are uncritically accepted by many people (Kling & Scacchi, 1979). Although a cultural perspective on computing is not commonly found in the scientific literature (see Turkle, 1980, and Kling & Scacchi, 1980, for two exceptions), the popular press frequently describes computing subcultures. For example, Zimbardo (1980) and Levy (1982) have described the "hacker" subculture at Stanford University. Kidder (1981) describes a similar culture in an industrial setting.

Certain organizational features, found on college campuses among other places, foster the development of a computer culture. First, computers are used for many different purposes. On a typical college campus, for example, the same machine or machines may be used for research, administration, accounting, teaching, and text processing. These machines have operating systems and programming tools that make them relatively easy to use. Second, because these machines serve many purposes, many kinds of people have access to them. Third, this access is relatively direct. That is, people have their own accounts; there need be no intermediaries between them and the machine. Fourth, many of the people with direct access are students; they are relatively smart, young, have few family or economic responsibilities, flexible schedules, and the stamina to stay up all night. Fifth, colleges tend to be less bureaucratic and formal than most government, commercial, or manufacturing settings. In other words, where smart people with free time have direct access to flexible machines in nonbureaucratic settings, the culture of computing is nurtured and can flourish.

Every culture has values and norms, a language, a status hierarchy, artifacts, membership signs, and boundaries to distinguish members from nonmembers (Gamst & Horbeck, 1976). Although the specifics differ from campus to campus, some general features of the culture of computing are widely shared. The culture is an adolescent one. Pranks, tricks, and games are benignly tolerated, when not actually encouraged. Users can be impolite and irreverent. Mild larceny—faking accounts, stealing time, breaking codes, and copying proprietary software—is also tolerated, if not encouraged. The culture is individualistic and idiosyncratic. Social cooperation or coordination is rarely necessary. There is competition to write the best, fastest, biggest program or to build the best, fastest, smallest hardware. The status hierarchy is revealed through categorizing people as wizards, wheels, hackers, users, and losers. True members of the culture can be found at the terminal room or computer center at all hours of the day and night.

The Alien Nature of Computing

Computing is not just something new; it is also something strange. Its spatial and temporal characteristics, controllability, and nature of feedback are unlike those of other technologies. Consider a college student encountering a time-sharing system for academic work. In other courses students are free to choose the time and space that suit them best to do their homework, but students who work on a mainframe computer are tied to a terminal room and a time at which a terminal is available. When a student is reading a history book, the page never goes blank. If a student's pencil breaks, he or she can sharpen it. If a student is doing a physics assignment, the first wrong digit he or she writes on the page does not generate an immediate cascade of error messages. In contrast, computer breakdowns are not under a student's control.

In order for a novice actually to use a computer system, he or she must negotiate through a host of arbitrary conventions that are unrelated to the science or theory of computing. New students are thrown into a sea of unfamiliar syntax, I/O devices, priority classes, programs, and system quirks with no conceptual life vest to keep them afloat. These problems are compounded because computing is a scarce resource on every college campus; thus students can be forced to wait long periods of time just to gain access to the potentially frustrating machine.

The strangeness of these experiences is exacerbated by the fact that they occur in a social context with which other people are quite comfortable. This embedding of computing in the larger life of the organization distinguishes students' encounters with computing from those with the physics laboratory. While the instructional physics laboratory may also lead students to feel out of control, it is a sheltered environment apart from the real business of physics. By contrast, the new computing student must compete for terminal time and cycles with administrators who are managing accounts, secretaries who are typing manuscripts, faculty members who are doing research, students who are doing assignments, and hackers.

Processes of Encountering

The initial interaction between a novice and a new culture inevitably produces reality shock for the novice. Reality shock is composed of changes, contrasts, and surprises (Louis, 1980). Changes are simply objective differences from the novice's prior situation, for example, in title, work load, compensation, or location. Contrasts are differences in what is subjectively salient from that in the novice's former situation, for example, in images of surroundings, pace, ethos, and language (e.g., Smalley, 1963). Both changes and contrasts can be anticipated by the novice preparing to enter a new culture. Through anticipatory socialization (Merton & Rossi, 1968) a novice can ease his or her transition to a new culture. Surprises, on the other hand, are unanticipated differences between expectations and reality. For example, technical assistants and management personnel sent overseas often experience a role ambiguity and a loss of personal status quite unlike what they had anticipated (Byrnes, 1966; Higbee, 1969). Reality shock is important because it signals that prior instrumental behaviors are no longer appropriate and new ones must be learned. It is also important because it colors the early lessons learned in the new culture. Reality shock, and how it is managed by the novice and the organization, do much to define the process and outcomes of socialization (Church, 1982; David, 1971).

