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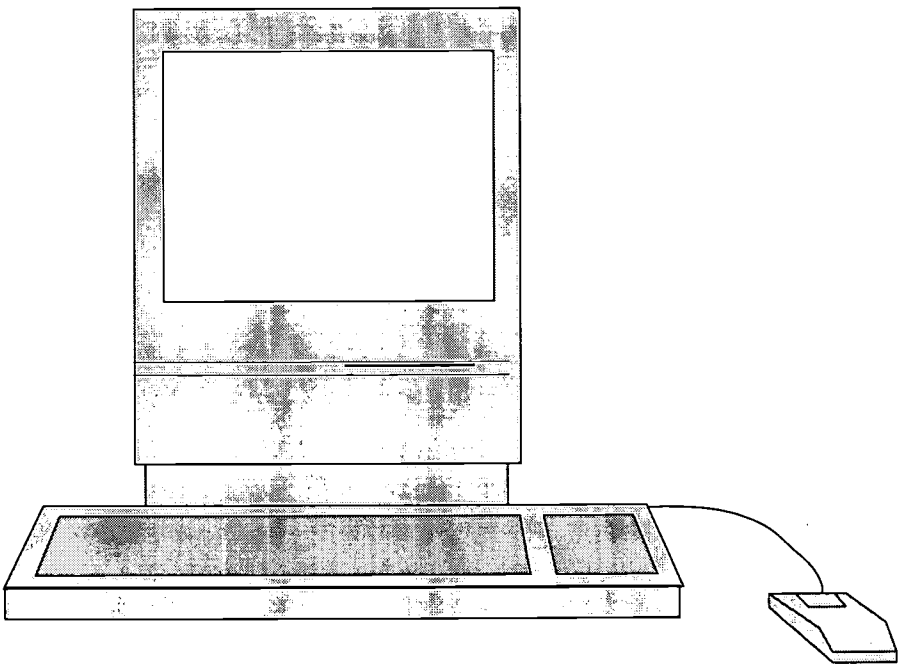
ABSTRACT

This paper presents results of a 23-day observation of 36 girls in all-girl math and computer classes at a public school's enrichment summer session for at-risk girls. Ages of the students observed ranged from 12 to 18. The students observed came to school with a long history of truancy, from homes where they suffered neglect and abuse. School was not a top priority for them. The same 36 girls were observed in 4 settings: a traditional, teacher-based mathematics class; a computer session that used a computer-aided instruction program for basic math skills; a class where students used to type using a tutoring program; and instruction and use of a spreadsheet program in a computer application class. The class was further split into two groups. One was in the math room for traditional math and computer-assisted instruction for 85 minutes, while the other group was with a different computer lab for typing and Excel. Then, the students had a 10-minute break and switched places. Findings from this observation revealed that this group of at-risk girls valued computers. They did not do well in the traditional school setting, yet they came to school with prior computer experience. They wanted to type. They wanted skills that would translate into a job, and did not value sitting in a class setting listening to a teacher talk and give work. When given a computer to work on, these at-risk girls were willing to listen and spend time in a classroom. The author concludes that it was the computer that changed the girls' behavior. Implications for educators are discussed. (Contains 18 references.) (AEF)

Gender and Computer Education

An Observation of At Risk Girls in Class



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Fall 2000

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Introduction

I am a math teacher at a residential treatment facility for adolescent girls. I was assigned to the basic math class after a teacher retired. My co-teacher had settled into the instructor mode while the other teacher was the computer guru and grader. I took over the guru and grader job! My job became setting up the computer system, assigning times and seats and deciding which computer programs to use. After a few days, I began to notice a difference from my previous non-computer classes. Some students whined loudly "When are we going to get on the computers?" Others avoided the computer at all costs.

As I circulated the classroom answering questions I began to notice how creative students can be. Instead of getting upset with the computer's constraints, they found ways to get around them. If the student had not begun to answer the question in 2 minutes the computer would give them a prompt and the question was marked wrong. To avoid this they would display their "daily report card" instead of the problems. They had found out that this was a "time-out" feature! I also noticed a student attacking the audio repeat button. She had found that pushing this button numerous times got the computer to work quickly through problems she did not like. It was a creative way to skip a problem. Wow! I now needed to keep my eyes open to any possibilities!

I discovered that many educators are interested in the use of computers in educational settings, especially education for girls. I wanted to see how girls work with computers in school so I decided to look into this area of research. Because of my particular teaching experience I choose to focus on gender issues in education. I narrowed my subject to girls labeled at-risk of academic failure.

What intrigued me most was the interactions between students when computers were used. How did they interact with the computer? How did they treat

each other? Did their action differ between the traditional lecture part of class and computer time? If so, how? I was busy teaching, answering questions, reading achievement reports, grading, going to meetings and taking classes. These were questions I did not have time to investigate while teaching during the school year.

I found a school where I could observe all-girl classes during summer session. I observed 36 girls in math and computer classes for 23 days. The students I observed came to school with a long history of truancy. They came from homes were they suffered neglect and abuse. School was not a top priority for them. My preconceived ideas about at-risk girls were shaken. I thought they would not be interested or experienced with computers. I thought they would not see value in education - that they came to school only when they felt like it and for reasons other than learning. I thought they would be self sufficient, not wanting or requiring any help. I thought of at-risk girls as tough, street kids who did what they wanted, when they wanted. I discovered a group of highly motivated girls. Instead of the street-wise know-it-alls, I found girls who were willing to learn more.

Current Research in Gender, Computers and Education

I graduated from high school before computers were used in secondary schools so my expectations came from what I read. I was intrigued by the perception among researchers that boys are more interested in computers. Boys have a history of outnumbering girls in computer classes. Some research showed that many more boys have a computer at home and that they used it more often than girls (Butler, 2000). Parents were more willing to buy a computer for a son than a daughter. The vast majority of computer software was written and advertised for boys. The first computer teachers were men, usually from the math and science departments. I got the impression that girls were not interested in computers.

To understand the interest in gender and computers we must first look at history. Computers were introduced into the educational system in the early 1980s. They were primarily used for programming courses. Computers were expensive and few teachers knew anything about them. Deborah Butler (2000) looked at literature and research on gender and computing over the past 15 years. She found that somehow computer classes were given the name "Computer Science," put into computer "laboratories" and thus slipped into the area of math and science (Butler, 2000: 225). The male math and science teachers were eager to get their hands on a computer. They were willing to try new things and even to take courses in computer programming and applications themselves. Thus, computers became a masculine thing.

Parents bought into this. In another review of literature, Rosemary Sutton wrote that "regional and national studies found that families of male students were more likely to own a computer than families of female students. Also, boys were three times as likely as girls to attend a summer computer camp" (1991: 481). Has this changed over the last 10 years since 1991? Butler noted that "boys still use computers more at home than girls do, a practice that is reinforced by many parents" (2000: 227). In an interview for *Technology & Learning*, Kevin Treu explained that these "subtle prejudices against girls fuel the flame that girls are not interested so it is okay to motivate the boys a little more" (cited by Holtzberg, 1997: 42). The question of a computer gender gap was genuine.

It was extremely difficult to change the notion that girls do not like computers. One person with first hand experience was Janese Swanson. She was the founder of Girl Tech, a web site created for girls, their families and teachers. She began her computer career as a programmer for Bunderbund. She created the game "Where in the World is Carmen Sandiego?" She was amazed when it ended up with a male twist. She set out on her own to start a company that would be more gender neutral.

She created a handheld recorder that uses voice recognition. She was quite upset when she saw the commercials for this "toy" with a young boy teasing his sister. The girl tried to get the recorder from her brother who played back his voice saying "NO WAY." This advertisement reinforced the notion that there was no way girls are going to use technology. This television ad was seen by millions of children, perhaps even some of the girls I observed. Janese's answer to the big business of computer and technology was to start another company using the internet. Here she did not have to rely on investors or big business. I listened to her present her story and message of gender and technology to mathematics teachers at the National Council for Teachers of Mathematics' national conference in April 2000. It was good to know that there was one person fighting to close the gender gap.

Many computer programs were violent in nature. They involved the shooting of something like rockets or cannons. The main character had to rescue the girl or find the treasure while creatures dropped bombs on them. Boys tended to prefer this type of software as shown by a huge consumer demand. Even today Butler said that "games that appeal to males continue to dominate game software" (2000: 227). In the mid-1980s, when the students I observed were born, programmers began to write software that would interest girls. The problem was that they choose stereotypical topics like visiting a shopping mall, dating, interior decorating and housework! (Sutton, 1991: 485). This attempt was not successful in gathering girls into computer labs across the country - or was it?

Janet Schofield, in her ethnography *Computers and Classroom Culture* , wrote that boys see the computer as a challenge. They wanted to see what the computer was capable of. They want to figure out how it worked and how to get it to work better or faster. They challenged each other over the number of problems they could solve, how many times they could win a game or how fast they could go. They challenged

themselves by trying to "beat" the computer in games like chess (1995: 155-160). During her observation of the open computer lab during lunch, she noticed that boys were less task oriented. They would laugh, fool around and socialize. They would help each other out and then brag about how gifted they were with the computer!

In contrast, Schofield noticed that girls came into the computer lab with a purpose. They would use the computer to finish writing a report. Some girls were working on articles for the school paper. Others were there to use an SAT prep program (Schofield, 1995: 158). Girls tended to use the computer as a means of getting a task done. As Butler said "girls prefer goal-oriented computer use" (2000: 226). I tended to think that some of the gender gap was a misperception of computer usage. Girls were computer literate. They just used the computer as a tool to get things done while boys saw the computer as a tool to be played with, investigated and expanded.

I researched articles and ethnographic studies of gender, computers and at-risk education. Much had changed in the past 15 years since computers were first introduced into schools. But the fact that gender was still a concern had not changed. The differences observed between girls and boys with computers still exists. But it was not a difference of good and bad. It was a difference of usage. Girls were interested in learning how to use computers.

One change to keep in mind was the availability of computers today. Even five years made a difference in the number of computers available for classroom use. When computers were first purchased for school use they were placed in a one room called a computer lab. There were not enough computers for each student in the class to use. Today, computer labs have more than one computer per student in the class. Another change was in the type of computer classes offered. When computers were first placed in schools the main class was computer programming. Now there were

numerous educational programs available. Computers were considered a form of technology and many textbooks, in all subjects, offered hints of how to use a computer for enrichment and remediation.

At-Risk and Special Education Students

The group I choose to observe was unique in research because the girls were labeled at-risk for academic failure. They had a history of abuse, neglect, truancy. Some had not been to school at all for the past year. Many had attended three different elementary school and two middle schools. By the time they reached high school age they attended class so infrequently that they had earned zero credit. Some of the students have lived on the streets. What does this group look like? What would they think of school?

