DOCUMENT RESUME

ED 348 521 CE 061 742

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|---|---|
| TITLE | SALSA (Southwest Advanced Learning System for Adults). Pilot Project Research Report. |
| INSTITUTION | Rio Salado Community Coll., Ariz. |
| PUB DATE | 8 Apr 91 |
| NOTE | 74p. |
| PUB TYPE | Reports - Research/Technical (143) |
| EDRS PRICE | MF01/PC03 Plus Postage. |
| DESCRIPTORS | *Adult Basic Education; Adult Literacy; Blue Collar Occupations; *Computer Assisted Instruction; Demonstration Programs; Educational Innovation; Home Study; Illiteracy; *Independent Study; *Literacy Education; Microcomputers; Reading Skills; Staff Development; *Telecommunications |
| IDENTIFIERS | Southwest Advanced Learning System for Adults; Workplace Literacy |

ABSTRACT

Researchers at Rio Salado Community College (Arizona) directing an educational research project, called the Southwest Advanced Learning System for Adults (SALSA), placed personal computers in the homes of production line workers as a supplement to traditional classroom basic skills training. Objectives were to determine whether this supplemental home-based computer education could shorten the time needed for factory workers to attain a desired level of reading competency and to determine whether other family members would perceive this learning system to be of value. Fifty-three Motorola, Inc. employees were issued computers for home use between August and December 1990. They received training in using them to access the NOVANET system for computer-assisted instruction. At the end of the project 40 were interviewed in groups; 17 family members were interviewed by telephone. Statistical analyses included reviewing employee and family data for patterns of computer usage. Thirty SALSA participants were paired with a control group of employees who received conventional instruction. These pairs were pre- and post-tested on the Tests of Adult Basic Education reading competency. Interviews revealed that employees in the experimental group and their families believed their skill and knowledge levels had increased. Critical variables affecting home-based computer use included perceived problems with initial training, hardware, and software; system downtime; and lack of clearly defined goals and objectives. Statistical analyses indicated greater gains for SALSA participants, but the gains were not statistically significant. (Appendixes include interview questions and answers and NOVANET course descriptions.) (YLB)

# SALSA (SOUTHWEST ADVANCED LEARNING SYSTEM FOR ADULTS)

# PILOT PROJECT RESEARCH REPORT

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ABSTRACT

SALSA was an educational research project directed by researchers at Rio Salado Community College. The project had two research objectives. The first objective was to determine whether home-based computer education, when used as a supplement to traditional classroom basic-skills training, could shorten the time needed for factory workers to attain a desired level of competency in reading. The secondary objective was to determine whether other family members would perceive this learning system to be of value in their homes.

The project represents the first time that satellite communications, telecommunications, and computers have been applied to increase basic skills training in the home. SALSA also represents an effective collaboration between industry and academia to improve literacy in the workplace. Project sponsors contributing equipment and services were Apple Computer, Inc.; Motorola, Inc.; U. S. West Communications; Rio Salado Community College; Businessland, Inc.; the University of Illinois at Urbana-Champaign; and University Communications, Inc.

Two broad research methods were used: interviews and statistical analysis. Fifty-three Motorola direct labor employees were issued computers for home use between August and December, 1990 to supplement traditional classes. At the end of the project, 40 of them were interviewed in groups. Later, seventeen family members were interviewed by telephone.

Statistical analyses included reviewing employee and family data for patterns of computer usage. In addition, thirty SALSA participants were paired with employees/students who were not issued computers for home use. These pairs were tested before and after the project on the Tests of Adult Basic Skills (TABE) reading competency. Pretest and posttest gains were reviewed and analyzed.

Interviews revealed that employees and family were pleased at how they were selected, thought the project was interesting and fun, and believed that their skill and knowledge levels had increased. Critical variables affecting home-based computer use included perceived problems with initial training, and with hardware and software, system downtime, the lack of clearly defined goals and objectives, the Persian Gulf crisis, and the holiday season.

Statistical analyses indicated that gains by SALSA participants were greater than for non-participants; however, it must also be noted that the gains were not statistically significant.

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## INTRODUCTION

The Southwest Advanced Learning System for Adults (SALSA) project was a preliminary effort to examine a unique way of implementing computer-aided instruction (CAI) to improve the literacy of factory workers. In this pilot project, personal computers were placed in the homes of production line workers who then accessed a remote CAI system known as NOVANET.

SALSA unites the known link between CAI and literacy improvement together with productivity improvement concepts that are a part of what business and industry refer to as human resource development. It is the first step in the implementation of a comprehensive productivity improvement plan.

The system begins by using CAI to improve the literacy of production line workers. Once the production line workers increase their literacy levels, the expectation is that their productivity will also improve.

The National Commission on Excellence in Education in 1983 and the Commission on Reading in 1985 both recognized that there is a critical need in the United States to deal with the persistent problem of adult illiteracy. SALSA began with the recognition that literacy in the workplace must be improved as well.

Leaders of business and industry are acutely aware of the problem. For the past two decades they have been watching productivity steadily decline in western economies while Japanese productivity has steadily increased. They view the fact that Japan has a more literate workforce as highly significant.

There are a number of experts who now believe that American businesses will not be ready to compete during the 1990s unless something is done to reverse the downward trend in the level of U.S. educational standards. The question becomes, then, what can be done to increase levels of literacy of working adults?

It is well known that CAI is associated with literacy improvement. But improving literacy through the use of CAI has not been directly linked to productivity improvement.

Productivity improvement is thought to be the result of the much broader category of human resource development (HRD). Training and development are a critical portion of the HRD function and it is here that the task of improving the literacy of production workers must begin. CAI, however, is not usually specified as playing a major role in this scheme.

The first step, then, was to combine the two key concepts: link the improvement of the literacy of production line workers through CAI with the expectation that productivity would also increase. SALSA is a forerunner of projects which will combine those elements.

SALSA used satellite and telecommunications technology to link home-based personal computers with a large library of CAI software (Figure 1). This link was established through the collaborative efforts of private business and higher education.

Employees of Motorola, Inc., were the project participants. In addition, Apple Computer, Inc., provided the personal computers. The University of Illinois and its University Communications, Inc., provided access to its satellite-based educational network, NOVANET and Businessland, Inc., provided additional hardware and support services. U. S. West Communications provided private home phone lines while Motorola provided 2400 baud modems for the participants. Finally, Rio Salado Community College, one of the Maricopa County Community Colleges in Phoenix, Arizona, managed the project and conducted the research.

The purpose of SALSA was to define and measure the benefits of home-based computer education as a supplement to traditional basic skills training which the production line workers received in Motorola classrooms. The research had two basic objectives:

1. To determine whether home-based computer education could decrease the number of hours for direct labor employees to achieve a targeted level of reading competency.

2. To determine whether other family members would perceive this learning system to be of value in their homes.

FIGURE 1: SALSA - SIMPLIFIED NOVANET ACCESS LINKS

```
                        SATELLITE
                      /         \
                 Uplink          Downlink   (Tucson)
                   |                 |
microwave  link ----    |                 |      --phone  link
               University        Link  Access
               of  Illinois      Unit  (Scottsdale
               (NOVA             Voc Tech)
               Computer)              |
                                      |      --phone  link
                                 SALSA Modems
                                 Home  Dial-up
                                 PC  Access
```

The two research objectives were the impetus for a six month pilot study to assess home-based computer activity of Motorola direct labor employees enrolled in basic skills classes. This involved assessing their activities with the NOVANET satellite communications network.

The research involved both qualitative and quantitative methods. The qualitative research consisted of interviewing the SALSA participants in groups during the last month of the project along with telephone interviews with selected family members. The purpose of the interviews was to define and identify the critical variables that impacted both employee and family member use of the home-based instruction system.

The quantitative research had two aspects. First, NOVANET usage was reviewed for patterns in two broad subsystems: Group Motorola (structured lessons) and M-World (games, notes, etc.).

Second, a pretest-posttest matched pairs' design was developed. Thirty employees who had the computers at home and were enrolled in reading classes were paired with thirty who did not have computers at home but did have reading classes. The reading classes were provided on-site at Motorola with a starting time that correlated to the various shift times. All sixty were evaluated using the Test of Adult Basic Skills (TABE). Pretest-posttest gain scores for each group were computed and compared.

# LITERATURE REVIEW

The implications of improving worker literacy through CAI usage are profound. SALSA is a first step in demonstrating that a theoretically based and practically applied system does exist between CAI, literacy gains, and productivity improvement of U.S. factory workers. SALSA has the potential for leading the development of a theoretical practical system that combines an established relationship between computer assisted or computer-based instruction (CAI/CBI) and literacy, and the theoretical connection between human resource development (HRD) and productivity.

Morever, SALSA is a natural outgrowth of CAI research and current thinking on how to improve productivity in the U.S. and other western countries with similar problems. The literature on CAI research will be examined first because it clearly shows that CAI does improve literacy and self-esteem. Then the work on human resource development will be reviewed. Current thought indicates that employers seeking productivity improvement must concentrate on the development of human resources. Exactly what specific kind of HRD is not clear, however. Thus, projects like SALSA are the forerunners in the development of a comprehensive theory of productivity improvement.

## CAI, LITERACY, AND SELF-ESTEEM

A great deal of work has been done in the computer-assisted instruction field so this review should be seen as representative, not comprehensive. Computer-assisted instruction (CAI) is also referred to as computer-based instruction (CBI). In this report the term CAI is used to mean both. Steel, et al.'s , defintion for CBI(1983) is used to define both CAI and CBI as the use of computers for tutoring, computer-managed teaching, simulation, and programming.

A review of this literature shows clearly that CAI is cost-effective and improves literacy in elementary, high school, and college students as well as in adults. CAI also improves feelings of self-esteem and self-confidence in these groups. In addition there is evidence indicating CAI is a good learning tool for Hispanics. This is of unique importance for project SALSA, which included a number of Hispanic participants.

The application of CAI is not a recent phenomenon. Pressy's "teaching machine" of the 1920s and Skinner's "programmed instruction" in the 1950s illustrate that CAI has been around for years. (Steele, et al., 1983).

CAI began widespread application in the 1950s. At that time CAI systems were typically large, centralized computers which controlled a number of terminals with only limited number of program choices. Today, microcomputers are used more often than before and the number of programs available has increased substantially.

## CAI IS COST-EFFECTIVE

Pressman, et al. (1984), shows that the use of microcomputers has helped to decrease costs involved for CAI systems, which include costs associated with hardware, software, user training, installation, and maintenance. In the 1950s, these costs were as much as $10,000 per terminal, plus $800 per month user fee. By 1984 these costs had been reduced from $3,000 to $500 per terminal.

Cost is always an issue in relation to CAI or any other training and/or educational program. In 1981 Harimun estimated that CAI could reduce training costs from fifty to twenty percent. Others, such as Goodroe (1986) make statements that CAI is "cost-effective" but offer little evidence to support their claims.

Perhaps the best evidence for CAI cost-effectiveness comes from Niemiec, et al.'s (1986), meta-analysis of 48 studies. That analysis found that CAI, when compared to peer-tutoring, produced the greatest gains per $100 of instruction.

## CAI IMPROVES STUDENT LITERACY AND SELF-ESTEEM

Steel, et al. (1983) found that fifth grade students gained in math achievement through the use of CAI. But they also found that CAI reduced the students' fears and anxieties and helped improve their confidence levels and understanding.

Glenn (1986) reports on a project using the Wicat system, which is a minicomputer based upon the Motorola 68000 processor. Thirty terminals were included and the system was installed in the Linton-Stockton Elementary School in Linton, IN. Students in grades four through six used the system for twenty-five minutes daily. While there were no gains in math and science achievement, a gain in reading comprehension was found only in grades using the system. Grades four and five went up two levels. While both students and teachers reported they liked the system.

Western Kentucky University's unique study used the Kentucky Early Warning System to broadcast courseware to rural elementary schools ("Kentucky's CAI Capability," 1986). Twenty-one schools in fourteen districts took part in the study. A mainframe computer linked up with sixty terminals. Students were involved with reading, math, and the language arts for ten minutes per day for 150 days. The average gain in reading was 1.93 years for grades three through six.

Swan, et al.'s (1990), study reported on thirteen CAI programs put in place in twenty-six elementary schools in New York City during 1987-88. Swan's investigation shows that, in spite of technical and administrative problems, a successful CAI program can be implemented in an active environment. SALSA's statistical analyses are similar to those used by Swan.

Swan and her investigators found gains in reading and math achievement. But, most important, they discovered that special education students benefited the most. They concluded that CAI can be an effective means for delivering remedial instruction in reading and math to educationally disadvantaged groups.

High school students, too, benefit from the use of CAI. Kinzie and Sullivan (1989) did not find any significant differences in science achievement scores when CAI was used. However, both their control and experimental groups were given instruction during the research. This may have negated any CAI effects on achievement. Yet, they did find that the students preferred to study science using a computer, which they interpreted as a positive, motivational effect.

Kulik, et al.'s (1980), meta-analysis of fifty-nine evaluations found small but significant achievement gains with CAI and university students. Instruction time was reduced. They also found positive effects on student attitudes.

HISPANICS BENEFIT FROM CAI

More recently Vesical (1989) reports on a computerized reading and language program at Rancho Santiago Community College in Orange County, CA. In her reading lab program, 95% of students were classified Limited English Proficient (LEP). She also worked with "at-risk" Spanish-speaking youths. In the year since computer-assisted learning had been added to her program, reading has increased by two grade levels.

Hispanics, in particular, may find CAI motivating. Thirty percent of Kinzie and Sullivan's subjects were Hispanic. In that study no significant difference was found in achievement scores but 79% of participants did favor learner control over program control.