Reality shock leads the novice to experience confusion (Oberg, 1966). Confusion about self leads the novice to feel overwhelmed and to question aspects of his or her self-identity or self-image. "What am I doing?" "Do I look foolish?" Confusion about the environment leads the novice to question the capabilities and motivations of those around him. "Do those people really know what they're doing?" "Why can't they communicate clearly?"

Of course, everyone feels confused at times. In ordinary circumstances this confusion is alleviated by observing what other people do, or by comparing one's behavior to standards embodied in the environment (Carver & Scheier, 1981, pp. 168-170; Festinger, 1954). In an alien culture, however, clear comparative information is lacking. When in addition to this conceptual ambiguity there is an absence of emotional buffering mechanisms (such as enclaves set aside for novices), then people experience a loss of control (Thompson, 1981).

Reality shock and confusion lead novices to try to reestablish control (Bandura, 1977; Carver & Scheier, 1982; Thompson, 1981). These attempts can entail mental activity alone, e.g., constructing satisfying interpretations of the confusing events. And they can also entail actions such as increased effort or talking with other people about the situation. In either case, aspects of the culture play a part in the control attempts. They provide sources of information for constructing interpretations and people who function as comparators or standards against which the novices can judge their behavior.

If the control attempts are successful, the individual is able to learn the values and skills necessary for the new role. If the loss of control is too great and control attempts are not successful, anger or withdrawal arises (Brockner, 1979; Carver, Blaney, & Scheier, 1979). Anger guarantees that the novice remains an outsider, but it allows the novice to maintain a positive self-image. The angry novice might say, "These people are so crazy that only an idiot would want to act like them." Withdrawal also precludes positive socialization, but does not contribute to a positive self-image. The withdrawing novice might say, "I'm no good at this and there's no sense in trying."

If computing does represent an alien culture, then we would expect that novices' first computing encounters would engender high reality shock caused by changes in the amount, kind, place, and timing of work, and by surprises (differences between expectations and reality). Reality shock leads to confusion. We would expect that novices would be confused about their own capabilities and roles, and about those of the experts in their environment. The most likely responses to reality shock and confusion are attempts to exert control by using resources in the cultural setting. These resources might include other students or teachers who provide ideas and behavioral examples of control responses. If attempts at control are successful, the person has gained the potential of becoming further socialized and a cultural recruit. If control attempts are unsuccessful, anger or withdrawal ensues and the person is likely to become a cultural dropout.

Overview of Empirical Work

Purpose

In the spring of 1982, we conducted a two-part study to explore the cultural perspective on computing and some hypotheses derived from it. In Part One, we conducted a survey of liberal arts students to explore how their first encounters with computing differed from their first encounters with college generally. This survey examined the possibility that college, not computing, was the alien culture. The hypotheses were as follows:

1. For nontechnical students, the computer programming course differs from and violates expectations of "college work" more than do other courses. The experience will produce confusion about self and environment.

2. Students will exert more attempts at control in computer programming courses than they will in other courses—e.g., by talking with peers.

3. Students will have more difficulty finding constructive ways to exert control in programming courses than in other courses; more of their attempts will be unconstructive control.

4. Students will experience more socialization "failures" in their programming courses as indicated by withdrawal and anger.

Part Two of the study used interview data to explore these processes. We asked a group of liberal arts freshmen to talk with us about their initial experiences with computing to see if their descriptions revealed elements of the process we have described above. In addition, we were interested in whether the students' descriptions would reveal aspects of the culture of computing, its alien nature, and the cultural lessons learned that were not measured in the survey.