The history of computer use with at-risk students showed that computers were the answer to remediation. According to educational research articles Sutton examined, she found "strong existing stereotypes that urban children need drill on the basics before they are capable of getting higher order thinking skills or problem solving suggest the potential danger in computer use in urban schools" (1991: 496). In this context I think "urban" meant children from low social economic status (SES) areas who were at a high risk for school failure. The potential to replace teachers with a skill and drill computer programs was a concern of both administrators and parents but it did not outweigh the usefulness of these programs.

You may get the idea of students sitting in front of computer screens like robots answering remedial addition and subtraction problems. But what actually happened turned out to be beneficial to both students and teachers. Sutton says that "it has been found in traditional classrooms, low-SES students need more active instruction, more feedback, more warmth, support and encouragement" (1991: 493). This was exactly what can be found in some computer classrooms. Students stated that they like the

computer because "it never gets angry" and "it is fair" (Sutton, 1991: 496). Schofield found that computers with tutoring programs increased the time the teacher had with lower students (1995: 27) and that student saw computer time "as relief from listening to teachers!" (1995: 145). So instead of a classroom full of robots you got a teacher who could circulate and help students when needed.

Programs that help students when needed were called Computer Aided Instruction, CAI. This included computer tutors, drill-and-practice and simulation programs. Students who used these programs showed increases in mathematical achievement (Woodward, 1997: 504). But there would be increases in mathematics with any additional practice. What matters was that students were willing to spend time on the computer doing even the most boring of math problems. Why? The key to CAI was its ability to individualize lessons, feedback, reinforcement, and rewards. Teachers spent time considering which programs met students' needs. Once the program was in use the teacher's time was freed up for direct interaction with students. An added benefit was that the student decided when to call on the teacher for help.

One ethnographic study of lower-track classes showed me glimpse of what school was like for at-risk students. Reba Page (1987) observed a public college-prep high school in a middle class neighborhood. She gave a clear description of an "at-risk" class. The students strolled in late, eating and chatting. Very few had done their assignment from the previous day. The teacher sat up front at a desk, reading a book, ignoring the class. The teacher knew that more students would stroll in late. The teacher reassigned the previous night's homework for classwork because he expected the students not do the work. Expectations for these kinds of kids was extremely low. The classes were boring and the students were doing their own thing. Even though this one observation took place in the late 1980's this example of educating at-risk students still exists. One classmate in my graduate class (winter term 2000) presented

his one day observation of an at-risk class that compared similarly with Page's. Would I find classrooms like this?

Another ethnographic study told the story of at-risk boys in an urban setting. The classes studied had all boys in the "special" class set up to deal with these students (MacLeod, 1995). Today more and more girls fail the education system, as seen by the increased population of my own school. The area of at-risk girls was not well studied. There were very few all girl schools or classes in the United States to study, as shown by the American Association of University Women Educational Foundation (Shamai, 1997). What worked for boys may not work for girls. What worked for at-risk boys may or may not work with at-risk girls. My decision to look at an all girl population was based on my own unique situation. I discovered there was little studied or written about at-risk girls, with or without computers.

The Method of Ethnography

Since I wanted to understand what was happening in my own classroom I decided to study a similar group. When researching the interactions in a class ethnography was a good method. Ethnography was a way of gathering qualitative data on a specific group. According to Wolcott; "Field work ought to inform us about how - and to some extent why - somebody does it . . .to help us understand similarities and differences between their ways and ours" (1995: 30). The "it" for me was the computer and its' transformation of my classroom. What were the similarities and differences between my more "traditional" class and my "computer" class? How had the computer changed my class? Then I had to find a place to observe.

I found a summer school program that was designed for at-risk young women. I asked permission to observe from the school and teachers. I received permission from the University's Human Subjects Committee. I also requested permission from the students and their parents or guardians. All names have been changed to protect the

identity of the school, teachers and students. I observed 36 girls in math and computer classes for 23 days. I spent about 72 hours in classes observing and helping.

I actively joined the group of at-risk girls in their classroom. I took notes on what I saw, what I observed, what I heard and how I was feeling. I rewrote my notes daily to reflect on all that went on. I used the book *The Ethnographic Interview* (1979) by James P. Spradley as a guide during my observation. I began to look for patterns in behavior and activities; who, what , where and when. Then I needed to try and understand the why.

Part of my ethnography included a written survey. I used open ended questions and in depth interviews to try and understand the why. I asked the girls about their past computer experience and any computer classes they had taken. I asked what they liked and disliked about the computer. (See Appendix 1 for a copy of the questions. I found I needed to include a face to face interview with each student to clarify their answers). I spent about 12 hours on interviews.

I began to "craft my quilt" by seperating pieces of information, looking for patterns and stitching it back together with facts (Wolcott, 1995: 21). I spent the rest of the summer working with pieces of information. I wrote up my observation into a paper quilt of ideas. Then I had to look for the most amazing and important ideas to share.

The School and Students Studied

The public school where I observed set up an enrichment summer school for at-risk girls ages 11 to 18. The school district used the term "at-risk" to applied to all students who had a history of school truancy and academic failure. These students usually had a lack educational support outside of school. So the school district tried to create programs to help students succeed educationally. This summer school session was a chance to get these girls back into the school system. The school felt that these girls needed a chance to see what education can do for them. Students went to

school for 3 hours, either AM or PM. They could earn 0.5 school credit. Courses were offered in language arts, science and mathematics, which included computer applications.

I observed 36 of the 40 girls who were placed in an all-girl math/computer class. They ranged in age from 12 to 18. (See figure 1 for their age distribution). They all were identified as at-risk for academic failure. The school counselor did a profile of the "typical" female student in the summer school session. She was 15 years old. She had attended 3 elementary schools and 2 middle schools. She was currently in the ninth grade because she has earned no high school credit. She had a history of school truancy, in many cases not having attended any school for the prior year.

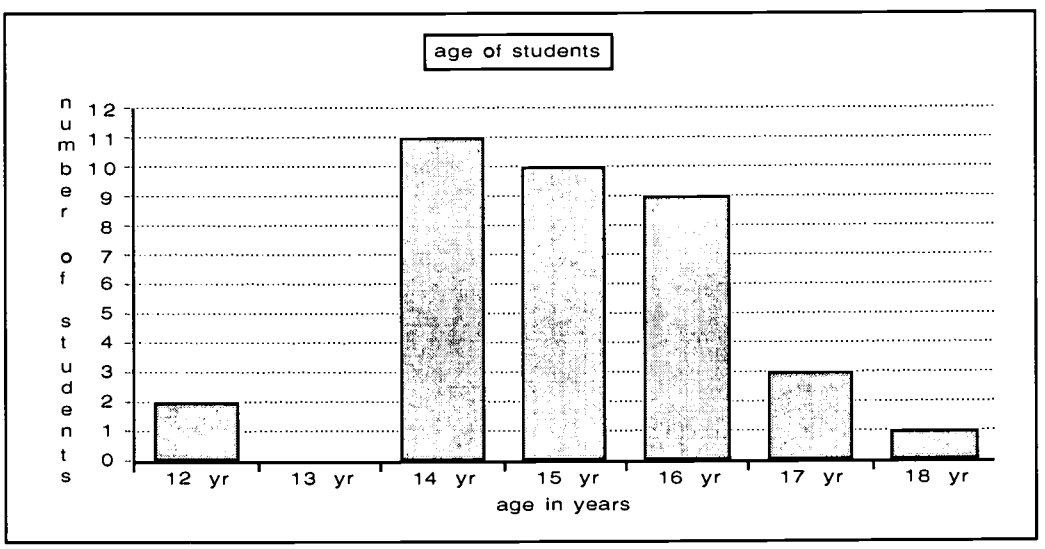


Figure 1: Chart of girls' ages

The girls I observed were from diverse backgrounds. Some were from the inner city, while some were from rural areas. Some were abused or neglected. Some had lived on the streets. Some have been involved with gangs. Some had just chosen to hang with the wrong crowd. The racial mix of the girls was 36% Caucasian, 56% African American and 8% Hispanic. Of the 36 girls, 15 qualified for Special Educational Services. They had been identified as learning disabled, emotionally impaired, attention deficit disordered or attention deficit hyperactive disordered.

During the regular school year, these identified students worked with teacher consultants on an individual basis. During the summer school, there were student interns from a local university that worked with individual students. Only one student in the math program had such an intern.

Class Set Up

Students were placed into classes according to their academic needs. The girls were tested using the Woodcock-Johnson Test for mathematics and reading. The girls who were placed in the mathematics-computer course scored below a 6th grade level in mathematic ability.

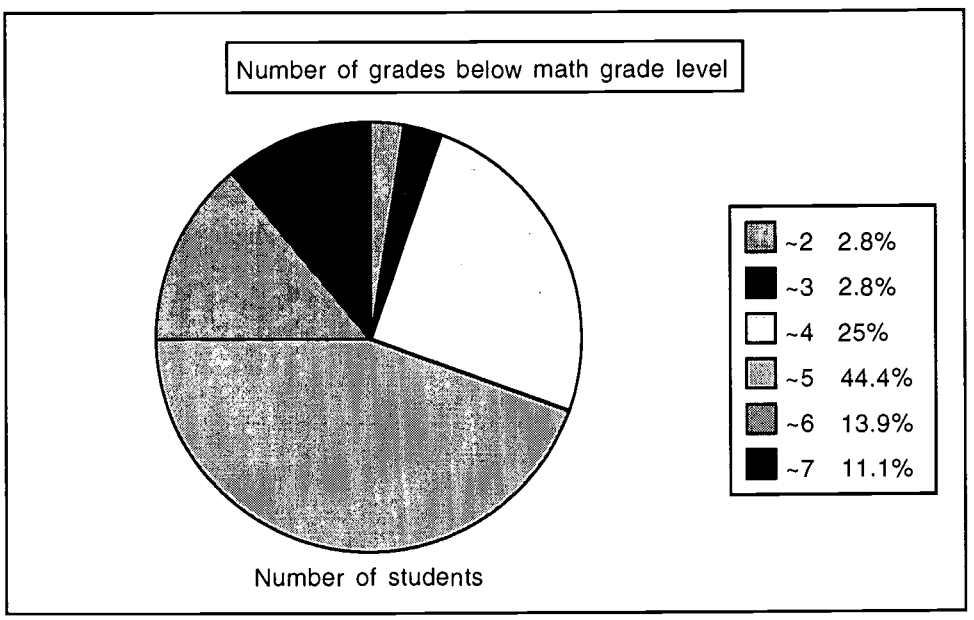


Figure 6: Percent of Students and Math Grade Level
This shows the number of grades students are behind in math. If a student is in the 10th grade but tested at 4th grade she would be 6 levels behind.