Why this should be? Lopez and Harper (1989) addressed this question. The common advantage of CAI, they say, is student control. Lopez and Harper conclude that CAI has strong appeal for Hispanics because Hispanics have higher levels of internal motivation (equating to control) than some other groups. For example, Hispanics in the study chose an "optional practice" category more often than did Anglos.

## ADULTS BENEFIT FROM CAI

Askov and Cole (1985) noted that computers have been used successfully to teach basic reading skills to adults, primarily using Control Data Corporation's PLATO. Askov and Cole were developing a program for nonreading adults using Apple IIe computers.

An adult basic education group using IBM's Principals of the Alphabet Literacy System (PALS) had a 1.73 year mean gain in reading for twenty weeks of instruction ("Literacy Program...", 1987). An additional benefit, was that the program positively changed participants' thinking. According to the report, their self-confidence and esteem increased.

A report by Day (1988) shows that adults and children can both benefit from CAI at the same time. Six Apple computers were used by the Botelle Elementary School in Norfolk, CT, to provide children with a "high degree" of computer literacy. An unexpected result was that a number of adults were "curious" to find out what was going on. The school offered five free lessons and fifth and sixth grade students were assigned as tutors. Day reports that the adults found the experience "new and exciting," and the children learned responsibility while their interpersonal and communication skills improved.

## CAI IMPROVES ADULT LITERACY

Turner (1988) states that CAI works in improving adult literacy because of its privacy, immediate feedback, individualization, control, and flexibility. Adult illiteracy is the "hidden handicap," i.e., adults who cannot read are thought by others to be ignorant. However, CAI does not include overt or implied inequalities: all users are treated the same. Thus CAI is a nonthreatening means of instruction for those who might otherwise feel embarassed to talk about their lack of literacy skills

In addition, CAI is self-paced and therefore infinitely patient. It is flexible, too, so that adults with children, jobs, and other commitments can schedule CAI at their convenience.

Perhaps most important, though, is what Kozol (1985) referred to as "empowerment." Adults involved with CAI found that they had more control over making decisions about their own education. For example, they made their own decisions about when and how long to study.

Today, reading is thought to be a process of interaction rather than just a set of skills. It is believed that readers construct meaning through an interaction of knowledge, written information, and written context (Young and Irwin, 1988). CAI is especially interactive and thus well-suited for being a part of the reading process. Heffron (1986) thus concludes that computers should be viewed as a tool for developing literacy.

THE PROBLEM OF ADULT ILLITERACY

This crucial aspect of the CAI literature represents the only existing bridge between CAI, literacy, and self-esteem, on the one hand, and human resource development and productivity improvement on the other. It demonstrates the scope of the adult illiteracy problem in the U.S. and calls for projects like SALSA to be developed to begin to address this serious national issue.

The National Commission on Excellence in Education (1983) and the Commission on Reading (1985) highlighted the critical need in the U.S. to address the persistent problem of illiteracy. An "unacceptable" percentage of adults are functionally illiterate, according to these reports.

Literacy can be defined in many ways but definitions are only attempts to clarify the problem. Clark's (1984) "functional definition" perhaps comes closest to a working definition for this review. Clark defines literacy as that set of knowledge and skills essential for effective, everyday functioning in a person's group or community.

Literacy as framed by the goals and objectives of project SALSA are defined not only as basic reading and English language arts skills needed by working adults, but also as the improvement or development of these skills. Working adults, in cooperation with the partnership of local businesses and the community college system, are assumed in this model to want to improve their literacy skills.

The business-community college partnership, through SALSA, looked to improve worker literacy and enhance self-esteem. A literate and confident workforce would likely be willing to look for ways to improve day-to-day, on-the-job performance. Ultimately those improvements would translate into the competiveness of American products in world markets and provide opportunities for better living conditions.

Those are requisites for survival, according to some researchers. Howie (1990) reports that adult literacy is essential in a society where 70% of contemporary jobs require it. Furthermore, basic literacy skills will be needed just to survive in a world where current information doubles every twenty months, and will double every twenty weeks by the year 2000.

Lavin, et al. (1988), tell us that the scope of the problem is enormous. Fifty million adults are illiterate in the U.S. Another thirty-nine million adults have difficulty reading. Several states have projects for reducing illiteracy but there are not enough resources to adequately address the problem. Lavin notes that the use of computers would help. Resources could be maximized and CAI's interactive nature (e.g., self-paced, immediate feedback) make it an ideal tool.

The Lavin, et al., research called for a pilot project that would integrate education and/or training programs already in use. Government and private industry should collaborate on such a project, they say, and it should be targeted toward maximum benefit of the adult learner.

Project SALSA is such a project. It combines the resources and technologies of Apple Computer, Inc.; Motorola, Inc.; U.S. West Communications, Inc.; the University of Illinois and its University Communications, Inc.; and Businessland; and adds to them the educational and research abilities of the University of Illinois, Urbana-Champaign; and Rio Salado Community College, Phoenix, AZ.

## PRODUCTIVITY DECLINE IN WESTERN ECONOMIES

Human resource development is integral to the adult-worker focus of SALSA. This focus begins with a story that is all too familiar to the captains of business and industry in western economies: western products have lost significant market share to Japan.

Japan gained market share because the quality of their products is superior. The Japanese are also more productive: Japan's real income per capita, its output, and its exports are all greater than those of Britain, particularly in the automobile and electronics areas (Prais, 1987).

In contrast, Canada has the worst productivity of western countries (U, 1989). Great Britain has its problems, too. Today, in the United States, growth of labor productivity is slower than in the 1970s (Ferleger and Mandle, 1990). Since the late 1970s the U. S. position as a world economic power has eroded and the decline in productivity is thought to be the cause (Mischkind, 1987).

## JAPAN HAS HIGHER EDUCATIONAL STANDARDS

Prais sees the problem of productivity decline embedded in differences between western and Japanese values, the most important of which is the value placed on education. In Japan, 95% of the population eighteen years old and under are full-time students. Prais concludes that Japanese industrial progress and higher productivity are the result of 1) higher math and science attainment during compulsory schooling years and 2) more advanced vocational training.

In the U. S., the case for improved education exists. For example, Ferleger and Mandle (1990) talk about an "urgent, critical" need in education for minorities. This need arises because one third of the growth of the labor market in the next ten years will come from the minority sector of the population. They call for the government to develop a "massive" program in education and retraining.

Rosow (1989) discusses the smaller and very different makeup of the future U. S. workforce. For instance, there will be more single parents than ever before. The public school system cannot prepare workers the way it should and American businesses will not be ready for the 1990s, and beyond, unless something is done to reverse the "diminishing level" of education, in Rosow's view.

## HUMAN RESOURCE DEVELOPMENT AS THE KEY TO HIGHER PRODUCTIVITY

Shetty and Buller (1990) interviewed 615 business executives, 307 of whom were from Fortune 1000 companies. The Gallup organization conducted telephone surveys and the executives were asked what were the most critical and competitive issues facing their companies. Not surprising, product and service quality and productivity were consistently listed at the top of their concerns.

The next question asked of these executives was how they thought product and service quality and higher productivity would be achieved. Number three on the list (after employee motivation and change in corporate culture) was education of employees.

Half of the respondents said that aggressive company actions were a better way to strengthen their competitive positions as opposed to resorting to "external" variables or mandates. What can be inferred is that companies must take responsibility for educating their own employees.

In-house worker education is accomplished most often by a training and development department. Training and development are fundamental components of the much broader category of human resource development (HRD).

In this report, Nadler's (1988) definition of HRD will be used. HRD is organized learning for a specified period of time with the goal of improved on-the-job performance, i.e., increased productivity.

Nadler also outlines HRD activities as training (present job), education (future job preparation), and development (general, not job related). In Nadler's view, HRD and productivity are allies: it is difficult to have a productivity increase without HRD activities.

This concept is repeated in one form or another throughout the productivity literature. For example, Worley (1988) states that productivity can be improved through employee growth and development. Worley's CEDET model links training and education to organizational success.

Bell (1988) also sees training as an "ingredient" in high performance. But, unlike Nadler, whose HRD definition could suggest a project approach or finite view of HRD, Bell talks about a "process" needing to be in place to "maintain" competence, skills, and encouragement. From this perspective, HRD is seen as an ongoing part of an organization's operation, not just a one-time effort with a clearly defined beginning and end.

This view is shared by Mischkind (1987), who discusses the company "infrastructure." Here skills, materials, technologies, strategies, and procedures are all under a peer-cooperative review which is referred to as ongoing and "self-renewing."

Rosow (1989) actually refers to "continuous learning" as the solution to productivity decline. Learning should be an everday part of the job and workers should learn others' jobs as well. They need to be able to see how their unit fits in with others. There should be, in Rosow's view, a "free-form" interaction of employees, trainers, teams, and managers.

The HRD-productivity link is summed up best by U (1989) who says that a radically improved attitude toward HRD is the key to productivity improvement. America must invest in its human capital through training and education.

The trend in the U. S., however, is to use fewer skills/lower level skills through automation, resulting in unskilled people overseeing highly sophisticated machines. In contrast, in Japan, highly trained people work with very sophisticated machines. Some writers see this development as resulting in products which are better than the sum of both machine and operator.

THE CAI-LITERACY, HRD-PRODUCTIVITY IMPROVEMENT LINK

What the literature shows thus far are two clearly established relationships:

- CAI is associated with literacy improvement.
- HRD is thought to be the key to productivity improvement.

The CAI-literacy association is backed by ten years of solid research. If the goal is to improve literacy, then using CAI should be a part of the strategy.

The HRD-productivity association is a only a theoretical construct at this point. It is backed by expert opinion rather than actual research. Given these relationships, then, there is but one extra step to predict the following relationship:

- CAI improves worker literacy which will improve productivity.

If this system could be shown to exist, the implications for the U. S. and other western economies are indeed profound. We know from the CAI literature that CAI is a cost-effective educational delivery system. We also know from the productivity literature that a massive educational effort must be made, primarily by employers, if U.S. productivity is ever to rebound. CAI may offer the most cost-effective way to implement that educational effort.

Thus, project SALSA can be far more than just a pilot program to investigate CAI and literacy improvement among factory workers. Rather SALSA could be the forerunner of serious literacy research which, in partnership with business and industry, develops and investigates models of a practically applied productivity improvement system that begins by using CAI to improve the literacy of American production line workers.

# METHODS

Prior to the administration of testing, a group of reading content specialists examined each of the four levels of the two reading subtests of the Tests of Adult Basic Education (TABE). Their analysis identified percentage cut-off points for each of the test levels that could be used for placement in the three reading classes specifically designed to address the skills deficits identified in the subject population. The cut-off points and their associated classes are:

| TABE Test Level | Cut-off Percentage | Below Cut-off Recommendation | Above Cut-off Recommendation |
|---|---|---|---|
| E | 100 | RDG-081 | RDG-081 |
| M | 70 | RDG-081 | RDG-085 |
| D | 90 | RDG-085 | RDG-086 |
| A | 70 | RDG-086 | No Classes |

For general comparison, the grade levels associated with each of the TABE test levels are:

| TABE Test Level | Grade Level |
|---|---|
| E | 2.6 - 4.9 |
| M | 4.6 - 6.9 |
| D | 6.6 - 8.9 |
| A | 8.6 - 12.9 |

653 subjects were tested using the TABE, Form 5. Of this group, 448 tested at or below the third grade reading level or at or above the 70% level of form A. This left 205 subjects as possible candidates for the project.

Pairs were identified from these 205 subjects. The subjects were paired on gender ethnicity, age, family structure and number of children in the household. 85 appropriately matched pairs were identified. The list of potential pairs was examined to determine if the experimental subjects from each pair resided within the area required for the telephone service necessary for the project.

The final subject list consisted of fifty-four (54) pairs of experimental and control subjects. At the mid-point of the project, the enrollment of the groups was checked. Of fifty-four (54) originally identified control subjects, three were attending classes. At this point, the original experimental and control pairs were abandoned.

Following the instruction, the experimental subjects were posttested along with other individuals from the original pool of 205 potential subjects who had received instruction. Following the posttesting, individuals were identified who had been included in the pretesting, posttesting, and who fell within the selection criteria for the project (pretest at or above the forth grade reading level and at or below the 70% level of form A.) This group consisted of thirty (30) pairs of individuals. The pairs were matched on pretest scores only.

The demographic breakdown of the fifty-three who were issued computers is shown below:

| | | |
|---|---|---|
| Female | 44 | 83.0% |
| Male | 9 | 17.0% |
| | | |
| Hispanics | 25 | 47.2% |
| Anglos | 15 | 28.3% |
| Black | 6 | 11.3% |
| Asian | 4 | 7.5% |
| Native American | 3 | 5.7% |

Another 160 participants were also involved. This group included members of the employees' households who also used the computers (children, spouses, other relatives and/or friends). This group is referred to as "family" in this report. Demographic data for family members was not collected as a part of this study.

SUBJECT TRAINING AND SUPPORT

The fifty-three employees in the experimental group were given two hours of hands-on training to use the computer at BusinessLand prior to taking the computers home. An additional twelve hours of hands-on training was given later. This training took part in two-hour increments and taught participants how to use the NOVANET system.

The NOVANET training took place at the facilities where the employees worked. During the last two-hour session limited training was provided to family members.

Two computer training specialists then provided additional support by answering questions of employees and family members who called them for help. This local phone support ended by October, 1990. From that time on, users could leave messages on the NOVANET system and a specialist from the University of Illinois would respond by leaving a message for the user in the user's library. (Figure 2 illustrates the SALSA training and support process.)