Setting

The study was conducted in the liberal arts college of a private university in the Northeast. Total university enrollment is 5,400; undergraduate enrollment is 3,900; undergraduate enrollment in the liberal arts college is 800. Computing is important on this campus. Currently, 83% of the students have a computing account. Almost every issue of the student newspaper has at least one story about computers and computing. The undergraduate catalog devotes over six times as much attention to the computer center as it does to the library (100 lines for the computer center; 16 for the library). The importance of computing on campus is reflected in the liberal arts college in several ways. Every liberal arts student is required to take an introductory programming course in the freshman year. Other required freshman courses also make use of the computer. The top administrators of the college and university value computing highly and express their positive opinions about computing frequently.

Part One

Method and Analysis

To compare computing courses with other courses, we administered a fixed-response questionnaire to 268 liberal arts freshmen (95% of the entering class) during a required social science course in the spring of 1982. We asked students to assess one course in each of four categories—English, social science, mathematics, and computer science—on a number of dimensions. Each assessment used the scale: 1 = false, not at all true; 2 = neither true nor false; 3 = true or very true of this course.

We compared course ratings via repeated-measures analyses of variance and by correlated t tests. A "true or very true" response was set equal to 1 and any other response was set equal to 0. (If comparisons were made such that 1 = false or very false, 2 = neither true nor false, and 3 = true or very true, then the findings would be stronger statistically but harder to interpret.)

The findings are based upon the responses of the 208 students who answered questions about one course in each of the four categories of courses. A typical student in the sample was enrolled in a computer programming course at the time of the survey (near the end of second semester, freshman year), and was also enrolled in a literature course, an interdisciplinary social science course, and in calculus.

Approximately 60 students were excluded from the analysis because they had not yet taken a computing course. This introduces a bias into the sample; however, it is a bias that works against our hypotheses. According to some of the students in question, they postpone computer science because they have heard it is "terrible" and they want to have the summer or the following year to concentrate on it. Hence the students not included in the analyses were likely to be especially negative about the computer course.

Results

Computing versus other courses. Table I presents the percentages of students who answered "true or very true" to questions about each course. These data indicate that students' experiences with computing were quite different from their encounters with other disciplines.

For the three items related to reality shock, an average 79% of the students answered "true or very true" about computing. In contrast, the average for the other three courses ranged from 20% to 27%. More students also reported being confused by their computing course, with three of the five variables having values at least three times the averages of the other courses. (The second most confusing course was English, which belies the idea than nontechnical students are generally more confused by quantitative courses.)

The attempts at control that we investigated were talking with others about the course and making causal attributions about good and poor performance in the course. Generally, more students in computer programming talked about the course with their friends, with students who had

Table I. Percentage of Students Answering "True or Very True" to Questionnaire Items, by Course[a]

Questions about socialization processes	My English course	My social science course	My mathematics course	My computer science course
Reality shock				
This course:				
Takes more time than I expected	28	19	17	78
Very different from other courses	22	40	19	82
My work habits in the course are very different	20	23	23	76
Confusion				
I feel I don't know what I am doing	11	8	20	59
I worry that I might look foolish	9	4	6	20
The course has a clear division of tasks	44	65	48	44
I feel like a different person when I am in class	14	11	12	24
I feel overwhelmed by the work	23	13	17	76
Control attempts:				
Talking to people				
I talk to friends about this course	68	66	61	87
I talk to my instructor	60	33	28	59
I talk to students who took the course in the past	38	45	41	70
I talk to other faculty about this course	9	5	9	21
I have talked to a counselor about this course	17	10	17	43
Class members help one another	32	52	57	71
Constructive attribution				
I am highly motivated	29	28	29	24
I really want to understand	64	68	78	65
When I do well it is because I work hard	72	69	65	72
When I do well it is because I have good ability	57	47	59	30
When I do well it is because the instructor is good	42	50	34	16
When I do poorly it is because I don't work hard	52	50	51	44
Unconstructive attribution				
When I do well it is because I have good luck	32	27	27	41
When I do well it is because the task is easy	26	30	40	27
When I do poorly it is because of poor ability	18	13	24	37
Outcomes:				
Academic success				
My performance is better than I expected	19	15	27	21
I am learning valuable skills	36	44	46	50
I am acquiring knowledge	66	77	71	56

Table I. Continued

Questions about socialization processes	My English course	My social science course	My mathematics course	My computer science course
Anger				
I get the feeling my instructors don't know what they're doing	16	11	33	59
This course makes me angry	27	15	28	72
I complain	40	25	40	79
Withdrawal				
I want to do just enough to get by	16	10	16	41