I observed the same 36 girls in four settings (see Figures 8 and 9 for classroom layouts). The first was a traditional, teacher based mathematics class; taught by Mrs. Doe. Second was a computer session that used a computer aided instruction, CAI, program for basic math skills; also taught by Mrs. Doe. Third was the students learning to type using a tutoring program; taught by Ms. Clampett. And fourth was the instruction and use of a spreadsheet program in a computer application class; also taught by Ms. Clampett. (See figure 7). The class was further split up into two groups. One group was in the math room for traditional math and CAI for 85 minutes while the other group was with a different computer lab for typing and Excel. Then the students had a 10 minute break and switched places. The student groups remained the same for the six weeks. So the variables became the teacher and the setting.

Mrs. Doe	Ms. Clampett
Traditional Math	CAI Typing
CAI Math Computer Session	Computer Applications Excel

Figure 7: Four Setting
Shows the teachers name and the four subject areas

Figure 8: Layout for Mrs. Doe's Math / Computer CAI Classroom

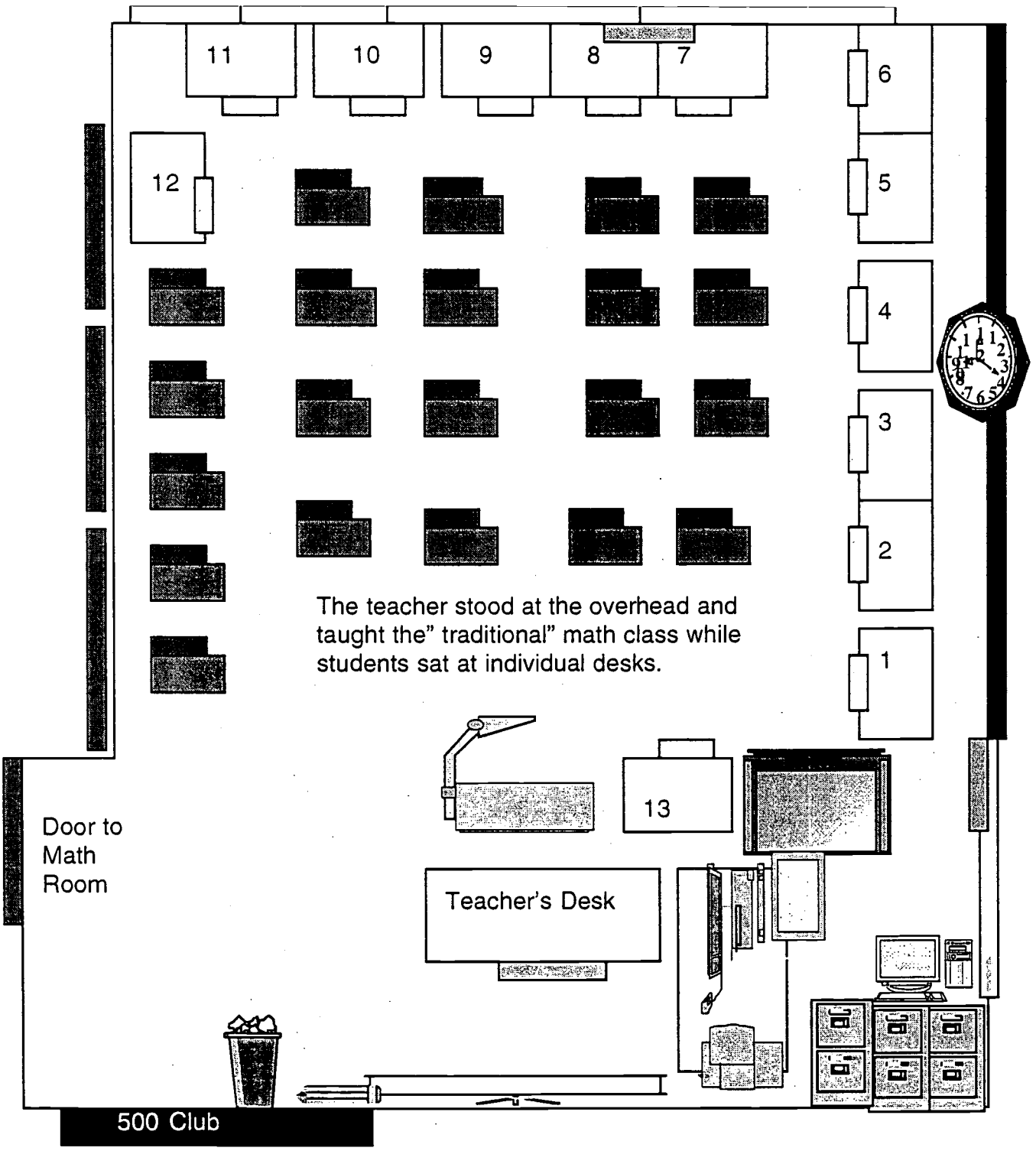
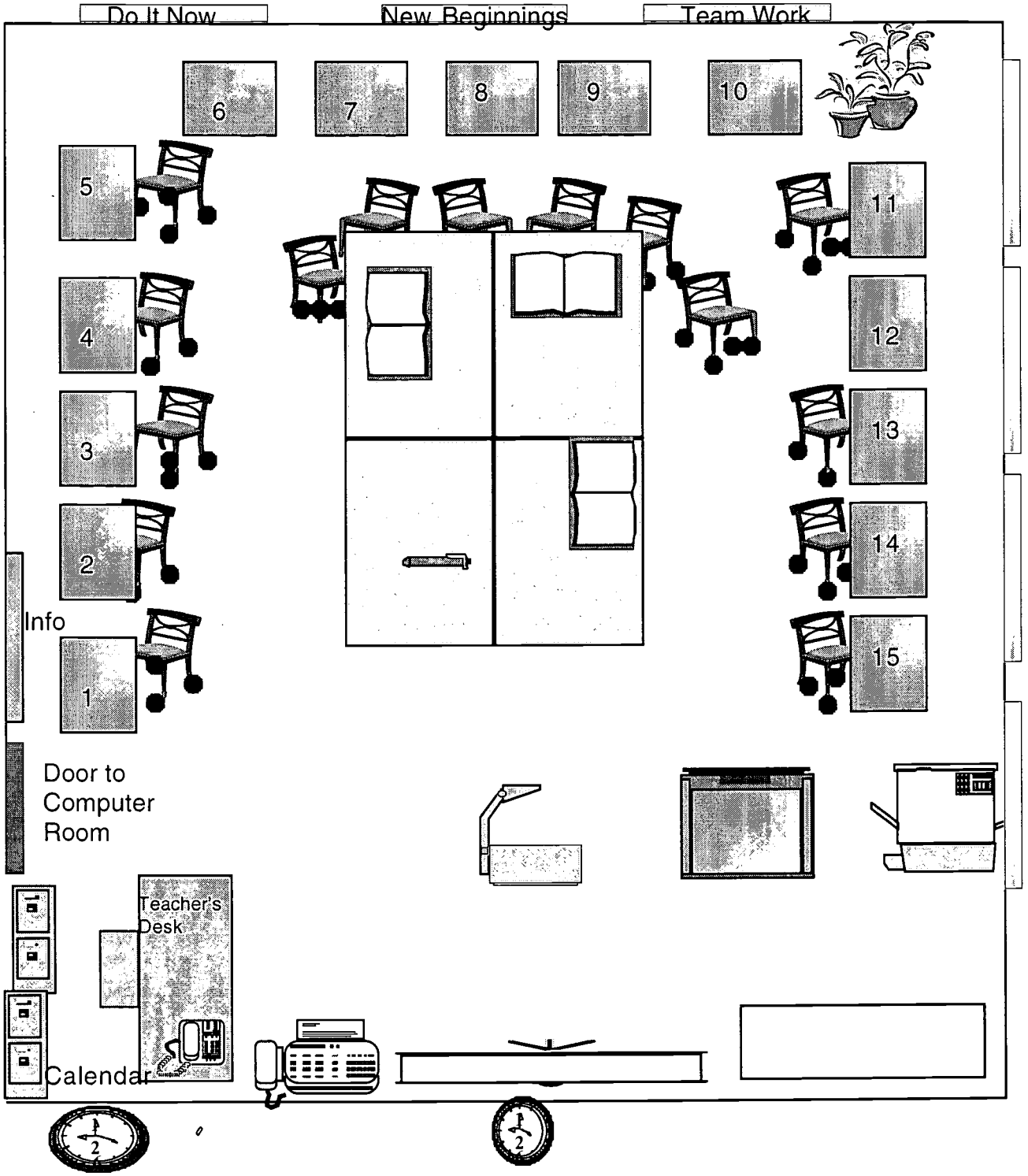


Figure 9: Layout for Ms. Clampett's Computer CAI Typing / Excel Classroom



Four Educational Settings

What amazed me the most was the difference the computer made in the culture of the class. Students were eager to get on the computer. Imagine sitting in a classroom where you can hear a pin drop. I observed this hour after hour. Students worked individually, quietly, sometimes too quietly. I do not mean to imply that more learning took place in a quiet classroom. Sometimes it was just the opposite, that students learn by discussion and explaining to others. So when I was observing a quiet classroom I took careful notice of what the students were doing.

First this quiet, peaceful atmosphere happened only when the girls were working on the computers. It did not matter which classroom, which teacher, which program or which group. The computers seemed to be the key element. The girls were seated at computers that line the outside of the classroom. The girls easily saw the computer screens on each side of them as well as the others across the room. When they were working on the math program some girls wore headphones. For the girls working on lower level skills the program spoke directions aloud. Other girls wore headphones just in case the computer would speak to them. A few girls asked when the computer would speak to them or why it was not speaking anymore. When they were told that they were at a math level above the computer's voice they seemed disappointed. The program had set a fourth grade level as the cut off point between voice directions and screen only directions. This gave a little hint at the math ability of these girls. Their average math level was half way through fourth grade.

Once in a while the computer session in math class was extremely noisy. One day a few girls started rapping in low voices. Some joined in singing "hi ho, hi ho, its off to work we go" and snapped their fingers. Others hummed their own songs. One girl unplugged her headphones so the entire class could hear the computer. One girl blurted out why didn't her computer talk? The noise just kept increasing. One girl

needed quiet to concentrate and usually chose to sit off by herself. She "hated" computers but would spend the required time on the computer. (Please read about Kari in Appendix 2). On this noisy day, she sat in the middle of it all. After 15 minutes I noticed that she sat in front of a blank screen. She said she had quit because she could not concentrate. What a day. But at the end of the class, I was able to check how many problems each girl did and at what percent correct. I was amazed. The range was from 28 to 104 problems in 25 minutes. The student with the 28 was not a disruptive student. Two students, one who was extremely disruptive, had completed 104 problems with 64% and 63%. This CAI program could be equated to classroom practice, not chapter tests. The program continually gave problems that were progressively harder. Even a score of 60% would be considered good daily progress. The class average was 57 problems with 72%. This meant that they were doing one problem every 30 seconds for the full 25 minutes! So even when this group was noisy, they were working on the computer program.