DATA COLLECTION - QUALITATIVE

Face-to-face interviews in a group setting were used to identify critical variables impacting employee and family utilization of NOVANET. The groups were called "focus" groups, since the goal was to have employees focus unstructured responses around a specific set of questions.

The Rio Salado research team developed a set of eight questions and eleven follow-up questions. Forty SALSA participants were interviewed on four days in December, 1990. Eight group interviews were conducted, the largest had nine people and the smallest had three. Each group was asked the same set of eight questions and eleven follow-up questions in the same order.

FIGURE 2: SALSA - NOVANET TRAINING AND SUPPORT PROCESS

"Two-Week Usage Periods, 1990"

| | TRAINING/SUPPORT SERVICES | 1 Aug | 2 Sep | 3 Sep | 4 Oct | 5 Oct | 6 Nov | 7 Nov | 8 Dec | 9 Dec |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | HOW TO USE THE MACINTOSH | XXXX | | | | | | | | |
| 2. | HOW TO USE NOVANET | XXXX | | | | | | | | |
| 3. | NOVANET Reference Manual | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX |
| 4. | COMPUTER SPEC PHONE HELP | XXXX | XXXX | XXXX | XXXX | | | | | |
| 5. | U of I COMPUTER SPEC NOTES | | | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX |

Responses to questions were unstructured and the interviewers took notes. Responses were also recorded on a cassette recorder. The recordings were later transcribed by Rio Salado staff members. (The individual questions and responses are listed in Appendix A: SALSA Employee Focus Group Questions and Responses.)

The researchers also conducted telephone interviews of seventeen selected family members during the week of February 11th, 1991. (The family member questions and responses are listed in Appendix B: SALSA Family Telephone Interview Questions and Responses.)

DATA COLLECTION - QUANTITATIVE, NOVANET USAGE

Two aspects of the quantitative data collection existed. The first part was the assessment of the home-based computer activity of SALSA participants and the second part was the answer to the question whether or not home-based computer instruction could decrease the amount of time direct labor employees needed to reach a targeted level of reading competency.

Initially, NOVANET hours used by SALSA participants were tracked (employee and family members were kept separate). Nine, two-week usage periods were tracked from September through December, 1990.

The University of Illinois provided the Rio Salado researchers with NOVANET cumulative hours and minutes used by participants for two broad use catagories: Group Motorola (structured lessons) and M-World (unstructured, e.g., notes, games). These hard copy reports were transferred manually to a spreadsheet format.

On the spreadsheet the hours were translated to minutes. A minute total for Group Motorola and M-World for each two-week usage period for each participant was then calculated by subtracting the previous period's cumulative total from the current period's cumulative total.

In this way, the researchers determined minutes used by participant by category for each two-week period. Later, a selected group of employees and family members were analyzed for specific minutes used by subject.

QUANTITATIVE DATA COLLECTION - MATCHED PAIRS PRETEST/POSTTEST DESIGN

The second aspect of the quantitative data collection (whether or not home-based computer instruction could decrease the amount of time direct labor employees needed to reach a targeted level of reading competency) could not be answered. A target level of reading was not set and for that reason and others listed below, information was not available.

However, the research could answer the question of whether or not home-based computer instruction achieved significantly higher gains in reading. The researchers then focused their efforts on this aim.

A pretest-posttest matched pairs design was used. Employees who were issued a computer and who had reading training were paired on the basis of TABE pretest score with employees who were slated for reading training only.

Those targeted as potential subjects for the reading training were direct labor employees scoring above the fourth grade reading level and below the twelfth grade reading level. The purpose of these cutoff points was to generate a realistic and representative sample.

All of the employees who pretested were also slated to take a TABE posttest after completing reading classes. All participants were slated to begin training at the same time so that the question of decrease in amount of time could be researched.

Some participants, both the in-home computer group and the others, simply did not take, dropped out of, or took different classes at their own discretion. Furthermore, since the research took place in an actual production environment, real-world historical events (e.g., Persian Gulf crisis) influenced participation.

These situations meant that the question of amount of time increase/decrease could not be answered. In addition, an analysis of the TABE scores found that some pretest scores were too high. People with these scores should not have been placed in either the experimental or control group. This situation meant that the orginal matched pairs design had to be modified. Twenty-three of the fifty-three experimental subjects fell into this category and were not included as part of the pretest-posttest design.

The final pretest-posttest groups contained thirty experimental subjects and thirty control group people. The pairing was done on the basis of TABE reading pretest scores: people with similar pretest scores were placed in pairs.

## DATA ANALYSIS - QUALITATIVE

Researchers reviewed notes of the interviewers and the transcripts of the recorded focus group interviews for consistency. The researchers' notes for the family telephone follow-up interviews and the composite responses to focus group questions were then analyzed for patterns. Major themes were identified and listed.

## DATA ANALYSIS - QUANTITATIVE, NOVANET USAGE

There were several aspects of quantitative data analysis. First, NOVANET hours used by two-week usage period were analyzed for simple patterns. This was done to identify "core" or "consistent" users, both for family and employee participants.

When the core users were identified, their NOVANET ID's were then used to generate complete user profiles by hours used and by subject. This would provide a more detailed assessment of computer activity. It would also allow a comparison of what subjects employees used versus what their family members used.

Next, ordinary least squares' (OLS) regression analysis was used to explore any relationships between hours used by employees and hours used by their family members. This would provide another assessment of activity and examine whether or not high activity by employees was related to high activity by their family members.

DATA ANALYSIS - QUANTITATIVE, TABE PRETEST/POSTTEST GAIN SCORES

The experimental and control groups were given the TABE, Form 6 as a reading posttest. Scores were compared with pretest performance.

A matched pairs' t-test and a single factor analysis of variance (ANOVA) were used as tests of significance. Due to the exploratory nature of the study, alpha levels were set at .05 and .10. Higher alpha levels were used deliberately in order to detect weak effects. In this study an alpha of .10 refers to the concept that any statistically significant results could have been achieved by chance alone ten times out of one hundred.

In addition, another OLS regression was used to explore the relationship of employee hours used to gain scores. The null hypothesis here is that there is no relationship between hours used and TABE reading pretest-posttest gain scores. The experimental hypothesis is that NOVANET hours used by employees have a direct relationship with gain scores, and the more NOVANET hours used the higher the gain score.

# RESULTS

QUALITATIVE RESULTS - FOCUS GROUP THEMES, EMPLOYEES

All respondents were employees who had been issued computers. The following themes represent their perceptions of the SALSA experience:

A. Hardware/software and communication problems seem to have affected many participants. There were reports of "garbage" on the screen, modems and "mice" (pointers) that would not work, disconnections without warning, and answers to NOVANET lessons that were inconsistent with keyboard inputs.

B. The NOVANET system shutdowns (7 p.m. Arizona time and on weekends) created concerns. Respondents felt that they never had enough time to use the system. "I'd try to use the system and it was down," or "I'd just get into it and it would say it was going down" were two very common remarks.

C. Most people thought the project was a good idea. With some improvements, they thought the skill and knowledge levels of themselves and/or their family members would increase. Employees selected for the project felt proud and fortunate to be included.

D. By December, 1990, most participants had been unable to use the system for several weeks. Overtime, seven day work weeks, frustration from experiencing hardware/software problems, the Persian Gulf crisis (military products due), and the holiday season were the most frequent explanations.

E. Participants liked the way they were selected for the project. SALSA gave them an unusual opportunity for self-improvement . They felt Motorola management was doing the right thing.

F. Participants thought that the project could have been designed better. They felt NOVANET training went too fast and had too many trainees per instructor. Once the computers were in place they believed there was too little follow-up to find out how things were going. Some got frustrated and gave up quickly. Calls to the help line or notes left on the NOVANET system had delayed responses. Often there was no response to either calls or notes. "Phone tag" was common: employees called one person and were told to call someone else, or that person was out and would call back, and so on.

G. A number of participants thought the Motorola/Rio Salado communication process could have been better. The turnover of SALSA administrators confused participants. And some would have preferred different Rio Salado instructors.

H. The use of the tape recorder affected employee responses. Employees were assured that their names would not be linked to answers, yet they remained uneasy. Responses were more open, candid, and relaxed when the tape recorder was not used.

In summary, the critical variables as perceived by employees that impacted their use of the home-based computer system were as follows:

SUCCESS AREAS

Participant Selection Procedure
Employee Interest, Enjoyment, & Skill Levels
Family Interest, Enjoyment, & Skill Levels
Face-to-Face Interactions with Instructors

PROBLEM AREAS

Time Frame of Initial Training
Instructor-Student Ratio of Initial Training
Understanding How to Use Hardware
Understanding How to Use Software
Monitoring and Follow-Up Help
NOVANET System Shutdown Timing
Instructor Personalities
Project Design
Interference on Telephone Lines
Persian Gulf Crisis
Holiday Season

QUALITATIVE RESULTS - TELEPHONE INTERVIEW THEMES, FAMILY

A review of notes taken during family telephone interviews identified the following perceptions:

A. Family members liked the project very much. They did not like having to return the computers.

B. Family members enjoyed a variety of subjects in NOVANET, but mostly they liked the games and notes.

C. Those family members not using the computer seemed to have had circumstances that prevented them from even trying the system. For example, a brother of one family member was killed in an accident. This situation simply dominated the lives of that family and the home-based computer project became secondary for them.

QUANTITATIVE RESULTS - NOVANET USAGE PATTERNS

The NOVANET usage for employees is shown in Table 1. After the second two-week period ending September 10th, 1990, the time spent by an average user was between one and one and one-half hours per two-week usage period. The actual number of users per period declined steadily, except for period five, when the number of users doubled from period four.

There are two groups of data: first a summary for all employee participants and, second, a summary for only those who used the computer. Except for period one, the time on the computer with the most users was greater than zero hours but less than two hours. In other words, most of those employees who used the computer used it to access NOVANET less than two hours during any given two-week period

The structured subsystem of NOVANET, Group Motorola, was used more by employees for periods one through three. After that the unstructured subsystem, M-World, was used more. At the end of the project, those employees still accessing NOVANET used the M-World subsystem about three to one over the Group Motorola subsystem.

Table 2 shows the NOVANET usage summary for family member participants. Some of the employee patterns are repeated in the family data. For example, the most and the longest average use came during period one. Also, most family users were on the system greater than zero hours but less than two hours per usage period. Again, as with employees, most family members who used the computer to access NOVANET did so less than two hours during any given two-week period.

Family members, however, consistently stayed in the unstructured M-World subsystem. They used M-World by as much as nine to one over Group Motorola (period six).

TABLE 1: SALSA NOVANET SUMMARY - EMPLOYEES

| 1990 USAGE PDS: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| DATE ENDING: | 09/10 | 09/24 | 10/08 | 10/22 | 11/05 | 11/19 | 12/03 | 12/17 | 12/31 |
| TTL USERS | 53 | 36 | 30 | 26 | 52 | 15 | 13 | 10 | 8 |
| >=5 HRS | 52 | 5 | 5 | 1 | 3 | 0 | 2 | 0 | 0 |
| >=2<5 HRS | 1 | 4 | 6 | 11 | 2 | 1 | 2 | 2 | 1 |
| >0<2 HRS | 0 | 27 | 19 | 14 | 47 | 14 | 9 | 8 | 7 |
| ALL | | | | | | | | | |
| MW AVG HRS | 7.68 | 0.81 | 0.67 | 0.57 | 0.35 | 0.13 | 0.24 | 0.20 | 0.13 |
| GM AVG HRS | 8.94 | 0.75 | 0.62 | 0.47 | 0.36 | 0.10 | 0.35 | 0.03 | 0.02 |
| TTL AVG HRS | 16.63 | 1.56 | 1.29 | 1.05 | 0.71 | 0.24 | 0.60 | 0.23 | 0.15 |
| USERS ONLY | | | | | | | | | |
| MW AVG HRS | 7.68 | 1.39 | 1.37 | 1.60 | 1.09 | 0.79 | 1.29 | 1.50 | 1.18 |
| GM AVG HRS | 8.94 | 1.98 | 1.73 | 1.25 | 0.37 | 1.20 | 3.13 | 0.53 | 0.33 |
| TTL AVG HRS | 16.63 | 2.29 | 2.29 | 2.13 | 0.72 | 1.20 | 2.44 | 1.21 | 1.01 |

TABLE 2: SALSA NOVANET HOURS USED - FAMILY MEMBERS

| 1990 USAGE PDS: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| DATE ENDING: | 09/10 | 09/24 | 10/08 | 10/22 | 11/05 | 11/19 | 12/03 | 12/17 | 12/31 |
| TTL USERS | 88 | 35 | 24 | 24 | 42 | 20 | 15 | 16 | 11 |
| >=5 HRS | 34 | 6 | 5 | 5 | 5 | 4 | 4 | 2 | 5 |
| >=2<5 HRS | 20 | 5 | 4 | 4 | 3 | 4 | 2 | 2 | 0 |
| >0<2 HRS | 34 | 24 | 15 | 15 | 34 | 12 | 9 | 12 | 6 |
| ALL | | | | | | | | | |
| MW AVG HRS | 3.70 | 0.97 | 0.95 | 1.01 | 0.94 | 0.91 | 1.01 | 0.82 | 1.03 |
| GM AVG HRS | 0.44 | 0.03 | 0.06 | 0.09 | 0.05 | 0.05 | 0.11 | 0.06 | 0.21 |
| TTL AVG HRS | 4.14 | 1.00 | 1.00 | 1.10 | 0.98 | 0.95 | 1.13 | 0.88 | 1.25 |
| USERS ONLY | | | | | | | | | |
| MW AVG HRS | 6.97 | 4.99 | 6.89 | 6.73 | 7.89 | 9.05 | 1.58 | 9.36 | 16.53 |
| GM AVG HRS | 1.67 | 0.61 | 1.47 | 2.51 | 0.21 | 0.98 | 4.54 | 2.38 | 8.48 |
| TTL AVG HRS | 7.53 | 4.58 | 6.68 | 7.06 | 3.74 | 7.64 | 12.02 | 8.79 | 18.11 |

Note: one person accounted for over 50% of all user hours

The lowest usage category in both Table 1 and Table 2, greater than zero hours but less than two hours per usage period, includes people who signed on and off NOVANET very quickly. A different pattern of usage is found if the very short time users and the very long time users are taken out of the data. Tables 3 and 4 examine the NOVANET usage data again, but this time with the extreme values, or "outliers," removed.