[a]The items above are grouped according to our theoretical framework. Correlations of each item with the total of other items in each category ranged from .08–.57, averaging .27. We performed repeated measures (Courses × Items analyses of variance, assuming correlated subjects' scores) on the data. All course main effects were significant at $p = .05$ or better (F ranged from 3.6–123, $df = 3$, 276–312). Degrees of freedom varied because subjects who did not answer an item for four courses were dropped. A few course by item interactions were significant. We assume this to mean that some items discriminated among courses better than did others, a trivial finding. We performed correlated t tests to compare computing with mathematics courses in each category. Differences were significant (computing was more negative) in the following categories: reality shock, confusion, talking to people, constructive attribution, anger, withdrawal (all t's > 2.10, df 60, $p < .05$).

taken the course in the past, and with counselors. The item, "class members help one another," yielded a 71% true response in computing, but averaged only 47% in the other courses.

Students in computing claimed they desired understanding and were as motivated as they were in other courses. But they tended not to attribute their good performance to their own ability. Table 1 shows that students made fewer constructive attributions of their performance in computing than in other courses, especially in English and mathematics. In addition, students made more unconstructive attributions about their performance in computing. When explaining their performance in computing, students tended to externalize their successes and internalize their failures: "When I did well it was because I had good luck," and "When I did poorly it was because I had poor ability."

There were no overall statistical differences across courses in the percentages of students who indicated that they were achieving academic success. Mathematics scored highest overall in numbers of students saying they performed "better than I expected." Social science was most frequently given credit for "acquiring knowledge." Computer science was most frequently cited for "learning valuable skills." On the other hand, the percentages of students who experienced anger and withdrawal were much greater in the computer programming course than in other courses. Over 70% of the students reported that computing made them angry. Forty-one percent said they wanted to "do just enough to get by" in computing.

Comparing computer science to mathematics (usually calculus) tells us something about whether the problems students had with computing were due to its quantitative nature. Our data suggest that computing was a more shocking and confusing experience than mathematics was, that it precipitated more talking to others as well as fewer constructive attributions, and that negative outcomes—anger and withdrawal—were significantly higher.

Some effects of background. Fewer students who had taken a previous course in computing (probably a high school course) experienced reality shock, $F(3, 294) = 3.0$, $p < .05$, but there were no other differences attributable to prior experience. Gender differences were significant for reality shock, confusion, and talking with others. Male students were more likely to experience reality shock in computer courses than were female students, $F(1, 98) = 4.34$, $p < .05$. However, female students were more confused by computer programming, whereas male students were more confused by mathematics, social science, and English, $F(3, 300) = 2.88$, $p < .05$. Consistent with these results, female students were more likely to talk with others about their computer programming course, whereas the male students were more likely to talk with others about their courses in mathematics, social science, and English, $F(3, 300) = 4.94$, $p < .01$.

Classification of students by outcomes. We classified students as potential cultural recruits or dropouts according to their answers to the outcome questions, and compared the resulting distributions for each course. This analysis, presented in Table II, is not inconsistent with our prediction that computer programming will produce more cultural dropouts and fewer cultural recruits than will other freshman courses. By our count, over one-third of the students in computer programming were potential cultural dropouts in that they reported no academic success at all (i.e., none of the three success items was checked as true). Only 8% of the students were potential cultural recruits who reported at least one academic success item as true and no anger or withdrawal. In contrast, the percentages of potential cultural recruits in other courses was much higher.

Part Two

Method

Twenty-five students, randomly selected from the 280-member freshman class of the liberal arts college, were invited to talk with us about their experience with computing. This procedure yielded 23 interview subjects. We interviewed each student, using 29 open-ended questions, during the

Table II. Classification of Students According to Potential Cultural Outcomes

Courses	Potential dropouts: No academic success items reported "true" (%)	Mixed cases: One or more success items, and some anger/withdrawal, items, reported "true" (%)	Potential recruits: One or more success items, and no anger/withdrawal items, reported "true" (%)
English	28.3	34.0	37.7
Social science	20.7	24.5	54.9
Mathematics	24.3	40.1	35.5
Computer science	35.1	56.8	8.1

spring of 1982. The questions centered on students' expectations about computing, their experiences with it, and their evaluation of it. For example: "Describe your first encounter with the computer [here]." "Please describe some occasion when you felt especially proud (unusually discouraged) about something that happened to you in relation to the computer." All interviews were tape-recorded; tape transcriptions were entered into computer text files for content analysis (Sproull & Sproull, 1982).