In the typing setting the girls walked into the computer room and signed right onto their assigned computers. They logged onto the Micro Type Pro program. The girls themselves had asked the teacher to learn to type so she set aside the first fifteen minutes of each class for self-taught typing. The girls were very interested in typing. They saw this as a valuable skill for their future. Some said they did not like to write and typing was faster, easier and neater. I watched as each girl went through the lessons on finger placement. The majority were finger pecking. They tried to line up their fingers and then used only their index fingers to type. I asked one girl, who was very experienced with computers, what she was doing. She replied, "Going faster than everyone else." (Please read about Lynn in Appendix 2).

In the computer application class I observed girls using computers with the Microsoft Excel program. They learned to set up spreadsheets for payroll. They had to

copy spreadsheets, then add formulas and format headings. Next they were asked to create their own spreadsheets using a set of data. The girls worked extremely hard on this. The classroom was sometimes quiet when all was going well. But there were times when the class was hectic. You felt when the students were frustrated. One day I counted 50 times in 30 minutes that someone asked for help! The girls' frustration was mostly due to their low math ability. They could not find the correct formula to enter into the spreadsheet. The problem "take year one away from year two" ended up with negative numbers when the girls know the answers should be positive. The girls had the correct cells but had written "year one - year two" instead of the other way around. Perhaps they had to face their lack of math skills and so spent more productive time on the math program in order to learn as much as they could. Perhaps CAI programs captured and held students' attention.

The more traditional teacher-centered situation contrasted with the three computer sessions. The students sat in individual, one piece desks in rows. They came into math class, sat down and went straight to work on problems that were on the overhead. Then the teacher gave a lecture on the day's lesson. Now this teacher had taught business classes and worked in an office prior to her teaching career. Each day she related the lesson to the world of business by giving real life examples. The lessons went along with the computer applications class by having the students work on salary, taxes and other deductions that have to do with payroll. Then the students were given a worksheet to complete in class. Since this was a summer school program the teacher did not use a textbook or give homework.

Even though Mrs. Doe worked to make the class relevant the students were more "off task" during the warm up and lecture times than in the computer sessions. Some students read notes, some wrote letters, one girl even wrote on another's arm! So much for learning to type because they did not like to write! Some girls talked to

each other and hardly paid attention to the teacher. During seatwork the teacher did allow students to help each other. Sometimes this was quality help and other times it was merely copying the work and socializing. (Please read about René in Appendix 2).

As part of my ethnography, I looked at the language the girls used. The meaning of words was important, as they may not mean the same thing to the observer as to the people being studied (Agar, 1980: 189-194). So I asked the girls to describe a "regular class" and a "computer class." Their choice of words demonstrated how they felt about school. (See figure 10 and 11 for their comments).

Comment	Traditional Teacher	Computer Teacher
write on chalkboard	6	0
teach at overhead	2	0
demonstrates	1	6
lectures	4	2
gives notes	3	3
tells, talks	8	6
explains, instructs	4	5
"bees boring"	3	0
work	"gives work" 4	"expects work" 1
gives assignments	3	4
grades	6	0
helps	8	1
at desk	"sits" 3	"not often at desk" 4

Figure 10: Student Comments
Shows grouping of comments from a face-to-face interview about the difference between a "regular" teacher and a computer teacher.

Comment: "Students..."	No computers	Computers
do their work	6	0
do their assignment	0	13
typing	NA	8
quiet	0	2
listen to teacher	6	3
are sent out	2 (6-7 students out / week)	1 (1 student out / week)
off task (talk, sleep, play, eat, write letters)	18	6
don't do work but pass	1	0
sometimes have fun	2	5

Figure 11: Student Comments
Shows grouping of comments from a face-to-face interview about the difference between a "regular" class and a computer class.

They described a regular class as a place where the teacher stands in front of the room and talks at them. By their descriptions you could imagine: the teacher wrote on the board and the students copied notes; the teacher gave the students work to do and then sat at their desk; most students were off task and spent class time talking and writing notes to each other.

A computer class was described as a place where the teacher gave directions. The teacher discussed what to do on the computer by involving students with their ideas and questions. Then the teacher gave an assignment. The students went to work on their individual computers. The teacher walked around the room helping. Students were described as being on task working quietly.

The girls noted a difference between "teacher talk" and discussion, work and assignment, off task and on task. Students showed they did not value talk and work by their being off task. Students showed that they valued discussion and assignments by being on task. I observed this in the classrooms. The "regular" lecture / classwork time was spent with most students not listening to the teacher talk. Overall, this time was

more noisy with social talk than any other period. In all three computer settings, I noticed a pattern of quiet concentration to the task at hand. I was amazed by the computers' impact on the atmosphere of the class.

Computer Experience

The girls were very experienced with computers. From their answers to my survey I found that 81% of these at-risk girls had used computers outside of school. Some of them said they had access to computers at home. Since these girls were from such diverse backgrounds home could mean with parents, grandparents or foster homes. I had the feeling that some had computers at home but had never touched them. A few girls spent time on computers every day! One girl answered the question of how much time she spent on the computer "24-7" meaning 24 hours a day, 7 days a week. She just "loves computers." (Please read about Chrissy in Appendix 2). A few students said they spent time each week in the library in order to use a computer. I had a hard time imagining these at-risk girls sitting in the library. But they saw the necessity of learning how to use a computer. And, not being in school, they found other ways to learn.

Over half of the girls had taken computer application classes before attending summer school. I phrased the question to include any computer class they might have had regardless of credit earned. So I cannot say if all 20 girls passed their classes. Nine girls had taken a computer applications class at this school. Also at this school, 28 of the 36 girls had worked on computers in other classes. These included the math class with the CAI math program, in science, in social studies, etc. They had worked off of interactive CDs and had gone on-line to do research.

Only four students had never worked on a computer prior to attending the school. Since coming to the school, three of these students spent a lot of time in computer classes. They had taken Business Tech, Video Art and Marketing. They had

worked on the CAI math program and with interactive science CDs. This school's goal was to get students interested in learning and providing needed job skills. They offered computer use in many different ways and these at-risk girls took advantage of this opportunity.

Only one student had no prior computer experience prior to this summer school session. She was 12 years old. Well, I cannot say no experience. She had played on the computer twice for fun, when she was working with a teacher consultant on school work. Amazing as it seems, these at-risk girls recognized the importance of computers and sought out any and all opportunities to work with them.

Learning Valuable Skills

The at-risk girls I observed were ready to learn valuable computer skills. As mentioned, they asked to learn how to type. The girls told me in interviews that they wanted to learn computer skills. One girl said she felt like a business woman when she sat at the computer. She liked everything neat, organized and fast. She would like to have a computer that is all in one without any cords or attachments. She mentioned that a teacher could just use the computer and have a paperless class. This showed that some students have noticed and thought about computers and their effects on education.

Another student who did not like working on the spreadsheet told me that she did see value in the skill. Her auntie was a model for her. Her auntie spent lots of time on the computer using it for shopping on-line and record keeping. Even though this student did not like Excel she saw the benefit not from school but from her experiences in society.

One day the teacher asked the students to work on typing all period. This was one hour and twenty-five minutes of typing! The computer teacher needed to give a lesson that required a math skill. The math teacher had not covered it yet because a

hands-on project was taking longer than expected. So that day, all they did was type, type, type. The teacher let them explore the other sections of the typing program. I was observing that day and granted relief the last fifteen minutes when I asked each student to answer my written survey! This long day of typing did not dampen the students' enthusiasm for typing. As students completed their exercises at the end of summer school, they asked to spend their free time on the typing program!

Are These Girls So Different?

Is the small population of at-risk girls I observed so different from other 12 to 18 year olds? Are these girls typical females? Did they prefer "girl" type software? Did they like to work in groups? Was their reaction to the CAI math and typing programs similar to other at-risk students who have been studied? I will now try to connect the girls I observed with what researchers have made general knowledge.

Feminine versus Masculine

Part of my survey included a question to see what these at-risk girls like to do on the computer. I wanted to ask an open ended question that would not hint at education or job skills. (See Appendix 1 for a complete list of the survey questions). I asked the girls this question: If you could create any computer program what would it be? I was taken by surprise when their answer fit the image of a stereotypical female. I thought these were tough street kids. I found that they care about hair, fashion and little kids. The answer to this question gave me a glimpse into what these girls value.

The corporate world of computer programmers could have sold a lot of "feminine" software to these girls since they responded that they would like to create outfits and hair styles. They even went a step further than on-line ordering; two students thought of a new "printer" that would allow the clothes to come out ready made!

During the last three weeks of the summer school session, the math teacher allowed students to work on a program called Math Investigations. The teacher was surprised at the positive response. The girl's favorite investigation was called "Cool Combinations." This fits into the idea of typical girls. The students worked a probability fashion problem with combinations of hats and sunglasses. The program used a CD so the audio and visual were enhanced with "music video" of a person wearing their choices. Lynn thought that more up-to-date effects would make learning fun. I asked her what she thought of this probability problem. She said it was the best one she had tried.

When I asked the girls a general question about what they had done on the computer many responded "play games." Well, there are a lot of games so I asked each girl what types of games they played. The overwhelming majority said *Solitaire* and *Hearts*. These games were usually installed on all computers when purchased. They did not go out to buy other computer games. A few girls mentioned that they would create a computer game. These were the four games mentioned: professional basketball; "Mortal Combat"; pinball; a game where the player travels around Puerto Rico with secret codes to find the Caribbean Sea. The basketball league and Mortal Combat were considered "male" type games. Pinball was nongendered. The Caribbean Sea game could be considered educational. Overall, the two games mentioned were the only two that did not fit a feminine stereotype. Janese Swanson still had a way to go in her effort to break down stereotypes and computer software.

Girls working together

Schofield found that girls used the computer for different reasons than boys. Sutton found that computer programs that portrayed females as active problem solvers were more successful at getting girls to work with computers (1991: 485). Butler wrote that girls "respond positively to software projects that require collaboration and

communication" (2000: 226). However, this was not what I observed. Parts of the math and Excel programs needed active, collaborative problem solving but I found girls who would rather work alone.