Table 3 shows that eighteen employees used the NOVANET system for one-half hour or more for at least four of the nine two-week usage periods. These people can be thought of as the "consistent" or "core" users.

The removal of the outliers shows that 34% (eighteen of fifty-three) of the employee participants can be defined as consistent or core users. However, only 11% (18 of 160) family members were core users (Table 4). Thus, proportionately more employees than family members fell into the category of core user.

n=53

TABLE 3: IN-DEPTH USAGE DATA - EMPLOYEES

"Use of System >=.50 Hours, >=4 Periods"

| ID CODE | EMP=E FAM=F | CORE *=Y | SYSTEM USE OF .50 OR MORE = 1<br>1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | TTL PDS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | E | * | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 8 |
| 52 | E | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 8 |
| 19 | E | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 7 |
| 3 | E | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 7 |
| 8 | E | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 7 |
| 15 | E | * | 1 | 1 | 1 | 1 | | 1 | | 1 | | 6 |
| 33 | E | * | 1 | 1 | | 1 | 1 | 1 | 1 | | | 6 |
| 48 | E | * | 1 | 1 | | 1 | 1 | 1 | | | | 5 |
| 18 | E | * | 1 | 1 | 1 | 1 | | | | 1 | | 5 |
| 16 | E | * | 1 | | 1 | 1 | | 1 | | | 1 | 5 |
| 24 | E | * | 1 | 1 | 1 | | | | | 1 | 1 | 5 |
| 20 | E | * | 1 | 1 | 1 | 1 | | | | | | 4 |
| 26 | E | * | 1 | | | | 1 | | 1 | | 1 | 4 |
| 1 | E | * | 1 | | | 1 | 1 | | | | 1 | 4 |
| 44 | E | * | 1 | | 1 | | 1 | | | 1 | | 4 |
| 50 | E | * | 1 | 1 | 1 | 1 | | | | | | 4 |
| 4 | E | * | 1 | 1 | 1 | | 1 | | | | | 4 |
| 6 | E | * | 1 | | 1 | 1 | | 1 | | | | 4 |
| 22 | E | | 1 | 1 | | | | 1 | | | | 3 |
| 40 | E | | 1 | 1 | 1 | | | | | | | 3 |
| 17 | E | | 1 | 1 | | 1 | | | | | | 3 |
| 21 | E | | 1 | | 1 | | | 1 | | | | 3 |
| 49 | E | | 1 | | | | | | 1 | 1 | | 3 |
| 36 | E | | 1 | 1 | 1 | | | | | | | 3 |
| 28 | E | | 1 | | 1 | 1 | | | | | | 3 |
| 37 | E | | 1 | | | 1 | 1 | | | | | 3 |
| 35 | E | | 1 | | | 1 | | | | | 1 | 3 |
| 47 | E | | 1 | | 1 | | | | | | | 2 |
| 41 | E | | 1 | 1 | | | | | | | | 2 |
| 11 | E | | 1 | 1 | | | | | | | | 2 |
| 30 | E | | 1 | 1 | | | | | | | | 2 |
| 46 | E | | 1 | 1 | | | | | | | | 2 |
| 42 | E | | 1 | 1 | | | | | | | | 2 |
| 39 | E | | 1 | 1 | | | | | | | | 2 |
| 43 | E | | 1 | 1 | | | | | | | | 2 |
| 2 | E | | 1 | | | 1 | | | | | | 2 |
| 31 | E | | 1 | | | | 1 | | | | | 2 |
| 53 | E | | 1 | 1 | | | | | | | | 2 |
| 27 | E | | 1 | | | | | | | | | 1 |
| 14 | E | | 1 | | | | | | | | | 1 |
| 38 | E | | 1 | | | | | | | | | 1 |
| 13 | E | | 1 | | | | | | | | | 1 |
| 32 | E | | 1 | | | | | | | | | 1 |
| 12 | E | | 1 | | | | | | | | | 1 |
| 25 | E | | 1 | | | | | | | | | 1 |
| 10 | E | | 1 | | | | | | | | | 1 |
| 23 | E | | 1 | | | | | | | | | 1 |
| 51 | E | | 1 | | | | | | | | | 1 |
| 29 | E | | 1 | | | | | | | | | 1 |
| 34 | E | | 1 | | | | | | | | | 1 |
| 45 | E | | 1 | | | | | | | | | 1 |
| 9 | E | | 1 | | | | | | | | | 1 |
| 5 | E | | 1 | | | | | | | | | 1 |
| | 53 | TOTALS: | 53 | 25 | 19 | 19 | 13 | 11 | 8 | 7 | 6 | |
| | | PCTS: | 100% | 47% | 36% | 36% | 25% | 21% | 15% | 13% | 11% | |

n=160 TABLE 4: IN-DEPTH USAGE DATA - FAMILY

"Use of System >=.50 Hours, >=4 Periods"

| ID CODE | EMP=E FAM=F | CORE *=Y | SYSTEM USE OF .50 OR MORE = 1 | | | | | | | | | TTL PDS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 26 | F | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |
| 18 | F | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |
| 26 | F | * | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 8 |
| | F | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 8 |
| 29 | F | * | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 7 |
| | F | * | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | | 7 |
| 51 | F | * | 1 | 1 | 1 | 1 | 1 | 1 | | | | 6 |
| 31 | F | * | 1 | 1 | 1 | 1 | 1 | | | 1 | | 6 |
| | F | * | 1 | 1 | 1 | 1 | 1 | 1 | | | | 6 |
| 51 | F | * | 1 | | 1 | 1 | | | 1 | 1 | | 5 |
| 48 | F | * | 1 | | | 1 | 1 | | | 1 | 1 | 5 |
| 44 | F | * | 1 | 1 | 1 | 1 | 1 | | | | | 5 |
| 23 | F | * | 1 | | 1 | 1 | 1 | 1 | | | | 5 |
| 16 | F | * | 1 | | | 1 | | | 1 | 1 | 1 | 5 |
| | F | * | 1 | 1 | | | | 1 | 1 | | 1 | 5 |
| 41 | F | * | 1 | 1 | 1 | | | 1 | | | | 4 |
| 22 | F | * | 1 | 1 | | | 1 | | 1 | | | 4 |
| | F | * | 1 | 1 | 1 | 1 | | | | | | 4 |
| 44 | F | | 1 | 1 | | | | 1 | | | | 3 |
| 35 | F | | 1 | 1 | 1 | | | | | | | 3 |
| 31 | F | | 1 | 1 | 1 | | | | | | | 3 |
| 25 | F | | 1 | 1 | 1 | | | | | | | 3 |
| 25 | F | | 1 | | 1 | | | | 1 | | | 3 |
| 2 | F | | 1 | | | 1 | | 1 | | | | 3 |
| 2 | F | | 1 | | | 1 | | 1 | | | | 3 |
| 53 | F | | 1 | 1 | | | | | | | | 2 |
| 48 | F | | 1 | | | | 1 | | | | | 2 |
| 43 | F | | 1 | 1 | | | | | | | | 2 |
| 40 | F | | 1 | 1 | | | | | | | | 2 |
| 38 | F | | 1 | 1 | | | | | | | | 2 |
| 31 | F | | 1 | | 1 | | | | | | | 2 |
| 30 | F | | 1 | | | 1 | | | | | | 2 |
| 20 | F | | 1 | 1 | | | | | | | | 2 |
| 15 | F | | 1 | 1 | | | | | | | | 2 |
| 11 | F | | 1 | 1 | | | | | | | | 2 |
| 3 | F | | | | | | | | | 1 | 1 | 2 |
| | F | | 1 | 1 | | | | | | | | 2 |
| | F | | 1 | | | | | | | | 1 | 2 |
| 52 | F | | 1 | | | | | | | | | 1 |
| 52 | F | | 1 | | | | | | | | | 1 |
| 51 | F | | 1 | | | | | | | | | 1 |
| 50 | F | | 1 | | | | | | | | | 1 |
| 49 | F | | 1 | | | | | | | | | 1 |
| 49 | F | | 1 | | | | | | | | | 1 |
| 48 | F | | 1 | | | | | | | | | 1 |
| 48 | F | | 1 | | | | | | | | | 1 |
| 48 | F | | 1 | | | | | | | | | 1 |
| 47 | F | | 1 | | | | | | | | | 1 |
| 45 | F | | 1 | | | | | | | | | 1 |
| 44 | F | | 1 | | | | | | | | | 1 |
| 44 | F | | 1 | | | | | | | | | 1 |
| 44 | F | | | 1 | | | | | | | | 1 |
| 40 | F | | 1 | | | | | | | | | 1 |
| 39 | F | | 1 | | | | | | | | | 1 |
| 39 | F | | 1 | | | | | | | | | 1 |
| 39 | F | | 1 | | | | | | | | | 1 |
| 38 | F | | 1 | | | | | | | | | 1 |
| 37 | F | | 1 | | | | | | | | | 1 |
| 35 | F | | 1 | | | | | | | | | 1 |

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|---|---|---|---|---|
| 30 | F | | 1 | 1 |
| 30 | F | 1 | | 1 |
| 29 | F | 1 | | 1 |
| 29 | F | 1 | | 1 |
| 26 | F | 1 | | 1 |
| 25 | F | 1 | | 1 |
| 25 | F | 1 | | 1 |
| 24 | F | 1 | | 1 |
| 23 | F | 1 | | 1 |
| 22 | F | 1 | | 1 |
| 20 | F | 1 | | 1 |
| 17 | F | 1 | | 1 |
| 15 | F | 1 | | 1 |
| 13 | F | 1 | | 1 |
| 7 | F | 1 | | 1 |
| 6 | F | 1 | | 1 |
| 2 | F | 1 | | 1 |
| 2 | F | 1 | | 1 |
| | F | 1 | | 1 |
| | F | 1 | | 1 |
| | F | 1 | | 1 |
| | F | | 1 | 1 |
| 52 | F | | | 0 |
| 52 | F | | | 0 |
| 52 | F | | | 0 |
| 52 | F | | | 0 |
| 51 | F | | | 0 |
| 47 | F | | | 0 |
| 47 | F | | | 0 |
| 45 | F | | | 0 |
| 44 | F | | | 0 |
| 42 | F | | | 0 |
| 42 | F | | | 0 |
| 41 | F | | | 0 |
| 41 | F | | | 0 |
| 40 | F | | | 0 |
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| 36 | F | | | 0 |
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| 25 | F | | | 0 |
| 24 | F | | | 0 |
| 24 | F | | | 0 |
| 24 | F | | | 0 |
| 22 | F | | | 0 |
| 19 | F | | | 0 |
| 18 | F | | | 0 |

(continues)

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| 17 | F | | | | | | | | | | | 0 |
| 17 | F | | | | | | | | | | | 0 |
| 16 | F | | | | | | | | | | | 0 |
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| 8 | F | | | | | | | | | | | 0 |
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| 6 | F | | | | | | | | | | | 0 |
| 6 | F | | | | | | | | | | | 0 |
| 3 | F | | | | | | | | | | | 0 |
| 1 | F | | | | | | | | | | | 0 |
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| | F | | | | | | | | | | | 0 |
| | F | | | | | | | | | | | 0 |
| | F | | | | | | | | | | | 0 |
| | F | | | | | | | | | | | 0 |
| | F | | | | | | | | | | | 0 |
| | 160 | TOTALS: | 77 | 27 | 18 | 18 | 16 | 14 | 10 | 10 | 8 | |
| | | PCTS: | 48% | 17% | 11% | 11% | 10% | 9% | 6% | 6% | 5% | |

OTHER IN-DEPTH NOVANET USAGE DATA - EMPLOYEE CORE USERS

Table 5 shows additional core user information. In general, core user demographics were representative of the employee group as a whole. The percentage of females and males were virtually identical, for example. In addition, representation of Blacks and Native Americans was identical to their percentage representation of all employee participants.

Anglos were overrepresented among core users while Hispanics were underrepresented. Asians also had a higher representation among the core users.

In terms of the employing organization, the MPO facility had the same percentage represented over all three shifts. But the BP1 facility is not represented at all among core users and the BP2 facility is underrepresented on the shift one and overrepresented on shift two.

Overall there are fewer core users, proportionately speaking, on shifts one and three. In terms of the overall employee group, more core users came from shift two.

Thus a brief demographic profile emerges of the "typical" core user. An Anglo or Hispanic female, she more than likely worked first or second shift at MPO or BP2.

OTHER IN-DEPTH NOVANET USAGE DATA - EMPLOYEE NON-CORE

Table 6 shows the non-core employee information. The non-core employee subgroup had a demographic makeup very much like that of the entire employee group.

One of the smaller differences was that there are fewer Anglos in the non-core group. There were also fewer people in the non-core user group from shift two at the BP2 facility.