Two kinds of findings are reported below: frequency data that suggest trends and direct quotations from students that illustrate dominant or majority responses. At the very least, the data demonstrate the existence of the phenomena we are interested in. But in addition, we believe they can be viewed as the first steps in specifying the determinants and consequences of the process of encountering an alien culture.

Findings

Describing their experience. Four elements predominated in students' descriptions of their experiences with computing. They can be viewed as components of reality shock: time, the terminal room, actually working on the computer, and course-related factors such as lectures, homework, and exams.

Many students (68%) reported computing to be much more time-consuming than they had expected. They reported having to spend long hours at the computer center, often late at night, and having to schedule the rest of their life around the availability of computer time. As one student said:

> If a computer program is due that week, then the computer sign-up times range all over my entire schedule. I have to arrange everything else around that computer time. If I get computer time at 6:00, then I have to have everything else arranged around that. It just rearranges everything. If you work from 11:00 until 3:00 or from 1:00 until 2:00 or however you work, it arranges your time. It just totally re-does your schedule. (P16)[1]

[1]Alphanumeric codes are student identifiers.

Of the eight students who did not find the time demands of computing remarkable, four had no course experience with computing, three still acknowledged having to schedule around the computer, and one had a terminal in his room. But this student is the exception. Late hours, long hours, and constrained scheduling characterize most students' encounters with computing and constitute one component of reality shock.

The terminal room itself is a second component of reality shock. Most students (77%) find it somehow unpleasant, with the major complaints being about crowding and lack of privacy.

> There's so many people who want to use them. There're enough terminals but it's just that there's rush hours and you just can't get on at all and then it will crash during that time and it takes even longer because people will wait for it to come back up. Plus privacy. It's kind of crowded and you can't set your books down cause there's not enough space between terminals. (19)

Four students had no complaints about the terminal room, but an equal number had extremely negative reactions. One student said:

> I feel like I'm in 1984, cells right next to each other. It's like Russia. You've got to just get as many people as you can crammed in there. . . . The walls are all white. And all they have are computer information on them. Maybe they could have a picture of Picasso. Anything just to break the monotony. . . . All you see are computer geeks and computers and the Xerox machines and white on the walls. (Q17)

Actually working on the computer produces a third component of reality shock. A striking instance of this is seen in how students described their first encounter with the computer at college. For example:

> I sat down at this computer and started hitting the buttons and it started making all this noise and people kept looking at me. I didn't know what I was doing. I didn't even know if it was on. (C3)

And another student said:

> And the first time it's like, "Wow, a computer! I've never used one of these before. I wonder how it works? . . . You didn't know what you were doing. I mean, you knew because the teacher told you what to do but you were just like, "Oh well, I type this, then I type that and I hope it works. Here goes." (R 18)

The fourth major component of student descriptions of their experiences with computing is course work—lectures, assignments, exams. During the fall semester computing course, students' final grade was based entirely on a 5-hour programming exam—the mastery exam—taken at the end of the semester. Homework assignments in programming were optional. During the spring semester, homework was mandatory and the mastery exam carried less weight. Students were surprised that the lectures seemed to have very little to do with writing programs or the mastery exam. For this reason, three-quarters (73%) of the students who had taken or were taking a computer course evaluated the lectures negatively.