The Math Investigation program, mentioned earlier, allowed girls to work with a partner. They chose who they wanted to work with or they chose to work by themselves. After reading that girls preferred to work in social groups I was amazed that these girls choose to work alone. Some worked with a partner one day but not the next. Of the 36 girls in class, there were only two pairs that worked together on a regular basis. The girls I observed did not fit the research Sutton looked at. I wonder if the fact that they are at-risk had anything to do with it. Appropriate peer interactions was one of the skills that many of these girls needed to work on. They had spent a good part of their short lives depending upon themselves. Perhaps they did not know how to work together so they preferred to work alone.

I observed a different way girls worked together. I found students helping each other. In the Excel classroom, the teacher Ms. Clampett, did not want the students helping each other. She wanted them to work from the assignments given and then develop their own spreadsheets for the data given. She was constantly helping students herself and allowed me to help as well. Her concern was that students might just copy from each other without thinking for themselves. But students did help each other.

I observed one student who had already taken the Excel portion of the class from the same teacher. Lynn sped through the first set of assignments by completing all three steps at the same time. The assignments were set up so that students would copy a spreadsheet and save it. Then open it later to format the cells so you could read the entire label and number. Then reopen it again to add formulas. But Lynn did it all the first week! So Ms. Clampett allowed Lynn to become a "tutor." Lynn circulated

the room and answered specific questions. She tried to give hints like the teacher did. I asked her about this and she said she was really "agitated." She felt that the students were not listening to her. She wanted to scream at them. But during the entire interview she had a wide grin on her face. She enjoyed tutoring and a chance to use her computer experience to help her peers. (You can read more about Lynn in Appendix 2).

Chrissy was another students who I observed helping. She was absent the first day of class. She missed how to log-on the computer, how to save to a disk and retrieve her information. The second day she was in class ready to learn. She held her head high, her eyes constantly watched the teachers and she absorbed everything that was said. Then it was time to log-on and get to work. Chrissy had a bit of trouble. She got into the database program instead of the spreadsheet one. The teacher had to help her. The next day her confidence was lower. She had trouble logging-on and opening her saved file. The teacher was busy with other students so he girl next to her helped. The help she received was not a social, collaborative help. Chrissy asked a specific question and the girl next to her told her what key to push or what file to open. Then they both got back to their individual assignments. I thought she would require a lot of help throughout the session. But I was wrong. Chrissy had computer experience and loved working on computers. By the end of the third day she has caught up and passed the rest of the class in the number of assignments she was able to complete. She ended up being a help to the girls on both sides of her. (You can read more about Chrissy in Appendix 2).

CAI Programs

The school where I observed wanted to give at-risk students a successful classroom experience. The motivation of working with a computer might help get students back into a classroom. Some students had not been in school for a few

years. Some students had been shuffled around to many different schools. With computer use, they had a chance to learn.

Another of the school's goals was to teach math in a different way. The use of computers could be motivating for some students. The students I observed seemed engaged during math / computer time. I verified their effort by watching them work problems. They showed me their math reports with the number of problems and their percent. They commented that classes in general were quieter during computer time. They said they concentrated better. Even those who do not like computers said that time went by fast when they were working on the computer. They were actively engaged in learning. Some students thought the math level was too low, but they still worked for the entire computer session.

The math and typing program used in summer school were considered CAI. They were set up for individual learning. The computer helped out with a tutor as needed or requested. Both programs were simple to use. The background was plain. There was not a lot of distracting images or sounds. Students could concentrate on the task at hand. (See Appendix 3 for examples of CAI math problems). These programs are similar to the ones studied by Woodward (1997). I observed the motivation she wrote about.

The students I observed spent quality time on the computer. The teachers checked student progress daily. Students were not graded on the number of problems attempted but on the time spent on task. I observed students working hard on simple math problems. I watched as some tried to keep their fingers on the proper computer keys. I saw students who did not like the computer work diligently nonetheless for the full 25 minutes sessions.

Conclusion

I was expecting girls who would be indifferent to learning. Who would have a mistrust of teachers. Who would only want to spend the school day talking and being "off task." What I found were very few of these. The vast majority of girls were willing to accept and give help. Most students finished every assignment and more. I heard girls arguing over math! They cared about their grades by showing up to class, checking their answers and making sure that their work was printed and turned in.

What I discovered was this group of at-risk girls valued computers. These girls did not do well in the traditional school setting as shown by their history of truancy and low math ability. Yet they came to school with prior computer experience. They wanted to type. They wanted skills that would translate into a job. These girls did not value sitting in a class listening to a teacher talk and give work. They wanted instructions and assignments. I observed girls who would work elementary math problems for 25 minutes when on the computer. These same girls would not pay attention to the teacher for more than 5 minutes! Even when the teacher tried to choose problems that were real world related, paychecks and taxes, the girls would quickly write any answer. When given a computer to work on, these at-risk girls were willing to listen and spend time in a classroom. It was the computer that changed the girls' behavior.

I had a very short six weeks with these girls. I took time each day to go over my field notes and write down my feelings and observations. I tried to make connections. I am unprepared to answer the question of "why?" Why are the girls motivated by computers? What drew them into a public library to go on-line when they did not have internet access or a computer at home? I am unsure if the girls themselves could tell me why. I think this area could use some further investigation. There must be more to it than getting the needed skills to get a good job. However, I did come to the

conclusion that these girls need a good dose of reality as far as their attainable future goes. They want to be surgeons and judges. One area for further research could be what do at-risk girls see themselves doing once they are eighteen and out of school? What are their career goals and aspirations? This may give some insight into the usefulness of computer skills. The school I observed in is beginning a career program to allow all students a chance to use computers to look up career information. If my summer school experience is any indication of motivating at-risk girls, the career program may see success. It may also be a good starting place for research into the reality question.

Another area for research might be the use of the internet. I found some really good beginnings as to what they look up. When I read that a girl went on-line to look up artists I immediately thought of a rapper. When I asked her to clarify this in a face-to-face interview she said artists like in art class! She liked to look at paintings and read about the artist, especially Van Gogh. Is this typical of at-risk girls? Do they have a need for learning that we are not giving them in school? Or, was this just a one time encounter?

Along with the internet is the whole area of chat rooms. Many students I observed had been in chat rooms. They all told me that they knew they had to protect their identity on-line but that sometimes they were themselves and other times they created an image. They told me that they went into "teen" chat rooms. They said that girls in chat rooms could be nasty. When a new girl in the chat room began to talk with a boy the other girls would send messages to "leave him alone, he's mine." This is a whole new world to explore.

My expectations, and those of the researchers I read, were mostly shattered. I expected to find a group of tough, street wise kids. Instead, I found a group of girls. Under the tough exterior were girls who reflected our gender stereotype of any typical

teenage girl. They valued the computer because it was a useful communication tool. They did not spend hours programming or playing violent games. When given the option, they would use "typical" female software. They preferred programs that displayed clothes and hairstyles. They wanted the computer to be more personal with a face or voice. They looked up Van Gogh. I am still at a loss as to why. What I observed was eye opening. It reflected just a small image of a few short weeks in summer school for at-risk girls. Yet it can provide a wealth of information especially to educators.

Implications For Educators

My ethnography showed that this small group of at-risk girls can be successful in school. They can come to class. They can, and more importantly, they want to learn. Two of the girls I have highlighted, Lynn and Chrissy, had a history of truancy. They attended school sporadically. During the summer school session these two missed only one or two days. I contacted the teachers to see if this trend was continuing during the fall term. Unfortunately, they both had many absences once again. Perhaps the fact that they are not in all computer classes played a role. Perhaps the fact that they are back to a full day played a role. Perhaps a number of other factors played a role. But, these two girls were the brightest and most eager to help others on the computer.

By spending the six weeks as an observer, I was able to reflect on what was really going on in an at-risk classroom. I had a rare opportunity to see girls in an all-girl educational setting. One option available to schools is to offer single gender classes in a coed school. If this is too radical, there are conferences and camps available to girls only. My students have attended one day conferences for girls interested in math and science. One student attended a summer camp offered by a local university for future female engineers. This may be an area of interest to

educators who might be seeing a need to help girls in any subject area.

The educational system can adapt. We can make changes in our everyday classrooms to reach all at-risk students. With the availability of computers and software, teachers should have high expectations for at-risk girls and boys. I personally have experienced a wealth of computers at my school. We have used At-Risk Funds and Title One Monies to purchase computers and software for the core classes: language arts, math, science, social studies. We use computers daily.

My district is currently looking at the state of middle schools. I sit on the newly created Middle School Advisory Committee and the Math Curriculum Committee. I am appalled at the lack of computer use outside of computer applications classes. My district is beginning to change. One K-8 school has purchased a CAI program for math and reading. A few high school teachers have borrowed software I use to look over for a university course they are taking. A middle school teacher visited my school just last week to review the CAI program I use. So times are changing. As we replace our Apple computer labs with new iMacs the old computers are being grabbed by other teachers for use in their own classrooms. Now the district needs to keep up with adding network lines and a larger server to keep up with an increase in demand.

As you can see there are many things to keep in mind: cost, knowledgeable personnel, types of programs, implementation. But with a group of motivated educators these hurdles can be overcome. The first step is to determine what students' needs are. For my students I needed to remediate and challenge. As a group, the other math teachers and I looked at computer programs. We visited schools and talked to teachers. We went to conferences and absorbed information. We visited exhibits and talked to sales representatives. We then found a program that worked for us. I can remediate with the CAI, I can challenge with a self-taught algebra program and I can motivate with the Math Investigations. My daily challenge as an educator is

to hold my students interest so they can learn and are not disrupting the learning of others. For me this involves placing half my students on a CAI math program for 20 minutes while I help the other half with paper and pencil assignments. This way my students are motivated by the use of the computer and my personal attention. As you may be able to tell, I am excited about what I do and what my students can achieve.

My final advice to educators is to have high expectations for all students. If this group of at-risk girls provides any change in our perception it should be that they want to learn and are capable of it. They searched out computers on their own. They took computer classes and remembered what they learned even if they did not earn any credit. Computers were a motivator for this group to even do elementary math problems for 25 minutes a day. Computers can be used in any class, in any setting. But computers are not the only answer. It takes educators who care and are willing to continue learning themselves.

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Appendix

Name Class Period

cut line

Computer - Math Class Written Survey

1. Prior to *school name*, did you work on a computer?

   Did you have access to a computer outside of school? Where and how often did you use it?

   Explain any computer classes you took, even if not completed.

   Explain what type of things you did on the computer.

2. At *school name*, have you worked on the computer? In school? Out of school?

   Explain any computer classes you have taken at *school name*.

Code Name Class Period

Name Class Period

cut line

Explain any computer usage in other classes at *school name*.

Explain any computer usage after school hours.

Explain any computer usage at work, if you have a job.

3. What things do you like about the computer?

4. What things do you like about computer classes?

5. What things do you like least about computers?

6. What things do you like least about computer classes?

Code Name Class Period

Name Class Period

cut line

7. If you could design a computer program to do anything what would it be for? What would it be like for someone sitting at the screen?