Other than those small differences, the non-core group was very much like the entire employee group. The typical non-core user was an Anglo or Hispanic female working first shift at the MPO or BP2 facilities.

Thus, in terms of demographics, facility, and shift information, the typical core user was very much like the typical non-core employee. Only small differences existed. The core user may have been more likely to be an Anglo female, may have been more likely to work shift two, and did not work at the BP1 facility.

TABLE 5: EMPLOYEE CORE USER DEMOGRAPHICS

| | | NO. ALL EMPLOYEES | PCT | NO. CORE USERS | PCT |
|---|---|---|---|---|---|
| EMPLOYEES: | | 53 | 100.0% | 18 | 100.0% |
| Females: | | 44 | 83.0% | 15 | 83.3% |
| Males: | | 9 | 17.0% | 3 | 16.7% |
| Ethnicity: | HISPANIC | 25 | 47.2% | 7 | 38.9% |
| | ANGLOS | 15 | 28.3% | 6 | 33.3% |
| | BLACK | 6 | 11.3% | 2 | 11.1% |
| | ASIAN | 4 | 7.5% | 2 | 11.1% |
| | NAT AMER | 3 | 5.7% | 1 | 5.6% |
| Employing Organization (Shift): | MPO (1) | 17 | 32.1% | 7 | 38.9% |
| | MPO (2) | 7 | 13.2% | 2 | 11.1% |
| | MPO (3) | 0 | 0.0% | 0 | 0.0% |
| | BP1 (1) | 0 | 0.0% | 0 | 0.0% |
| | BP1 (2) | 2 | 3.8% | 0 | 0.0% |
| | BP1 (3) | 3 | 5.7% | 0 | 0.0% |
| | BP2 (1) | 10 | 18.9% | 1 | 5.6% |
| | BP2 (2) | 6 | 11.3% | 5 | 27.8% |
| | BP2 (3) | 8 | 15.1% | 3 | 16.7% |
| Shift: | (1) | 27 | 50.9% | 8 | 44.4% |
| | (2) | 15 | 28.3% | 7 | 38.9% |
| | (3) | 11 | 20.8% | 3 | 16.7% |

TABLE 6: NON-CORE EMPLOYEE DEMOGRAPHICS

| | | NO. ALL EMPLOYEES | PCT | NO. NON-CORE | PCT |
|---|---|---|---|---|---|
| EMPLOYEES: | | 53 | 100.0% | 35 | 100.0% |
| Females: | | 44 | 83.0% | 29 | 82.9% |
| Males: | | 9 | 17.0% | 6 | 17.1% |
| Ethnicity: | HISPANIC | 25 | 47.2% | 18 | 51.4% |
| | ANGLOS | 15 | 28.3% | 9 | 25.7% |
| | BLACK | 6 | 11.3% | 4 | 11.4% |
| | ASIAN | 4 | 7.5% | 2 | 5.7% |
| | NAT AMER | 3 | 5.7% | 2 | 5.7% |
| Employing Organization (Shift) | MPO (1) | 17 | 32.1% | 10 | 28.6% |
| | MPO (2) | 7 | 13.2% | 5 | 14.3% |
| | MPO (3) | 0 | 0.0% | 0 | 0.0% |
| | BP1 (1) | 0 | 0.0% | 0 | 0.0% |
| | BP1 (2) | 2 | 3.8% | 2 | 5.7% |
| | BP1 (3) | 3 | 5.7% | 3 | 8.6% |
| | BP2 (1) | 10 | 18.9% | 9 | 25.7% |
| | BP2 (2) | 6 | 11.3% | 1 | 2.9% |
| | BP2 (3) | 8 | 15.1% | 5 | 14.3% |
| Shift: | (1) | 27 | 50.9% | 19 | 54.3% |
| | (2) | 15 | 28.3% | 8 | 22.9% |
| | (3) | 11 | 20.8% | 8 | 22.9% |

## OTHER IN-DEPTH NOVANET USAGE DATA - USAGE RELATIONSHIPS

Two OLS regression analyses were conducted to explore the relationship between family members and employees in terms of hours used. One analysis had the employee hours as the dependent variable and the other had the family hours as the dependent variable.

Tables 7 and 8 show that, even when zero hours used by family members were excluded, the relationship of hours used by employees to that of hours used by family members was purely random.. A more in-depth examination reveals a different result, however.

When core users only were examined, a relationship did exist, as shown below in Table 9. Regression analysis was not needed to see that a pattern was clearly evident.

This data show that an employee core user was twice as likely not to have a family member as a core user. The same relationship exists for family member core users: if a family member was a core user then it was twice as likely that that family's employee was a non-core participant.

## OTHER IN-DEPTH NOVANET USAGE DATA - SUBJECTS BY SUBSYSTEM

Tables 10 and 11 show the hours used by subject for each of the two NOVANET subsystems. These tables also compare subject usage by employee and family core users. (Appendix C: NOVANET Course Descriptions, lists topics and the subject matter of each.)

Although there were some similarities, Table 10 shows differences existed between the subjects used by employee and family core users. Employees used the structured Group Motorola subsytem over 200 hours more than did the family core users. In addition, family core users selected study skills, math, and spelling subjects more than the employees did.

Over 90% of family Group Motorola time was in these three areas. In contrast, employees spent over 90% of their time in five areas: reading, language, math, spelling, and critical thinking.

While employee core users spent more time in the structured Group Motorola subsystem than family core users did, the opposite was true when the unstructured hours used in M-World was viewed. This is illustrated in Table 11: family core users spent almost 400 more hours in M-World than employee core users did.

TABLE 7: EMPLOYEE DEPENDENT

Where Employee Hours Used is a Function of Family Members' Hours Used
* Note: Families with Zero Time on System Were Excluded

| NO. | FAMILY HOURS USED | EMPLOYEE HOURS USED |
|---|---|---|
| 1 | 95.73 | 13.42 |
| 2 | 69.16 | 28.80 |
| 3 | 60.74 | 33.30 |
| 4 | 59.90 | 9.79 |
| 5 | 42.04 | 42.04 |
| 6 | 36.07 | 9.26 |
| 7 | 34.10 | 8.48 |
| 8 | 32.80 | 16.43 |
| 9 | 31.90 | 9.73 |
| 10 | 30.23 | 19.32 |
| 11 | 30.00 | 19.67 |
| 12 | 27.20 | 72.51 |
| 13 | 22.14 | 19.40 |
| 14 | 19.60 | 26.99 |
| 15 | 17.14 | 11.71 |
| 16 | 14.34 | 20.58 |
| 17 | 11.46 | 29.93 |
| 18 | 10.20 | 10.42 |
| 19 | 9.49 | 11.50 |
| 20 | 8.28 | 24.77 |
| 21 | 7.82 | 13.43 |
| 22 | 7.17 | 47.34 |
| 23 | 6.58 | 9.59 |
| 24 | 5.95 | 29.30 |
| 25 | 5.27 | 50.88 |
| 26 | 5.10 | 9.39 |
| 27 | 4.60 | 7.75 |
| 28 | 4.00 | 36.83 |
| 29 | 3.79 | 97.14 |
| 30 | 3.14 | 55.03 |
| 31 | 2.10 | 16.44 |
| 32 | 1.75 | 19.53 |
| 33 | 1.03 | 12.13 |
| 34 | 0.90 | 4.77 |
| 35 | 0.80 | 18.46 |
| 36 | 0.50 | 38.08 |
| 37 | 0.21 | 41.48 |

r-squared = 0.0209

F = 0.05

df = 35 & 36

alpha = .05

TABLE 8: FAMILY DEPENDENT

Where Family Member Hours Used is a Function of Employee Hours Used

* Note: Families with Zero Time on System Were Excluded

| NO. | EMPLOYEE HOURS USED | FAMILY HOURS USED |
|---|---|---|
| 1 | 97.14 | 3.79 |
| 2 | 72.51 | 27.20 |
| 3 | 55.03 | 3.14 |
| 4 | 50.88 | 5.27 |
| 5 | 47.34 | 7.17 |
| 6 | 42.04 | 42.04 |
| 7 | 41.48 | 0.21 |
| 8 | 38.08 | 0.50 |
| 9 | 36.83 | 4.00 |
| 10 | 33.30 | 60.74 |
| 11 | 29.93 | 11.46 |
| 12 | 29.30 | 5.95 |
| 13 | 28.80 | 69.16 |
| 14 | 26.99 | 19.60 |
| 15 | 24.77 | 8.28 |
| 16 | 20.58 | 14.34 |
| 17 | 19.67 | 30.00 |
| 18 | 19.53 | 1.75 |
| 19 | 19.40 | 22.14 |
| 20 | 19.32 | 30.23 |
| 21 | 18.46 | 0.80 |
| 22 | 16.44 | 2.10 |
| 23 | 16.43 | 32.80 |
| 24 | 13.43 | 7.82 |
| 25 | 13.42 | 95.73 |
| 26 | 12.13 | 1.03 |
| 27 | 11.71 | 17.14 |
| 28 | 11.50 | 9.49 |
| 29 | 10.42 | 10.20 |
| 30 | 9.79 | 59.90 |
| 31 | 9.73 | 31.90 |
| 32 | 9.59 | 6.58 |
| 33 | 9.39 | 5.10 |
| 34 | 9.26 | 36.07 |
| 35 | 8.48 | 34.10 |
| 36 | 7.75 | 4.60 |
| 37 | 4.77 | 0.90 |

r-squared = 0.0147

F = 0.51

df = 34 & 35

alpha = .05

TABLE 9: CORE USERS' RELATIONSHIPS WITH FAMILY HOURS USED

| | |
|---|---|
| **ALL CORE USERS** | |
| No. Employee Core Users = | 18 |
| No. Family Core Users = | 18 |
| Total = | 36 |
| **EMPLOYEE CORE USERS** | |
| No. Empl Core Users with Family Non-Core = | 12 |
| No. Empl Core Users with Family Core Users = | 6 |
| **FAMILY CORE USERS** | |
| No. Family Core Users with Empl Non-Core = | 12 |
| No. Family Core Users with Empl Core Users = | 6 |

"TABLE 10: GROUP MOTOROLA (STRUCTURED) SUBJECT USAGE, CORE USERS"

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

GROUP MOTOROLA
(STRUCTURED) HOURS

| 18 | EMPLOYEES | | 18 | FAMILY | |
|---|---|---|---|---|---|
| SUBJECTS | HOURS | PCT | SUBJECTS | HOURS | PCT |
| - - - - - | | | | | |
| READING | 120 | 40.5% | STUDY SKILL | 32 | 47.1% |
| LANGUAGE | 65 | 22.0% | MATH | 14 | 20.6% |
| MATH | 35 | 11.8% | SPELLING | 11 | 16.2% |
| SPELLING | 30 | 10.1% | READING | 4 | 5.9% |
| CRIT THINK | 30 | 10.1% | CRIT THINK | 4 | 5.9% |
| STUDY SKILL | 16 | 5.4% | LANGUAGE | 3 | 4.4% |
| TOTALS = 296 | | | | 68 | |

TABLE 11: M-WORLD (UNSTRUCTURED) SUBJECT USAGE - CORE USERS

M-WORLD
(UNSTRUCTURED) HOURS

| 18 EMPLOYEES | | | 18 FAMILY | | |
|---|---|---|---|---|---|
| SUBJECTS | HOURS | PCT | SUBJECTS | HOURS | PCT |
| ELECTRONICS | 1082 | 78.3% | GAMES | 1466 | 82.8% |
| NOTES | 76 | 5.5% | NOTES | 102 | 5.8% |
| GAMES | 73 | 5.3% | GEN MATH | 54 | 3.1% |
| GEN MATH | 35 | 2.5% | TYPING | 25 | 1.4% |
| ENGLISH | 25 | 1.8% | EDUCA GAMES | 21 | 1.2% |
| TYPING | 23 | 1.7% | ADV MATH | 18 | 1.0% |
| USING MAC | 17 | 1.2% | ENGLISH | 16 | 0.9% |
| SOCIAL STD | 11 | 0.8% | MUSIC | 10 | 0.6% |
| HEALTH 1&2 | 6 | 0.4% | ELECTRONICS | 9 | 0.5% |
| ADV MATH | 6 | 0.4% | SIMULATIONS | 9 | 0.5% |
| EDUCA GAMES | 5 | 0.4% | USING MAC | 7 | 0.4% |
| FGN LANGUAGE | 4 | 0.3% | SCIENCE | 6 | 0.3% |
| SPORTS | 3 | 0.2% | CAREER PLAN | 5 | 0.3% |
| CAREER PLAN | 3 | 0.2% | ART/DRAFT | 5 | 0.3% |
| COMPUTER SCI | 3 | 0.2% | JOB SKILLS | 3 | 0.2% |
| READING | 2 | 0.1% | HOME ECON | 2 | 0.1% |
| MUSIC | 2 | 0.1% | HEALTH 1&2 | 2 | 0.1% |
| HOME ECON | 2 | 0.1% | INDUSTRY | 2 | 0.1% |
| ART/DRAFTING | 2 | 0.1% | FGN LANGUAGE | 2 | 0.1% |
| SIMULATIONS | 1 | 0.1% | SOCIAL STD | 2 | 0.1% |
| INDUSTRY | 1 | 0.1% | SPORTS | 1 | 0.1% |
| | | | ACCOUNTING | 1 | 0.1% |
| | | | LAW | 1 | 0.1% |
| | | | PHOTOGRAPHY | 1 | 0.1% |
| TOTALS = "1,382 " | | | "1,770 " | | |

Table 11 also shows that over 82% of family core user time was spent in the games area. In contrast, employee core users selected games just over 5% of the time. Employee core users stayed in the electronics area 78% of the time while family core users selected that topic less than one percent of the time.