> I get the feeling from my computer teacher that he's just telling me half the story. That's all he is telling me because when I get to the computer I still don't know what I'm doing, even after listening to him in class. . . . He explains procedures and functions and major things, but he doesn't show us how to write a program. (L12)

The importance of the mastery exam was clearly a surprise in this course. Two-thirds (67%) of the students with course experience commented negatively on this feature of the course:

> That was the biggest change, when they told you everything was based on this one big final. All of a sudden, all of the pressure was on that one 5-hour test. (M13)

Reactions to their experience. Students described several ways that they feel out of control in their encounters with computing. Seventy-seven percent of the students reported such an experience. One common catalyst is ignorance:

> It's frightening when everyone else is around you just typing in as fast as they can, and you don't even know what to do. (E5)

Another is system crashes:

> I was almost finished with a program and it crashed. I didn't have a save. I didn't put save on. I had to start over. It was heartbreaking. (O15)

And a third is experts whose "help" simply emphasized these students' fragile positions:

> I was on the computer and something happened. I didn't know what was going on. I saw a guy sitting over there who looked like a real hacker. So I asked him, and he got up, and he started doing all of this stuff with my account without telling me what he was doing. He started messing around, "You need this. Let's see, I'll give you this file." It's like, "What are you doing?" He wouldn't tell me. (W23)

In attempting to gain control over their situation, all but one of the students who had taken computing experienced some success. Two-thirds were proud of getting a program to run, often after a great deal of work.

> I was just euphoric. I was just . . . I was so glad. I remember that night I went running home and there were some kids in my room. I was just going crazy and they didn't know what for. It was probably just the most basic program, but I was just so psyched-up that I couldn't sit still. (C3)

Over half the students who had not yet taken a computing course also had found occasion for pride in an encounter with computing. The student who used text-editing to type a letter thought it looked "very nice" (X24). One student took pride in logging on without help (N14). Another was proud of error-free output in a history assignment:

> Itook me 20 minutes one night, not to do a program but to get data from a program and run it. It came right out with no errors. It was perfect. I thought I did a good job. (O15)

Students also found occasion for distress; 82% reported some discouragement. Of those who had taken computing, one-third mentioned their performance on the mastery exam; almost two-thirds mentioned difficulty with trying to get a program to run. Other students reported discouragement with system crashes and a screen that scrolled too rapidly.

On the whole, particularly for those students who took a computing course, the negative experiences outweighed the positive ones. The combination of long hours, an unpleasant terminal room, confusing interactions with the machine, seemingly irrelevant lectures, a difficult mastery exam, discouraging times, and the feeling of being out of control was oppressive.

Cultural learning. In the aftermath of reality shock, confusion, and attempts at control, students learned some cultural lessons. Newcomers commonly have a relatively undifferentiated view of a culture's social organization; these students were no exception. The students had only a rough idea of how the formal responsibility for computing on campus is managed. One student, while admitting she had never thought of the computer center as an organization, was able to produce a helpful analogy:

> I just thought of it more like a library: a place where you use things that you can't use anywhere else. And they're there to help you with your classes. If you stretch it a little, you can think of the user consultant as a librarian, someone who advises you when you don't know what to do. (K11)

Only one other student was able to provide an analogy for the computer center, an analogy of a very different sort:

> They have little gnomes and they sit down in the basement...in big hot rooms, like the devil, and mess around with students and put errors in their programs. (J10)

Students' perceptions of the social organization of computing at the university were dominated by a we–they distinction: there are people who are competent in computing and committed to it, and there is the rest of the world. People who use the terminal room are divided into two categories: "we" who do not know what we are doing and "they" who do. "They" are also differentiated by special names, characteristics, and behaviors. Two-thirds of the students made this distinction.

Within this dichotomous view of the world, students made both positive and negative assessments of "them," although people making negative assessments outweighed those making positive ones five to one. Positively, "they" are viewed as very smart and competent:

> The amount of more intelligent people I've met down there....What I did on the computer seems so amazing to me....Then I thought that some of the people around me were doing such more complicated things and how smart they must be. (C3)

Negatively, "they" are viewed as being strange and difficult to talk to.

> Some people just live and die with computers. They sleep there. They don't get any sleep because they sleep with computers.... They can't relate to anything but the computer. They can't talk to a normal guy. Even when they talk, they talk computer language. It's like they've turned into a computer. (Q17)

In addition to learning the rudiments of role and subculture differentiation, students began to learn about the computer itself as a cultural artifact. This learning took the form of being able to use terminology properly, understanding that there are multiple computer functions and uses (and that this generality is valued), and not anthropomorphizing the computer. Employing terminology in their conversation is a sign of cultural learning.