Code Name Class Period

Individual Students

Note: I used the names of my high school friends as replacement names.
They do not remind me of the particular student but of being in high school together!

I choose to highlight 4 individual students. I choose these students because they represented the diversity of the students I observed. The first student was Lynn. I choose her because she is the most experienced. She was Caucasian. Her story went from knowing the spreadsheet to helping tutor students. The second student was Chrissy. She had some computer experience. She is part of the special education department. She asks each day for a hug. The third student hates computers. Kari is also a member of the special education department. She followed the teacher's instructions but would rather work on a worksheet than the computer. The fourth student I choose had very little experience with computers. René was a slow worker. She liked the idea of getting help from the computer tutor icon. All of these girls passed the class. These girls represented the range of at-risk students I observed.

As I looked back on these four girls I saw the reflection of the entire group. They told me of a love and a hate for computers. They told me of enjoyment and frustration. Yet, each one rarely complained out loud. Yes, I could tell by the way they sat in their seats how they felt. Some days they would be anxious to begin work. They sat up straight and concentrated without moving. Other days, they slouched in their seats, they wiggled, twisted and moved. Yet, they were working. They were completing assignments. They were learning how to use a computer. They were learning mathematics. No matter their prior experience, from none to having had the same teacher for Excel, they were eager to come into the classroom and get started. I had never seen this before. It amazed and surprised me. The one thing that thing that was different here was the computer. Its impact on the education of these at-risk girls was tremendous.

Lynn

Lynn was a fifteen year old girl who was still in the ninth grade due to a lack of high school credits. She did not like coming to school. Prior to attending to this school, she had her own personal computer she used everyday. She played games like solitaire and free call. She wrote letters. She hated handwriting and loved the idea of typing on the computer. She had taken a keyboarding class and a business technology class at her last school. She learned to use the Excel program. She had even been in a teen chat room on the internet. She found one by clicking on one from a search engine. She said there were a whole bunch of teenagers and stuff. "I guess they were, you never know these days." She did not use her real name and was not herself as she chatted away.

At this School, she took another business technology class and had a math class that used computers. She said summer school was the third time she had used the same booklet! The first day in computer class she had an old composition book with her. The teacher had passed out new ones to take notes in, but as the teacher was giving notes, Lynn was writing in her old one! I don't think she was writing notes because she had a lot more lines than the notes required. So much for not liking to write!

When it was time to get on the computer, Lynn was helping her computer neighbor. At the end of the hour Lynn called the teacher over and asked if she was to save her work. The teacher said yes and Lynn replied that "We have already done this." The teacher said yes that some of them had. She asked Lynn to help the other students save since they would not have time to show the class how to save. Lynn willingly went around to help those students around her.

The next day, the class started a warm up session. They were told to sit at their

computer and begin the first lesson on Micro Type Pro. They learned the fingering of the keyboard. At first the teacher was not going to stress keyboarding skills, but some of the students had asked her if they would learn it. This time allowed class to begin immediately and gave the teacher time to take attendance and get set for class. Lynn, who has had keyboarding asked "Is this all we are doing today?" To her relief the answer was no. I noticed that Lynn was using two fingers to type. I expected her to use both hands especially since she was an experienced computer user. I asked her what she was doing. She replied" going faster than everybody." At the end of the 15 minute warm up session the teacher asked the students to print their report. Lynn walked over to the printer and began to help out passing the first session reports out to the students. From now on the teacher would get the reports.

During the computer time the students were just beginning to learn how to lay out a spreadsheet. They just typed labels and values just as they see on the exercise sheet. After 6 exercises they did two critical thinking exercises were they laid out their own spreadsheet from a set of given data. Lynn was working on her computer. She was typing in the exercises and adding formulas! She knew that the next set of exercises asked the student to recall these and add formulas so she was doing it all at the same time. She was passing this information on to her computer neighbor! By the end of the hour, Lynn had completed exercises 2-8. The teacher told her to put her name and exercise number on each one and print them. Since she had already added some formulas she began exercise 13 the next day. I hoped the teacher had enough work to keep her busy!

The next day, Lynn began the day by finger pecking her way through the typing lesson. She talked to her other computer neighbor who was new to the school. At the end of the warm up session the students slid their chairs over to the table. The

teacher told the students to continue working on exercises 2-8. Lynn said "I'm on exercise 13, do you want me to help someone or keep going?" The teacher told her to keep going. Part of the reason was to let Lynn finish all the assignments. The other part was so that the students had a chance to work the exercises themselves. Some students struggled and gladly let someone else tell them what to type. This did happen with two other students towards the end of the summer school term. The teacher helped any student who needed it but in a guiding way. So, Lynn continued to fly through the exercises she had already done twice before.

The second week I observed the same students in the computer math room. Lynn was one of five students to arrive late. She quietly took her seat. She quickly did the math problems from the overhead on her warm-up sheet. Then she read a personal letter. Lynn was the first to get the newspaper to look up her stock prices. The students followed two stocks once a week to gather data they used the last week of the term in the other class to create a spreadsheet and chart. She asked the teacher if she was to do the some stocks as last time. When she was done, she placed the newspaper on the desk next to her, finished her worksheet on time and over time, then continued to read her letter. Another student finished her work and asked if she could get on the computer to start her computer session. The computer session was timed and students were required to do one session per day. It took Lynn about 8 minutes before she decided to get on her computer.

The classroom had a low rumble in it. Some students were singing, humming and calling out for help. Many students needed help with the stock market prices. Some of the computers were not cooperating with the sign in and they took "a long time to log on." The students began their computer time when they got done with their worksheet so some students helped each other at their seats, some worked on

computers and some called out to the teacher for help. Lynn was quietly working in the back corner of the classroom on her computer session. She called out "Done." The teacher answered back that there was enough time for another session. Lynn quietly signed on again and spent another 20 minutes quietly working. She sat up straight, used the mouse and number key pad. Her one foot was quietly tapping. She worked until the end of the second session. She talked quietly with her computer neighbor who had also finished two sessions this day. She told the teacher that she had a headache and needed a Tylenol. The teacher replied that there were only four minutes left in class, then she could go get some.

What a difference a day makes! The next day Lynn was again late for class. A student from the morning class came in to do "make up" work. The teacher had offered this to students who had missed a day. I do not recall this student missing a day. She was extremely distracted this morning and did not get her work completed. The teacher allowed her to come in. She chose the seat right next to Lynn. These two continued to chat and waste time the entire period!

The teacher gave the lesson and asked the students to work on the computer first, then they could do their worksheet and decorate their folders. Lynn and her friend chose computers next to each other and continued their conversation quietly. When the 20 minute computer session was finished, the two students returned to desks next to each other. Lynn got two worksheets from the teacher and told her that the other student did not understand the assignment and that she would help her. As students finished their class work, I asked if they would fill out my survey. Neither Lynn nor her friend finished their worksheet. By the end of the hour, Lynn was writing on her friend's arm. So much for hating to write!

You may be wondering what the teacher was doing this whole time? I was!

She was dealing with a few disruptive students. One could not decide between the green or the beige folder. She finally decided on the beige one. She wanted a blue one! This same student was playing with her headphones around her neck and singing out loud. A few other students were joining her in song. So two students talking quietly in the corner were not noticed.

Lynn said she did not like the math program. "It is very boring to me, it takes forever to get it over with, you get the same problems over and over again." Yet her behavior while she was on the computer was outstanding. She paid attention to the problem at hand and got work done. She was one of the first to reach 500 problems on the math program. She could not have done so many problems unless she was actually doing the work. The computer was set to do 1 problem in 2 minutes, so it would do 10 problems in 20 minutes. The computer would do 40 problems a week for 6 weeks and not reach the extra credit goal of 500! Lynn did it in about 6 days! She described computer classes "funner" and that "time goes by faster." She said that regular classroom teachers explain more but they talk more and class was "boring." So even working on a program that was boring was better than working in a regular class. She read letters in regular class to pass the time.

I went back to Lynn's computer class the fifth week of observation to find that she was the teacher's helper. She had completed all 20 exercises and the 3 problems that required graphs. She was sorting through all the in-box papers. She asked the teacher if she wanted her to grade them. Instead of grading them, she went over to students working on the computer to help out. There were still a few students working on the first 20 exercises. When I asked Lynn about "tutoring" she said it was fun. But, she was "agitated" when students would not listen. She said "they do not read directions, they don't know what they are doing, I feel like screaming

at them."

Lynn would create a computer program that would get children interested in using computers. She wrote "many children do not like computers these days you need computer knowledge and I feel if the game was interesting, children will become more interested in computers and learn how to use them." She would make it a challenge. She would use real people to get them interested and add music and sound. I wondered what she thought of the MI program. I asked her. She thought the "Cool Combinations" problem was the best. This problem involved combining sunglasses and hats to find the number of combinations. The computer used a CD to enhance the audio and video effects. It showed a teenager wearing the chosen sunglasses and hat dancing to music. This problem was what she had in mind in get younger kids interested in computers.

Chrissy

Chrissy was a fourteen year old girl who was eligible for special educational help. She was Caucasian. She had her own computer "24-7." She had used the computer in school prior to attending this School. She used it to take reading tests, do math and look up artists on the internet. The artist she liked the most was Vincent Van Gogh. This summer school enrichment class was her first experience with computers at this School. She liked to work on computers because they were quick, neat and organized. She admitted that "when I first learn something, like a new program, it is frustrating." She caught on to the computer fast and worked hard.

Chrissy missed the first day of class but she was ready to get started the second day. The teacher spent some time with her during the typing session to talk to her about the care of the machine and the computer disk. Chrissy was listening while taking her sweater off. She worked quietly, twisting her chair back and forth. When it

was time to get on the Excel program, Chrissy got into the wrong program. The teacher came over and showed her how to close out of there and double click the mouse on the correct problem. She was in Microsoft Access instead of Microsoft Excel. When the students sat at the table for instruction, Chrissy was the only one without her head on her hands or the table!

The next day Chrissy got lots of help. She was sitting low in her chair pulling the collar of her sweater. She asked her computer neighbor how to open a file. She called the teacher over to help her open the file from her disk. Once she got started she worked quickly. By the end of the hour she asked for help with exercise 7, the first critical thinking problem. At the end of class, the teacher came over to show Chrissy how to shut down. She told her "okay, take a break and we'll see you tomorrow."