To summarize, the two NOVANET subject areas that employee core users selected the most were electronics and reading. In contrast, the two areas selected most by family core users were games and notes.

TABE PRETEST/POSTTEST GAIN SCORE COMPARISONS

The results of the gain scores are shown in Table 12. The gains by the computer group were greater than the non-computer group; however, the difference was not statistically significant.

Table 13 shows the results of the significance testing. The matched pairs' t-test found that the paired gain differences were not statistically different at either the .05 or .10 levels. Also the ANOVA F-test found no significant results between the group scores, either at the .05 or .10 levels. Since this is a pilot study it is worth noting that results of both the t-test and the ANOVA may have been statistically significant at the .15 level or lower.

While the statistical analyses show no significant results, a graphical analysis shows that two different processes of grade level gain may have been at work for the SALSA participants and controls. This difference is illustrated in Figures 3 through 5.

Figure 3 shows the grade level gain for nonusers, to include both the control group and experimental group. The graph shows that nonusers were about as likely to gain grade levels as they were to lose grade levels from the pretest to the posttest.

These results could be due to unsual test circumstances or simple differences in individuals between the pretest and posttest situation. The testing situation is always affected by personal circumstances and outside conditions (to include those who give the test). Thus, some scores would be expected to decrease even after some people attended reading classes.

TABLE 12: SALSA READING PRETEST-POSTTEST TABE GAIN SCORES

| Experimental (Computer In Home) | | | | | | Control (No Computer In Home) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | Pretest Level | % | Posttest Level | % | *Gain (%) | ID | Pretest Level | % | Posttest Level | % | *Gain (%) |
| 29 | D | 87 | A | 93 | + | 25 | D | 87 | A | 89 | + |
| 26 | D | 54 | A | 67 | + | 1 | E | 76 | M | 77 | + |
| 1 | E | 74 | M | 76 | + | 8 | M | 81 | D | 80 | + |
| 27 | M | 97 | A | 91 | + | 10 | D | 69 | A | 66 | + |
| 13 | M | 89 | D | 81 | + | 4 | E | 77 | M | 70 | + |
| 17 | D | 83 | A | 70 | + | 11 | D | 70 | A | 61 | + |
| 9 | M | 84 | D | 70 | + | 16 | M | 90 | D | 66 | + |
| 8 | M | 83 | D | 63 | + | 17 | M | 91 | D | 59 | + |
| 10 | M | 86 | D | 66 | + | 19 | M | 94 | D | 63 | + |
| 30 | D | 87 | A | 66 | + | 20 | M | 96 | D | 63 | + |
| 15 | M | 90 | A | 30 | + | 9 | M | 80 | M | 93 | +17 |
| 23 | A | 63 | A | 90 | +27 | 6 | M | 67 | M | 79 | +12 |
| 16 | A | 51 | A | 71 | +20 | 15 | A | 60 | A | 71 | +11 |
| 4 | M | 66 | M | 86 | +20 | 21 | A | 66 | A | 74 | +8 |
| 12 | A | 47 | A | 63 | +16 | 29 | A | 67 | A | 73 | +6 |
| 2 | M | 57 | M | 71 | +14 | 3 | E | 80 | E | 84 | +4 |
| 25 | A | 66 | A | 77 | +11 | 26 | A | 71 | A | 74 | +3 |
| 28 | D | 87 | D | 96 | +9 | 5 | M | 61 | M | 61 | 0 |
| 20 | A | 69 | A | 77 | +8 | 30 | D | 87 | D | 87 | 0 |
| 19 | A | 63 | A | 67 | +4 | 23 | A | 66 | A | 66 | 0 |
| 24 | A | 67 | A | 71 | +4 | 14 | D | 70 | D | 70 | 0 |
| 11 | D | 69 | D | 71 | +2 | 28 | A | 69 | A | 63 | -6 |
| 18 | D | 81 | D | 81 | 0 | 2 | E | 73 | E | 67 | -6 |
| 6 | M | 79 | M | 74 | -5 | 18 | D | 80 | D | 71 | -9 |
| 5 | M | 79 | M | 74 | -5 | 27 | D | 86 | D | 76 | -10 |
| 22 | D | 84 | D | 77 | -7 | 24 | D | 83 | D | 71 | -12 |
| 3 | A | 33 | D | 79 | - | 7 | D | 54 | M | 90 | - |
| 14 | A | 57 | D | 84 | - | 13 | D | 74 | M | 84 | - |
| 21 | A | 67 | D | 84 | - | 12 | A | 50 | 0 | 61 | - |

*For individuals who changed test level from pretest to post, the percent of gain/loss cannot be directly interpreted. The rank order (ascending) for the levels of the TABE is E, M, D, A.

TABLE 13: PRETEST-POSTTEST SIGNIFICANCE TESTS

Matched Pairs T-Test

| | |
|---|---|
| Sum Diff. | 16.8000 |
| Mean Diff. | 0.5600 |
| SD Diff. | 2.4021 |
| St Error | 0.4386 |
| Obtained t | 1.2769 |
| Critical t @ .10 | 1.3110 |
| Critical t @ .05 | 1.6990 |

"Note: For Results to be Significant, Obtained t must exceed Critical t"

RESULT: NO STATISTICALLY SIGNIFICANT DIFFERENCE IN PAIRED OBSERVATIONS

- - - - - - - - - - - - - - - - - - - - - - - - -

Single Factor ANOVA

| | |
|---|---|
| SSA | 4.7040 |
| SST | 127.8360 |
| SSE | 123.1320 |
| MSA | 4.7040 |
| MSE | 2.1230 |
| Obtained F | 2.2158 |
| Critical F @ .10 | 2.7900 |
| Critical F @ .05 | 4.0000 |

"Note: For Results to be Significant, Obtained F must exceed Critical F"

RESULT: NO STATISTICALLY SIGNIFICANT DIFFERENCE BETWEEN GROUP SCORES

There was only a single pretest and a single posttest. This is what makes this design "quasi-experimental." To be more certain of real effects, a series of pretests and posttests would have had to have been administered in order to establish a clear pattern of gain/loss from individual to individual.

Figure 4 shows the grade level gain for SALSA users. These were the experimental group who received computers and actually used them. The pattern is different from that shown in Figure 3. Figure 4 shows that it is more likely for computer users to gain grade levels.

If the gain processes were the same it would be expected that the graph in Figure 3 would appear similar to the graph in Figure 4. However, they do not appear to be the same and this suggests that different gain processes were at work for the computer users as opposed to nonusers. More research must be done in order to verify this observation.

It suggests that those people who had computers at home and used them were likely to gain grade levels in reading. Conversely, those people who did not use computers (even if they had them at home) were just as likely to gain grade levels as lose grade levels in reading.

Figure 5 shows the two processes together. Here the differences between users and nonusers is clearly evident: those who did not use computers were just as likely to gain grade levels as they were to lose grade levels.

Computer users, however, have a different grade level gain pattern, as shown in the right half of the graph. They were far more likely to gain grade levels in reading.

TABE GAIN SCORES & PERIODS' USED REGRESSION ANALYSIS

Table 14 shows the results of the OLS regression analysis. Only SALSA participant data was used here. The dependent variable is grade level gain and the independent variable is usage periods.

The Pearson's correlation matrix actually shows that there is a slight inverse relationship between usage periods and grade level gain. This means that as the numbers of periods' used increased, grade level gain was actually less.

## FIG 3: GRADE LEVEL GAIN, NONUSERS

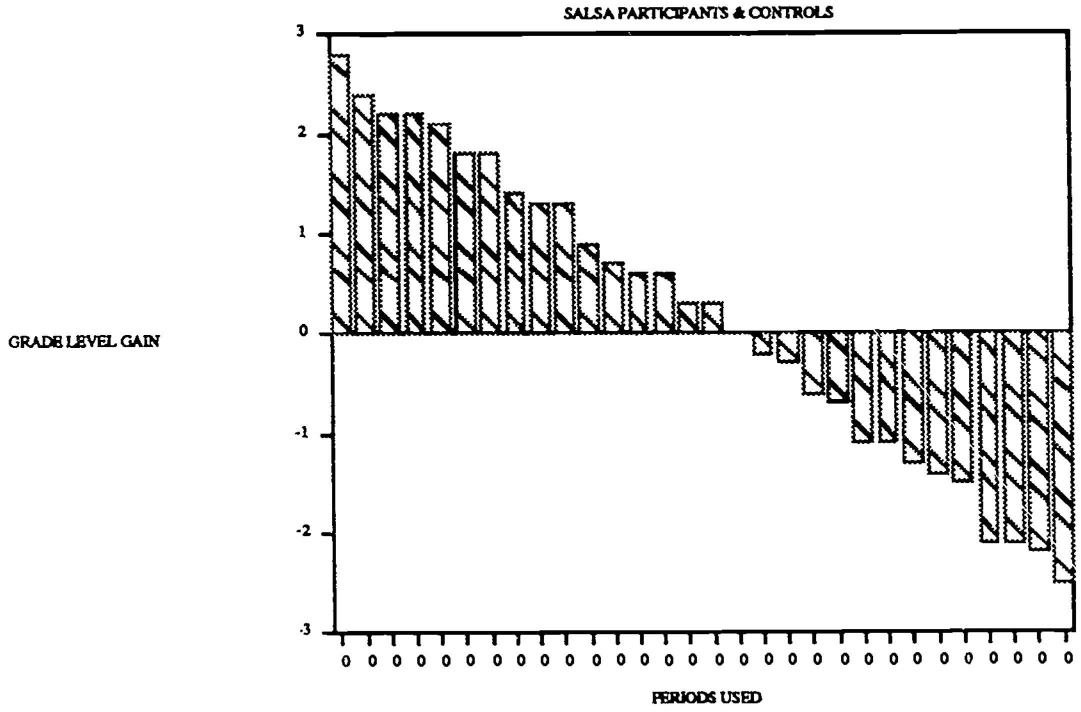

FIG 4: GRADE LEVEL GAIN, USERS

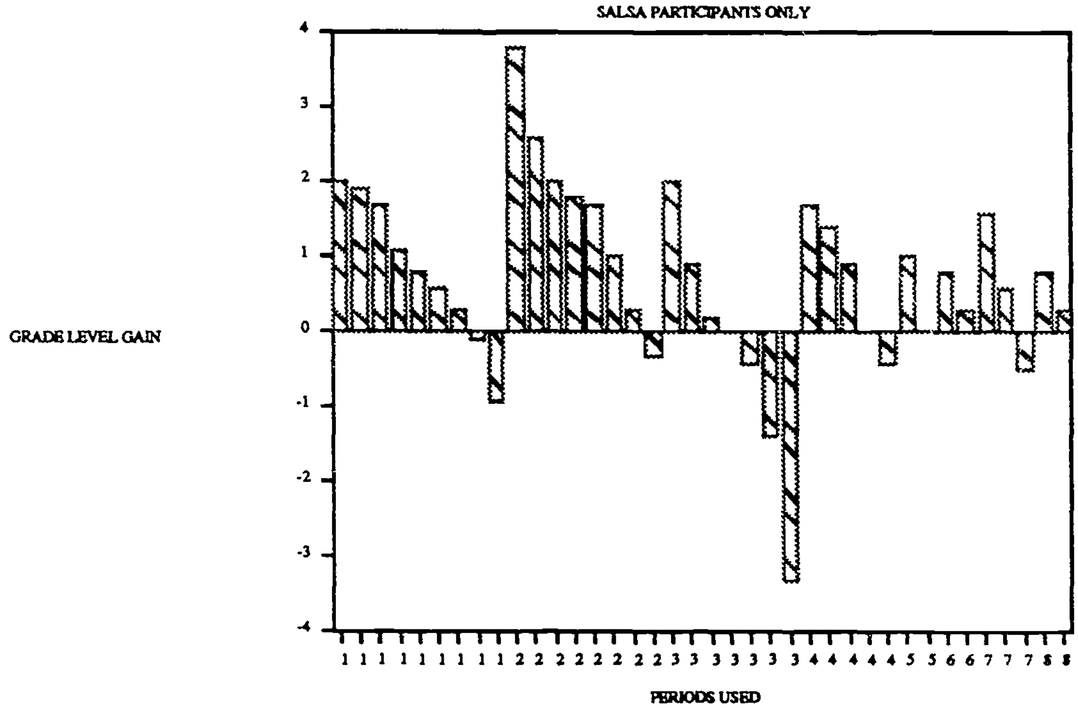

FIG 5: GRADE LEVEL GAIN, USERS NONUSERS

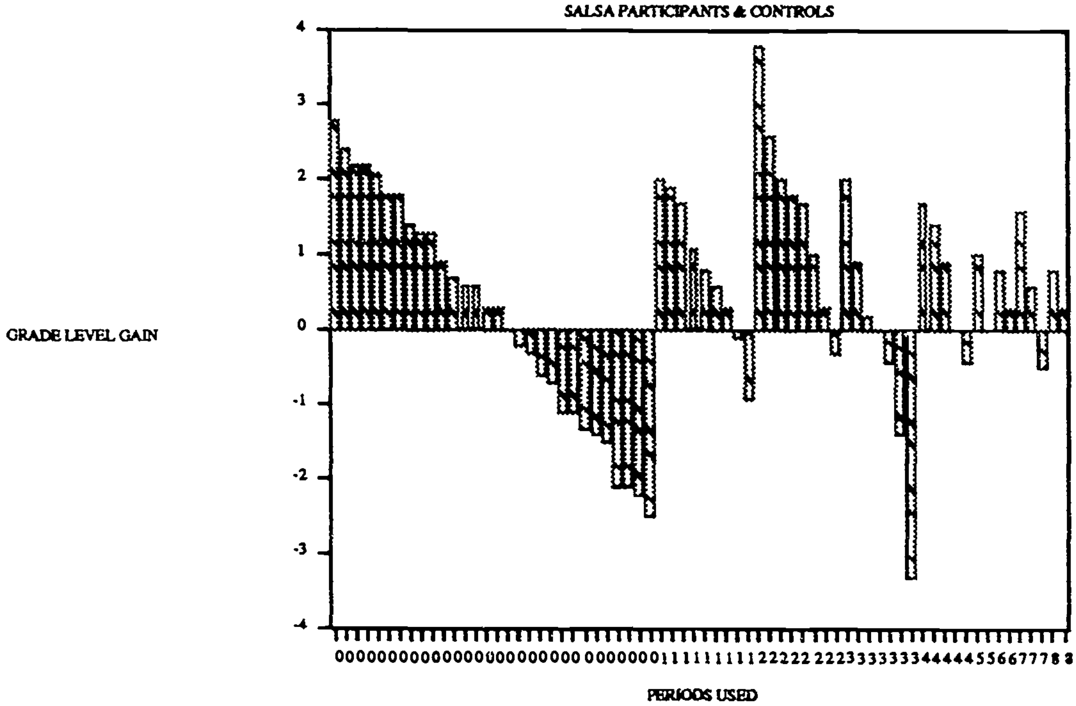

TABLE 14: OLS REGRESSION ANALYSIS - GRADE LEVEL GAIN & USAGE PERIODS

CORRELATION MATRIX

| | Usage | Gain |
|---|---|---|
| Usage | 1.0000 | |
| Gain | -0.1450 | 1.0000 |