> [I felt proud] the first time I had a program actually work on the computer. It had taken some work to get through all the debugging. I call it debugging now. It's just correcting errors. (A1)

Understanding that there are multiple computer uses for computers is another sign of cultural learning.

> It depends if I think about programming or if I think about using a computer. I don't like programming too much but when it comes to using a computer, like the Minitab system that manipulates stuff for you, I like that.... But I don't like programming the computer to do the stuff. (K11)

Differentiated thinking about computers was, however, not typical of these students; only five students exhibited some sense of differentiated function in their comments about computers. Some students still anthropomorphized the machine. Five students said something like the following:

> I mean, sometimes I feel like the computer is out after me. You know, everybody gets that feeling that the computer's after them sometimes. (Q17)

Personal outcomes. In assessing the effects of computers and computting, students distinguished between the effects on themselves personally and the effects on society as a whole. They are impressed with the capability and versatility of computers for society as a whole, believing they are the "wave of the future" (J10). But they were less positive about the effects of computers on themselves. In assessing the effects of the computer on their own activities as students, 15 students listed more negative effects, 6 listed more positive effects, and 2 listed equal numbers of positive and negative effects. One student who characterized the entire experience as "a fight," exemplifies anger.

> The whole fact that you have to fight to get on, you – the whole computer theory, everything about computing here is a fight to do it. It's something you don't want to do and you have to fight to get there to do it. And you have to fight to sit down and do it. And you have to fight the system to stay up. And you have to fight your program to make it work. And the whole time you're fighting the clock. (J10)

Another student, exemplifying withdrawal, said:

> Looking back, I'm really not afraid of computers, but I'm going to try to stay away from computers. I know I shouldn't, because it's probably the thing of the future. But I'm really kind of leery to get into any type of computing again. (C3)

A less common view was offered by another student, who exemplifies successful socialization. When she learned that she would have to do a history assignment on the computer the semester following her computing course, she said:

> I was glad that we were doing it on the computer. I don't know why. I just thought, "Oh neat, we get to use the computer again." (K11)

Discussion

We have suggested that novice encounters with computing can be interpreted by considering computing as a culture rather than simply as a tool. In a series of open-ended interviews, novices revealed reactions to computing which seem to have been influenced by the social order surrounding computing: by the attitudes and behaviors of people who are good at it, by the management of computing resources, and by the general perceived importance of computing in society and the organization. They also revealed different ways of trying to cope with the strangeness of computing, with more or less success. We believe these interviews reveal reasons for the differences found in the first part of our study. There is nothing in the way electrons flow, operating systems work, or programming procedures are written that explains the reactions we discovered. We believe they are explained, instead, by novice attempts to operate in and make sense of an alien culture.

The data are limited to one setting, one group of novices, and one point in time. Obvious next steps include investigating other kinds of novices, such as new secretaries; other responses, such as observed changes in work performance; and other settings, such as industrial and commercial organizations. There is some evidence that novices in work organizations experience disaffection with computing (Zuboff, 1982), but there has been no investigation from a cultural perspective. If a cultural perspective has merit, then research should be carried out to discover how reality shock and confusion may be altered in degree and kind within particular organizational settings.

Computing technology is changing so rapidly that the systems present in our study will soon be replaced by different ones. The questions that we ask about culture, socialization, and control are independent of any particular computer system, however, and are more tied to particular organizational settings. It is true that computer systems are always changing, but the social settings remain relatively stable.

In our study, novices to computing encountered a situation unlike that of their other new experiences in college. Teachers were relatively unsympathetic, the physical setting was unpleasant, the learning environment was confusing, and resources for coping were not available. This social context was associated with reality shock, confusion, and unsuccessful control attempts. Further, it taught some cultural lessons that we believe will magnify differences within the organization. Cultural dropouts will be estranged from an important and valued activity of the university. Cultural recruits will join the somewhat esoteric subcultures of computing and will promulgate their values, standards, and ideas.

The organization we studied values computing quite highly. But in their enthusiasm for computing, its managers and experts have created situations in which it is hard for novices to be equally enthusiastic. Like the overzealous tour guide who forces his charges to climb endless sets of steps for the perfect view, to eat sheep's eyeballs for the perfect culinary experience, and to sit through a 5-hour native poetry reading, this organization may be producing fewer recruits than cultural dropouts.

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