The next day Chrissy had trouble remembering the password. Once logged on, she worked hard. She showed her computer neighbor how to open files and print the exercises that they had completed. Chrissy turned around and looked across the room at the printer to see if it was working. Chrissy again helped her computer neighbor but this time it was with the critical thinking problem that the teacher wanted them to do on their own. The teacher told the entire class not to help each other with the critical thinking problems. Chrissy asked me for help with recalling a file and adding a formula for sales tax. I read the problem out loud and let her work through it. Chrissy had been able to keep up with the class even though she missed the first day. Her questions were appropriate, she worked quietly and helped out when asked.

Now we go to the math room. Chrissy was sitting in her assigned seat doing the warm up problem. She asked the teacher if she could pass back the graded papers. The teacher said no, "it helps me remember names, but thank you." Chrissy replied "okay." A few minutes later, Chrissy asked if she could "pass out the new

sheets?" The teacher said "not yet" and finished the lesson. The teacher passed the worksheets out and Chrissy did not say anything.

The students were working on finding their stock prices. Chrissy told another student not to write in the newspaper. In this room, she was working on her seatwork with her head on the desk. When she finished her worksheet and stock price she got up to get on the computer. The teacher was standing by the computers and told her to get on a different computer than she was assigned because it was already to go. She would not have to wait for the log in. Chrissy replied that "I don't like this computer anyway, I think it is mad at me." She sat up straight with her feet on the rung of the computer desk. She called out "oh no" and put her head in her hands. Then I heard "I am not in first grade, I am really mad, I am not in first grade." I went over to explain that the computer would move her up to her level as she correctly answered the problems. That it would take a few weeks for the program to get to know her and for her to get to know the program. She checked her report card to see how well she was doing. When the bell rang she came over to me and asked for a hug. When I interviewed her, I asked her what she thought of the CCC program. She said it was "getting kind of annoying, it is too easy." She liked it when it talked to her because she understood her mistakes. So even though she thought the work was first grade level she made mistakes and learned from them.

The next day Chrissy changed her seat so she could see better. She was in the middle row one desk back. Now she was at the side of the room near me. I'm not sure how she can see better. She told the teacher she needed lined paper for notes. The teacher said it is on her desk and she could help herself. Chrissy said "thank you." She worked quietly on her worksheet and the computer. At the end of class we had time to chat informally as a group. Chrissy asked me if I know who CS Lewis

was. I reply that was the author of the Narnia series. Then I told her that I got CS Lewis and Lewis Carroll, author of my favorite book Alice in Wonderland, confused sometimes. Then another student joined in with her favorite book being the Secret Garden. We then moved on to Flowers in the Attic. Now it was time to go.

The next day, Chrissy found the currency table in the glossary. She called me over with her discovery. We together looked at money from different countries. We spent a few minutes and then she returned to her math lesson.

The fourth week I spent in the computer room. Chrissy was doing great. She was working on formulas. She showed me a quick way to copy formulas by just clicking on the cell you want to copy and dragging the box in the corner down or across to the cells you wish to fill. The teacher did not show the class this. It was a quicker and easier way to copy formulas! I watched her format the cells to two decimal places and right justify the headings. She asked how to do the net pay formula. I reminded her of her math class and asked how they did it in there. She then entered the formula to subtract the taxes from the gross pay. She saved this spreadsheet and printed it. Then she opened the previous exercise, also on net pay, and fixed this one by herself. For the rest of the 50 minutes in class she worked by herself without any more help.

When I asked Chrissy about what she liked about computers and computer class she said typing on the computer and that it was quick, neat and organized. She said she got frustrated when she first learned something. She began the class by getting the necessary help with logging on and opening the correct program. After she had the process down, she quietly helped others.

Chrissy told me that she would write stories and publish a book if she could do anything on the computer. She would like to print out pages that look like a book and

then bind them. She would sell the book but give her friends discounts! Maybe she could take the computer teacher's class where one assignment was to make a book. Students have to type poems and short stories using a word processor, print them out and bind them. The students got to create a cover on the draw program. I hope she had a chance to do this.

Kari

Kari was a 16 year old ninth grade student. She was part of the special education program. She was African American. Kari was not a fan of computers or computer classes. She got tired after about 20 minutes. Her eyes and body hurt. She got frustrated when the computer would not accept her answer. Kari had taken a typing class and a video art class. She used the CCC math program last semester at this School. But still she did not like the computer.

The first day I observed Kari, she worked on the CCC math program. She choose to sit in the back corner. She was all by herself with no neighbors around her. She worked on her session for 25 minutes. The teacher had increased the session time by five minutes because they have more time in class than the regular semester. The fall and winter term are on block scheduling for 75 minutes and the summer school enrichment term was 85 minutes. The teacher choose to fill the extra 10 minutes with more time on the computer.

The next day, I noticed that Kari headed for the corner computer but moved over to sit next to a girl she knew. She did not talk to this student even when she was disruptive. Her computer neighbor was reading out loud, interacting with others around her by talking and laughing. Kari did not join in this activity but kept working on her computer problems. Kari was drumming her fingers on the metal computer desk. She called out "it keeps giving me these stupid problems." She finally quit the

program by logging off the network. She did not sign out properly. I went to talk to her about this. She said she was frustrated. I checked her report and she had completed 54 problems with 28 correct. This was just about 50%. This program was designed to teach students what they do not know from the kindergarten to 8th grade. A 50% meant that she was able to do some problems and was being led through the process of solving those she could not do. The teacher stressed that this was not a test but practice, like homework.

A few weeks later, I again observed Kari on the math program. She did the entire session then went to her seat. She picked up a book and started to read. The teacher asked her if she wanted to go on the Math Investigation program. The students may select any problem they wish to work on and have the ability to quit when they want. The program uses a CD with music and video. She said that she did not want to work on the computer. "I don't like computers. I hate computers." The teachers said she must work on math stuff and offered her a worksheet instead. She accepted the worksheet and worked on it until the end of the class period.

I observed Kari in the computer classroom a few weeks into the spreadsheet lesson. She asked me for help. I offered her guidance and reassurance. I read the directions out loud and asked her what to do. The teacher consultants for special education students often read aloud instructions or use prompting questions to get the student to work through the process. I asked "what is gross pay? What do you do with taxes?" She was able to tell me that you subtract the taxes from the gross pay. She entered the formula, copying and pasting it. I then helped her with a critical thinking problem. She needed to go back and fix the exercise on income and expenses. She was organizing the data a little differently than what the teacher wanted. The teacher told her to look at the previous exercise and set it up like that.

Kari turned back to it but was not making the connection to the current problem. We turned back to the income and she set it up her way. She understood the concept of adding up income and expenses separately for the 2 weeks given. She was then going to subtract to find the savings. I left her to finish the problem.

The next week, Kari was redoing exercises she had turned in and gotten wrong. She had a payroll problem and was wondering why all her numbers were negative. The problem said to take expenses from gross pay and she had put in the formula to read expenses minus net pay. I helped her understand what the work "from" means and she was able to switch her formula. Again, she required the problem read to her with emphasis on certain words.

René

René was a fifteen year old ninth grader. She was eligible for special education. She was Hispanic. She had little experience with computers. Her sister was also in this class. Her sister had more computer experience and loved working on them. René had made cards, played solitaire and searched on-line for singers and their pictures. She has not had any school classes in computing. The summer enrichment class was her first formal computer training. The summer term was her first term at this School. She liked the idea that she could push a button and get help and that you don't have to write. She said that "kids" pay more attention to the computer than they did at the table.

René was a quiet girl. She was talking quietly to her computer neighbor the first week of class only when the teacher was not in the room. She raised her hand to ask for help. She accepted help from her peers and her teachers.

René used the "finger pecking" way of typing. But she paid close attention to the Micro Type Pro program. She liked the pull down menus. The computer teacher

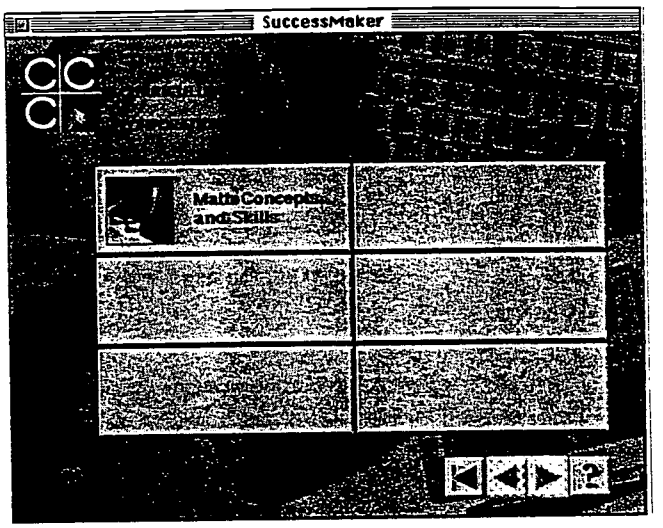
was stressing the icon tools but René kept using the pull downs.

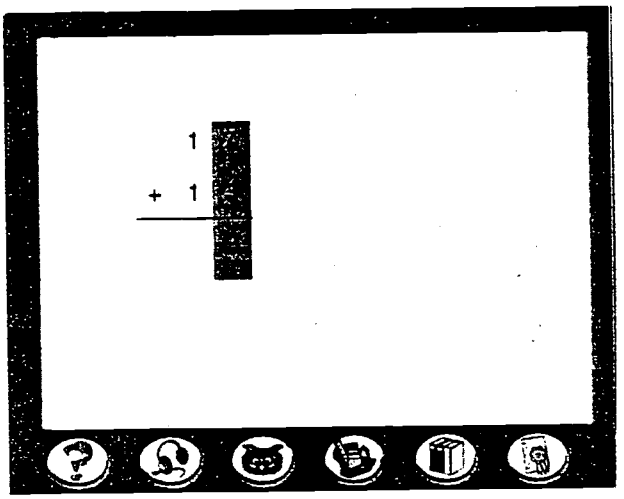
In math class, René worked slowly. One day the teacher gave the students a worksheet on overtime wages along with finding their stock prices. René got help from the teacher with the stock market prices. She then worked on the worksheet. Most of the students had finished and were on the computer. René asked a peer what the answer to the last question was, wrote it down and turned it in. Then she went to her computer. Her computer was talking to her so I plugged in her earphones. The computer only used audio if the students are working below the fourth grade level.