n = 38

BASIC STATISTICS

| | Usage | Gain |
|---|---|---|
| MINIMUM | 1 | -3.3 |
| MAXIMUM | 8 | 3.8 |
| MEAN | 3.2890 | 0.7050 |
| STD DEV | 2.1420 | 1.2360 |

REGRESSION ANALYSIS

| | |
|---|---|
| Dependent Variable: | GAIN |
| N = | 38 |
| R-SQUARED = | 0.0210 |
| ADJ R-SQUARED = | 0.0000 |
| STD ERROR EST = | 1.2400 |

ANALYSIS OF VARIANCE (of Regression Equation)

| | |
|---|---|
| REGRESSION | |
| SUM OF SQUARES = | 1.1970 |
| DEGREES OF FREEDOM | 1 |
| MEAN SQUARE | 1.1970 |
| F RATIO | 0.7790 |
| P | 0.3830 |
| RESIDUAL | |
| SUM OF SQUARES = | 55.3380 |
| DEGREES OF FREEDOM | 36 |
| MEAN SQUARE | 1.5370 |

Figure 4 illustrates an anomaly. A statistical aberration does not exist, however, because even when the highest gain and the lowest loss are removed, an inverse pattern still appears.

The greatest grade level gains came from those who used the computer for two of the nine usage periods. Overall, those achieving the greatest grade level gains used the computer for between one and three of the nine usage periods.

This result suggests that grade level gains plateaued after some minimum amount of computer time had been achieved. Given the core user cutoff at one-half hour per usage period and above, this means that most of the grade level gain in reading occurred after as little as one-half to one and one-half hours in NOVANET. Grade level gain actually began to decline slightly the more periods a SALSA participant accessed NOVANET.

The regression analysis in Table 14, however, shows that the number of periods the computer was used was randomly associated with grade level gain of USERS. The F statistic is not significant which means that the regression equation is one that could be obtained by chance alone.

What the regression analysis in Table 14 really shows is confirmation of the process illustrated in Figure 4: grade level gain is not dependent on the number of periods (i.e., length of time) the computer was used. It indicates that grade level gain was simply associated with any amount of computer use over and above some minimum.

Thus, noting the patterns of grade level gain in Figures 3 through 5 and the results of the regression analysis, the results indicate that any use of the computer could be associated with grade level gain. However, those direct labor employees who did NOT HAVE or did NOT USE the computer were just as likely to lose grade levels as they were to gain grade levels in reading.

These results, while not statistically significant, point out that some grade level gain process was at work that has not yet been identified. There does seem to be a difference in grade level gain between computer users and non-users, but it is not clear from this analysis what the process may be.

# DISCUSSION

The results of the focus group interviews indicate that the critical variables affecting home-based computer utilization were perceptions that employees had of project design difficulties and technical problems. Outside events also influenced use of the computers.

Employee personal variables played a role as well. Most employees were serious about participating. Ironically, this factor affected how much their family members utilized the system. If an employee was a core user it was not likely that one of his/her family members would also be a core user.

Computer use was influenced by design difficulties because of the uncertainty and lack of direction employees felt about their role in the project. The SALSA participants seemed unsure why they were issued computers and did not completely understand what they were supposed to do with the computers in their homes.

Employees also perceived that the computer support system had design difficulties. When employees who had questions could make a local call and get a response from someone they knew (i.e., an instructor from one of the initial training sessions), the use of computers was perceived as easier.

When the local support was transferred to the University of Illinois, however, questions were answered by an unknown "expert." Employees perceived this change in procedure as unwelcome and some became discouraged. This change from local to remote support was associated with the perception that the home use of computers was more difficult.

These attitudes influenced utilization of the computers because those employees who got discouraged early on in the project and quit using their home-based computers saw no real reason for going back and trying to use them again. This was a difficulty in project design because the change from local to remote support contributed to the perception employees had that the project changed.

Technical difficulties influenced computer use because employees who experienced hardware and/or software problems early on in the project quit using the computer and became frustrated and discouraged. These feelings increased when they tried to phone for help and got less than they expected.

Thus, the six weeks of initial training and face-to-face local support was probably too short a time frame in which to assume that employees had become independent computer users. A permanent local support team might have changed the perceptions of employees that the project had technical problems as well as design difficulties.

In addition, focus group responses support the notion that face-to-face support was discontinued too soon: employees consistently reported that the training went too fast and did not answer all their questions. It appears that the employees were not ready to be left on their own when local support was discontinued.

Consequently, training direct labor employees to use computers may require a slower pace. These adults, especially those who have never used a computer before, may need a more deliberate approach.

This kind of approach also appears to require continuous interaction in terms of support and follow-up. The outcome of a follow-up phone call to employees during period five found NOVANET usage went up immediately. Although many employees and family members appeared to sign on and off very quickly, it does suggest that more follow-up and local contact would have meant more participants would have used the system.

Finally, outside events played a critical role in computer utilization. When the Persian Gulf crisis escalated during the fall of 1990, many employees began working longer hours and/or more days per week. This influenced them physically and a number of them said they were too tired during the months of November and December to use the computers.

Given these situations, it is important to consider what might have happened if only some of the perceptions of design and technical problems had not occurred. Certainly, the employees and family members would have used the computers more and for longer periods of time.

What remains very positive is that a small group of employees kept on using their computers, despite the perceived problems and longer work schedules. These core users were likely to gain grade levels on the reading posttest. In contrast, those who did not use or did not have the computers were as just as likely to lose grade levels as gain them. This result implies that, if an employee's perception of the early computer experience is positive, he or she is not only more likely to keep using it, but is also more likely to increase his/her reading literacy.

A third of the employees (eighteen of fifty-three, 34%) were identified as core users. These participants took project SALSA very seriously.

The profile of a SALSA core user employee was female, Anglo or Hispanic, who worked first or third shift. She was likely to be a single parent as well. Even when using the unstructured activities in the M-World subsystem of NOVANET, she spent more than three quarters of her time in the electronics area.

These women were proud and felt honored to be a part of SALSA. They may might not have known quite what the project was all about, but they were going to do the best they could under the circumstances.

Moreover, SALSA allowed participants to have new experiences. It is likely that many of them would never have explored topics provided in NOVANET on their own without being a part of SALSA. They saw possibilities they had never thought of before.

The profile of a non-core employee is virtually identical to the user profile. What, then, influenced one to become a core user and another to be a nonuser? The answer is that an employee's early experiences in SALSA determined whether or not he/she kept using the computers.

If she became frustrated and unhappy during the initial hands-on training, then she almost certainly quit using the computer by the end of September. If, however, she had initial training experiences that were positive, she was likely to continue utilizing the computer.

Therefore, if the early perceptions of SALSA participants could have been uniformly positive, computer use would have been higher for longer periods of time. This result, based on the critical variables that were identified, is reasonably straightforward.

Interpreting whether or not there really was any true gain in reading literacy is a difficult matter, however. There were no statistically significant results at either the 95 or 90 percent confidence levels. In other words, any grade level gain or other association found with grade level gain could have happened purely by chance.

Second there is an even higher degree of variability in the TABE grade equivalencies. One standard deviation equals about four grade levels. What these two problems with the TABE mean is that any interpretation of TABE pretest-posttest gain scores is completely unreliable.

So any discussion of gain in reading literacy must be taken with this warning: the level of gain results could have been achieved by chance. The interpretation below is entirely speculative.

SALSA was a pilot project undertaken to see what would happen if computers were placed in the homes of factory workers. SALSA was a social experiment conducted in the real world. This fact accounts for a many of the design difficulties perceived by employees.

SALSA's sample was small and its "treatment," i.e., the home-based computer instruction, was "weak" (employees were deliberately left on their own to see what would happen). Thus, in terms of planning for a larger, full-scale project, it is important to note that the reading grade level gains might have been significant at the 85 percent confidence level. This means that a larger sample (e.g., 400) with a stronger treatment (e.g., continuous local, face-to-face support) might have produced statistically significant grade level gains.

Interpreting the gain level by itself may be unreliable, but comparing the gain with other results of similar studies is still useful. The comparison below shows that SALSA results are in line with those reported by Glenn (1986) and Kentucky's CAI project (1986). Glenn and the Kentucky CAI project did not test for statistical significance.

SALSA results actually fit in with what might be expected, given SALSA's adult participants and the average grade level at which they started. Swan (1990) reported work by earlier studies that an inverse relationship exists between achievement and beginning level: the higher the beginning level the lower the average gain. Swan also found the same inverse relationship. SALSA results show this relationship as well.

Thus SALSA's lower level gains are to be expected. That is because SALSA participants had a higher average beginning grade level than either the Glenn (1986) or Kentucky (1986) studies.

In addition, as confirmed by Bill Golden of the University of Illnois, it is not necessarily the QUANTITY of time on the CAI system that is important. Rather what is important is the QUALITY of learning that occurs when the CAI system is used.

This supports SALSA results also: gain in reading was associated with just about any amount of time spent in the NOVANET system. In other words, even though the NOVANET system may not have been used a great deal by SALSA participants, the time that was spent appears to have been quality learning time.

To summarize, project SALSA made a significant contribution to the betterment of the quality of life of the direct labor employees who were core users of the home-based computer system. Early hands-on training that would have enabled participants to achieve uniformly positive experiences would probably have increased the number of computer users, and increased the time they spent on the computer.

A level gain in reading literacy was achieved by most participants, but it was not statistically significant at the 95 percent confidence level. Interpreting the gain score results for adults is unreliable, yet the results do compare favorably with those of other studies. Yet a larger sample (e.g., 400) might have achieved statistical significance.

# CONCLUSIONS

The primary objective of this pilot project was determine if home-based computers would decrease the time needed for direct labor employees to achieve a desired reading level. The second goal of the SALSA project was to determine whether other family members perceived the learning system to be of value in their homes.

Rio Salado researchers pursued these objectives by identifying the critical variables affecting home-based computer utilization. This was done through group and telephone interviews.

Home-based computer activity was also assessed. Time spent by employees and their family members on the NOVANET system was reviewed for patterns. In addition, thirty of the SALSA participants were compared with a control group using TABE pretest-posttest gain scores.

As discussed in the "Methods" section, participants took different classes at different times and the Persian Gulf crisis meant their work schedules changed. Thus, the question of whether or not home-based computer instruction could decrease the time for direct labor employees to reach a desired level of reading achievement could not be answered.

The research was able to answer the question of what would happen if direct labor employees were issued computers for use at home. Employees took the project very seriously. They spent the vast majority of their time in the NOVANET system in the subjects of electronics, reading, math, spelling, and critical thinking. SALSA participants gained an average of nine months' grade level in reading while the SALSA control group gained an average of only two months.

The results were not statistically significant and interpreting the TABE gain scores for adults may be highly unreliable. Yet, with that warning stated, there is still an indication that the reading class experiences of the employees who had computers were different from the experiences of employees who did not have computers.

SALSA results are consistent with those of other studies, statistically significant or not: SALSA participants were more likely to gain levels than the control participants. These differences may not be attributable to the home-based computer use itself. More research must be done to determine how home-based computer instruction, used as a supplement to reading classes, impacts reading literacy.

A future project should have a sample size of at least four hundred. The implementation of the initial training should be slower paced and more deliberate. Locally based, face-to-face support should continue for the life of the project.

Both employees and family members liked the project and thought is was a good idea. While employees felt their knowledge and skill levels increased, family members (typically children) were likely to characterize the project as being fun. Employees especially liked the way they were selected. The project clearly enriched the lives of all partcipants, employees and family members alike.

An assessment of the home-based computer activity shows that there was a core of employees and family members who consistently accessed NOVANET over time. While a third of the employees were "core users" only one tenth of the family members were consistent users.