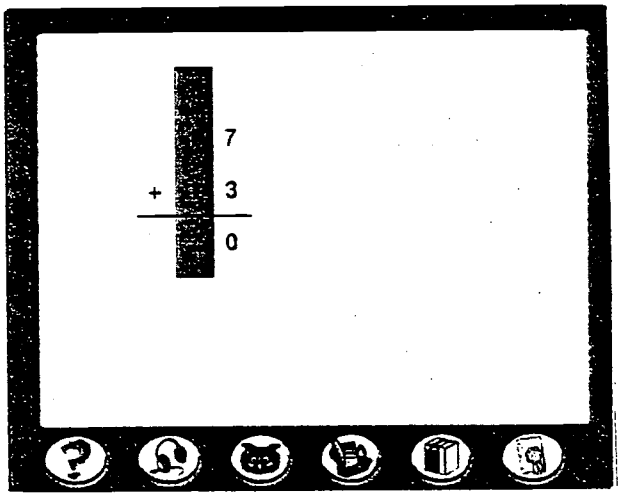
The next day she was late to class again. She worked on her computer session first. She worked quietly. After the 25 minutes, she returned to her seat to work on her worksheet. Today the lesson was on combining regular pay with overtime pay. René worked hard on the worksheet but turned it in 20 minutes early. The teacher noticed that it was not complete. She said "that's all I can do." She did not ask for help but was just turning it in. The teacher helped her with the incomplete problems. The classroom was noisy.

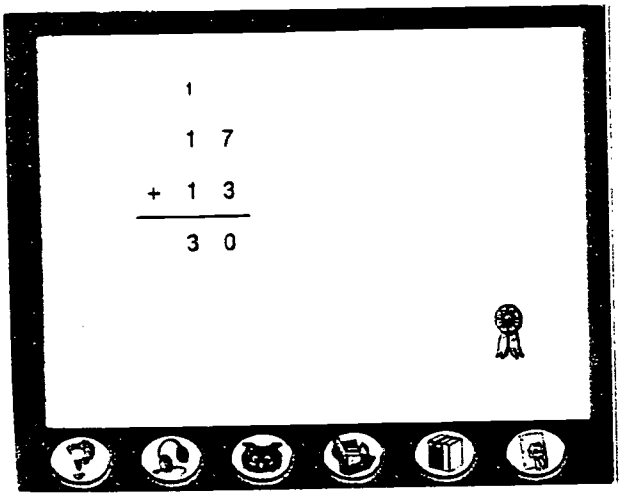
René was one student who could be easily overlooked. She was quiet and rarely asked for help. She raised her hand and waited to be recognized. In a class where students called out, she got overlooked. She accepted help if someone noticed that she needed it. She liked the computer because she could click on a button and get help when she needed it.

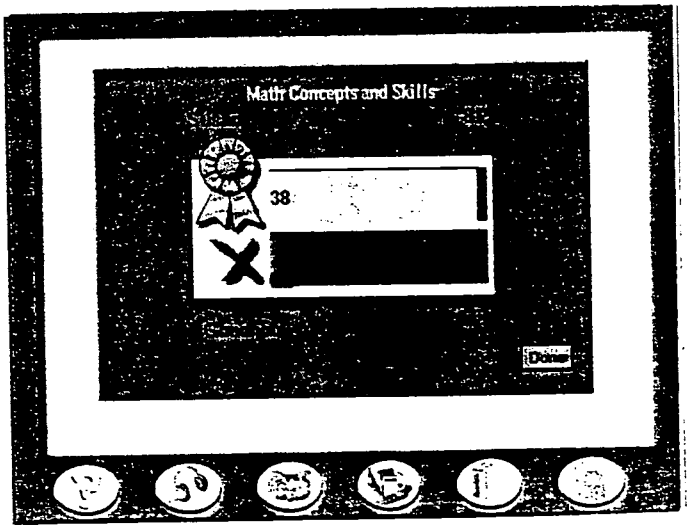
CAI Math Sign In, Example Problem, Daily Report

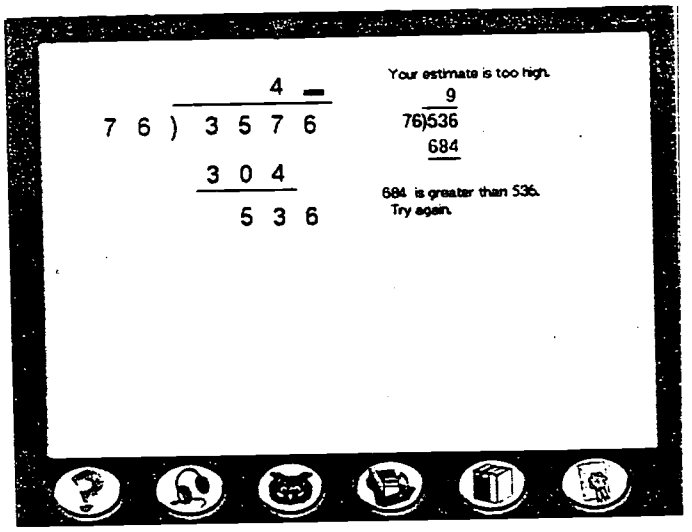


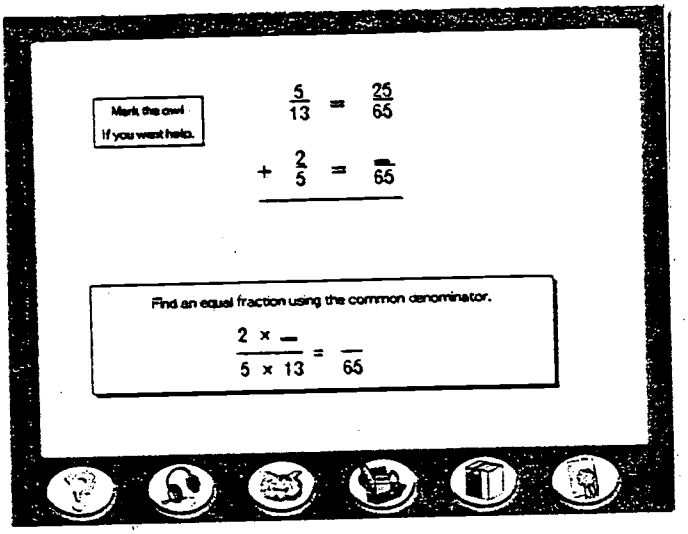


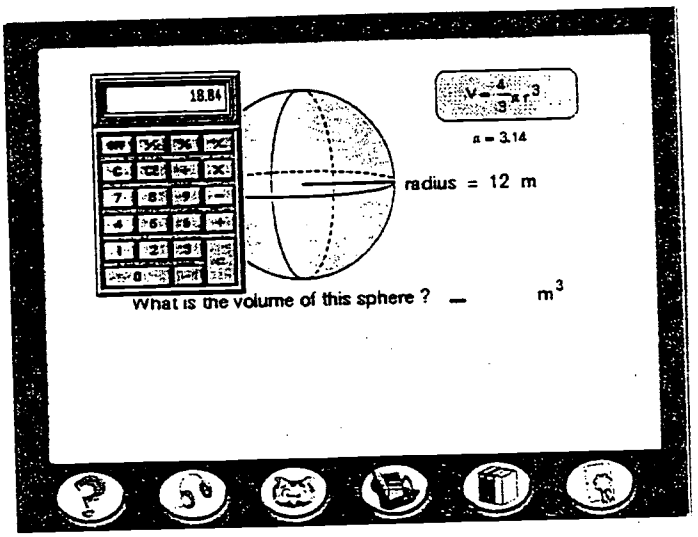


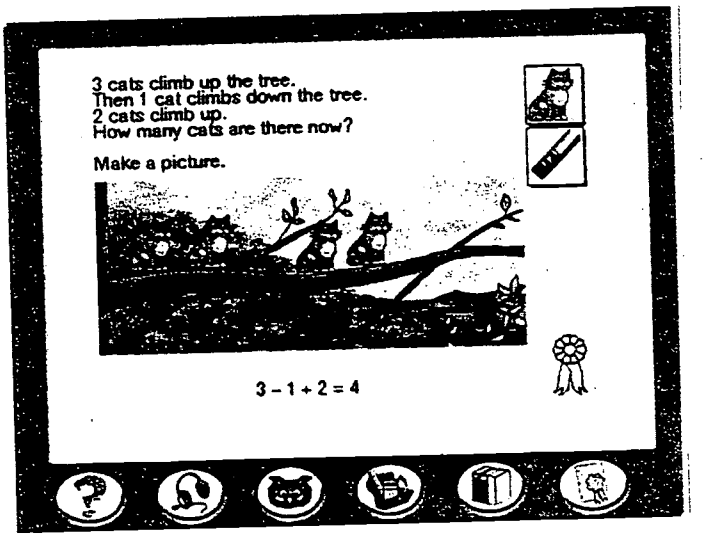


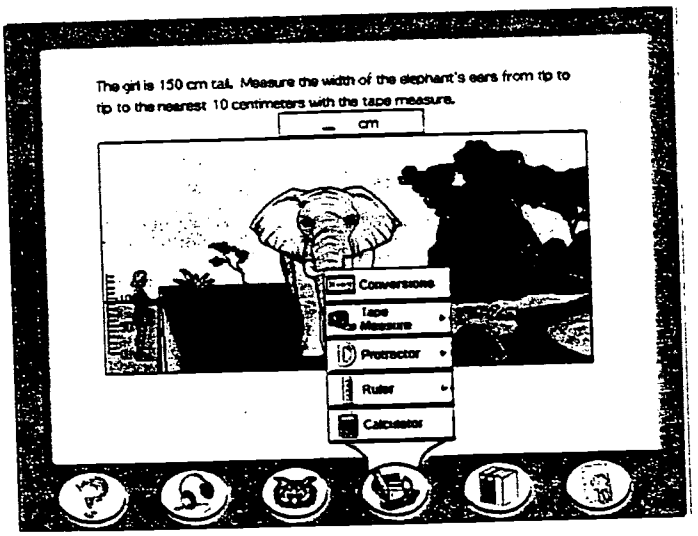


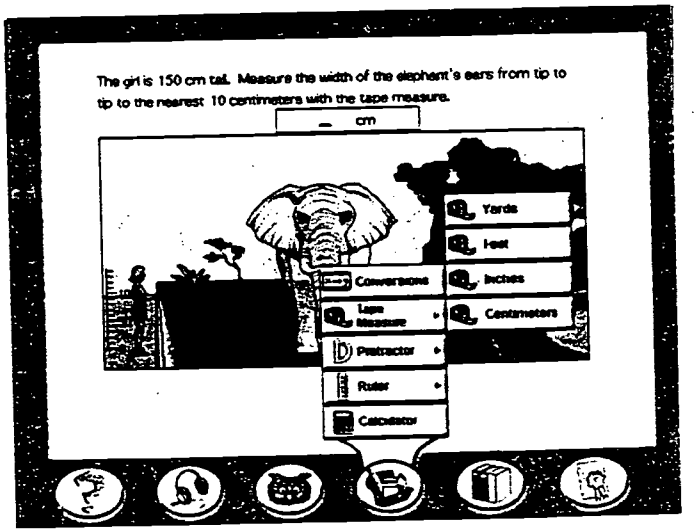












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