An employee core user, however, was unlikely to have a family member as a core user. Conversely, a family core user meant that that family's employee was unlikely to be a core user. The reason for that relationship seems simply to be availability. If the computer was free, then a family member may have been more likely to try to use it. However, if an employee was consistently using the computer, then the family member may have given up trying.

The major variable affecting home-based use was the employee's perception of design and technical problems. The Persian Gulf crisis also influenced SALSA participants by changing their work schedules.

If the perceptions of design and technical problems had been reduced, it is likely that more participants would have been consistent users. While it is impossible to control outside events like the crisis in the Persian Gulf, projects like SALSA should not overlap the holiday season.

Project SALSA definitely contributed to the enrichment and betterment of the direct labor employees who stayed involved. It provided new opportunities and provided them with a sense of accomplishment they had not experienced before.

These employees had probably experienced failure during their formal education. As a result they sometimes appear intimidated and self-conscious about formal classroom training. Retaining their sense of dignity is very important to them. To fail in the public arena of the classroom is unacceptable.

SALSA allowed participants, in the privacy of their own homes, the freedom to learn without public humiliation. Home-based computer-aided education allowed them to maintain their pride and and dignity.

Does a direct labor employee whose pride and self-esteem is enhanced become more productive? That question remains to be answered. But it would seem that enhanced self-esteem at least helps to make people more ready to perform at the highest levels possible for them.

The question of improved productivity through improved literacy presents an opportunity for employers to contribute to the development of the American workforce. This is the chance to directly participate in serious, basic and applied research which investigates the hypothetical link among computer-assisted instruction, literacy improvement, and productivity improvement.

Also, the decline of productivity in western economies is associated with the decline of western educational standards. At the same time Japan's rising productivity is associated with its high educational standards.

The real solution, of course, is to get at the root of the problem and increase western educational standards. This should begin at the elementary school level. Hopefully this issue is being addressed at national levels.

American business and industry cannot wait for new educational standards to take effect, however. They must act today to increase the literacy skills of the workers they have now and the skills of those they are likely to hire in the next two decades. This means a massive outlay of funds for training and development.

An unanswered question, however, is what KIND of training and development and HOW should it be applied? It has been hypothesized in this study that productivity increases could be achieved through using computer-assisted instruction to improve the literacy of direct labor employees. It is only through real-world, practically applied, controlled experiments that that question can be answered.

Therefore SALSA calls for American businesses to participate in the development of full-scale research projects which test the CAI-literacy improvement-productivity improvement hypothesis. The results of such experiments could have major implications as to how American business and industry will attempt to improve the literacy and productivity of its factor workers now and into the twenty-first century.

# RECOMMENDATIONS

Any future project that uses the SALSA format must consider placement of computers in the homes of employees to be a major responsibility. The project must have a strong "implementation plan" and a larger sample should be used. In addition, achieving desired objectives may be more likely if the following concerns are addressed and resolved before the project is initiated.

1. The project should be directed by a manager who is physically located close to the facility/ties where employees have been issued computers. This person must have complete authority and control and this should be his/her primary task.

2. The project director should set up a team to include the following:
   - Trainers/instructors who have expert knowledge of the software used.
   - Trainers/instructors who have expert knowledge of the computers used.
   - Experienced hardware and software troubleshooters.
   - Experienced communications' troubleshooters.
   - Administrative assistants whose primary task is project support.

3. Team members should be company employees and must agree to stay on for the life of the project. Team members must be willing to go to employee residences to walk-and-talk employees through difficulties. Real hardware/software problems should be repaired with minimal delays.

4. Software/hardware support personnel should be assigned and in place from day one. Employee use patterns should be strictly monitored. Those who use the computers very little or not at all should be contacted within the first month to determine the reason for lack of use. Problems should be solved. Computers should be returned if people are not interested.

5. If an employee shared-cost purchase program is to be a part of the in-home computer project then the following should also apply:
   - Systems purchased cannot be resold for eighteen months.
   - Several options should be available to include these:
     * Computers in a variety of configurations, e.g., 20 to100 mg hard drives, 1 to 4mg RAM, mono & color screens.
     * An optional modem and NOVANET access.
     * An optional printer (several types to be available).
     * Software options (e.g., games, educational packages, and basic word processing, spreadsheet, and database programs).

6. A $500 entry level price was popular. A credit option was popular as was the option for an automatic payroll deduction. The $15 monthly phone line fee needs a rationale to be meaningful, e.g., it might be cheaper in the long run.

7. Employees were interested in a "software library" being established so that they could check out various programs and return them at a specified time. Games, educational packages, and basic word processing, spreadsheet and database software might be popular. At first, software should be the most user friendly possible. When skills of library users increase and demand is demonstrated, more sophisticated programs could be added. The project manager needs to inquire about licensure agreements on software packages that might be a part of such a library.

SALSA demonstrates that a real potential for learning, interaction, and quality-of-life improvement does exist for direct labor employees. The "treatment," i.e., the early training, interaction, helping, and follow-up functions must be far "stronger," i.e, intense/deliberate/patient/persistent if a project such as SALSA is to be truly successful in improving direct labor employee literacy.

Any home-based computer project must be carefully planned, managed, and supervised, just like any other serious project in an organization. SALSA demonstrates that employees, left on their own, do take home-based computer training seriously, but they need clearly defined goals and objectives, continuous local face-to-face support, and periodic follow-up to insure continued use of the system.

Future projects like SALSA should be conducted as a major component of an organization's human resources development. With this kind of attention and commitment, maximum results and benefits are likely to follow.

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## APPENDIX A: SALSA EMPLOYEE FOCUS GROUP QUESTIONS AND RESPONSES

Q1. How did you like having the computer in your home?

R1.

LIKED = 31
NOT LIKE = 3
NO RESPONSE = 6

Q1.1. Did it (computer in home) in any way help you with your reading class? Give some examples.

R1.1.

YES = 16
Why Yes? It was very patient. More interesting than class.

NO = 19Why No? I didn't take the class. I'm a single parent-no time. The reading class on NOVANET was not anything like the reading class at the plant.

NO RESPONSE = 5

Q2. How do you feel about having to give the computer back?

R2.

NOT GOOD/SAD = 24
Why not so good/sad? Step son wants to use it. Want more time to use it. Want another six months. Wrong time of year - Xmas, end-of-year orders, working seven days, can't find time to use. Didn't have enough time to use it.

OK/FINE/NOT MATTER = 14
Why OK/fine/not matter? Bored with it. Frustrated - it never worked right. I went on vacation then the time went too quickly. It's not mine, so why should I be sad? I can't do it all - work, class, take care of family, use computer - too much.

NO RESPONSE = 2

Q2.1. How do your family members feel about having to give the computer back?
R2.1.

NOT GOOD/SAD = 21
Why not good/sad? Kids used puzzles, games, school, typing.
Age range of children/young adult users: 3, 4, 6, 6, 6, 6, 7, 8, 9, 10, 10, 11, 12, 14, 15, 15, 16, 17, 18, 19, 21, 21.

Age Range, InclusiveNumber
5 - 10 years 11
11 - 16 years6
16 and older 6

OK/FINE/NOT MATTER = 7
Why OK/fine/not matter? No kids. Didn't use it.

NO RESPONSE = 12

Q2.2. The computer and modem cost about $1000 each at Motorola employee discount. Would you be willing to pay $500 if Motorola paid the other $500 to buy the computer and modem?
R2.2.

YES = 35
Comments: I need the credit pay-by-month option. Could we buy it through a payroll deduction? I'd like a printer. It all depends on what options the computer would have. I want a color screen.

NO = 3

NOT SURE = 2
Why not sure? It depends on price, options, payment method...

Q2.3. Would you be willing to pay $15 (per month?) for a private home phone line to have access to NOVANET? Or would you just use your regular phone line and not have a private line for your computer (and pay the long distance charges yourself)?
R2.3.

YES = 20
Comments: What do you mean? Not sure. The price keeps going up and up.

NO = 4.

NOT SURE = 16
Comments: What do you mean? Not sure. Depends. Couldn't I use a disk with programs on it?

Q3. Who used the computer most in your family?

R3.

EMPLOYEE = 24
CHILD = 10
OTHER = 5
COMPUTER NEVER WORKED = 1

Q3.1. How did that (arrangement) come about? Who decided who would use the computer the most? Did it just happen that way?

R3.1.

EMPLOYEE DECIDED = 6
Comments: I decided to spend X amount of time per day on it.

OTHER DECIDED = 5
Comments: I woke up and my daughter was already using it. They (family) used it when I didn't.

DEPENDED ON SITUATION = 19
Comments: It wouldn't work so I lost interest and (others) began to use it.

NO RESPONSE = 10

Q4. What was it about this project that you did not like?

R4. Comments:

Poor training on how to use NOVANET system - too fast, got me confused, too many people, instructors not knowledgeable, poor quality, poor job. Hardware problems got me discouraged quickly. No help on problems - called often and never got response.
The system went down (off) by 7 p.m. - that's too early.
Did not like the teachers.
The monochrome monitor.
Wanted class lessons to coincide with computer lessons.
Wanted printer.
Project was not organized/monitored.
Got disconnected.

Q5. What suggestions do you have for improving this project? Or, if you had your way, what would you do differently?

R5. <u>Comments:</u>

Slow the training down.
Make the initial (NOVANET) training less confusing.
Have smaller (computer training) classes.
Get lower student/teacher ratio in computer training.
Have training (computer) at each facility.
Get hardware problems solved right away.
Get computer installed quicker - took more than two weeks.
Monitor non-users and contact them right away - find out why.
Get better communications among Motorola, Rio, and employees.
Plan better.
Communicate better. Need accurate information.
Coordinate better with phone company.

Q6. Will you do anything differently now that you have had this computer experience? For example - buy a computer or take other classes?

R6. <u>Comments:</u>

Not sure, no response.
Planning on taking classes: Lotus, Excel, MacDraw.
Will buy computer, if reasonable.

Q7. If you could tell Motorola management one thing about this pilot project, what would you tell them?

Q7. <u>Comments:</u>

| PRO | CON |
|---|---|
| Thanks. | Get your act together. |
| Good idea. | Get the bugs out. |
| Honored to be picked. | Get the phone lines clear. |
| Fantastic. | We were dumped. |
| Never thought I'd be chosen. | Needs better organization. |
| Favorites were not played. | Poor communications. |
| Proud to be Motorolan. | Who was in charge? |
| Will help us in our jobs. | Bad timing (e.g., holidays). |
| Feel fortunate. | Overtime messed us up. |
| Good thing. | |
| Interesting | |
| Nice of them (Motorola) | |
| We're proud - we built that computer. | |

SUGGESTIONS

Teach me how I can use it at home to do home things (e.g., checking, budgeting).
How about a disk library we could have access to?
How about a printer?
Need 24 hour NOVANET access.

Q8. Were you still using the computer the last few weeks?

R8.

YES = 7

NO = 30

Why not? Overtime - working too much. Working seven days now - too tired.
Got frustrated with the hardware problems and gave up.
Military orders due for Middle East. Kids bothered me.
Holidays. School - kids' activities.

NO RESPONSE = 3

Q8.1. If you were not using the computer, was one of your family members?

R8.1.

YES = 12

NO = 11

NO RESPONSE = 17

Q8.2. Why did your family members continue to use the computer but not yourself?

R8.2.

Comments:

End-of-year contracts now - too busy/tired.
Overtime started. Ten hours a day now. Too tired.
Miliary orders due. Persian Gulf crisis means more work.
It's the holidays - other things to do now.
I'm discouraged with the thing. It never worked right.
I'm frustrated and angry. I got disconnected and no one said why or ever hooked me back up again.
I never had enough time.
My daughter took over.
My fiance/stepson/husband/brother used it all the time.

Other comments:

The 7 p.m. NOVANET cutoff time was bad.
The NOVANET weekend cutoff time was bad. That's the only time I could use it.
The system doesn't work right. It gave us the wrong answers.
Went back and did same problem and know I got answer right but system still said wrong. Get bugs out.
I had problems logging in.
"Garbage" on screen really made it hard to use.
Class, work, home, family, computer - too much.
Get classwork to be the same as computer work.
Problems getting help - no response to messages.
I needed more training to use it right.
I knew my reading scores were supposed to go up more than the scores of people who didn't have a computer.
BusinessLand people were helpful.
Will I be fired if my reading scores don't improve?
I got disconnected - why?
I called but never got a response - why?
The computer was down more than it was up.
Cappy, Barb were hard to get a hold of.
Golden wouldn't respond. Golden was no help.
What happened to the six months? It's only four and we have to give it back.
Mouse quit working.
I might have used it if it worked better.

## APPENDIX B: SALSA FAMILY TELEPHONE INTERVIEW QUESTIONS AND RESPONSES

Q1. What did you like about having the computer in your home?

<u>Comments:</u>
Fascinating. Not good in school, I needed the help.
Interesting.
Enjoyed it.
Fun. Loved it.
Liked the games.
Liked the games, math, spelling, notes, music.
Really liked talking with people across the country.
Had no time to use it.
Did not use it: brother died.

Q2. What topics did you use the most?

<u>Comments:</u>
Games, electronics, math, spelling, notes, Spanish lessons.
Teen talk. School subjects, social studies, music, science.

Q3. What did you not like about the project?

<u>Comments:</u>
When the computer left: it was a part of the family.
Hard to get to know how to use it at first.
Did not like giving the computer back.
Sorry to see it go.
Can't think of anything: liked the project a lot.

Q4. Any other comments you want to add?

<u>Comments:</u>
Wonderful.
Wanted to keep the computer longer.
Wish we had it longer. Want to buy it.

APPENDIX C: NOVANET COURSE DESCRIPTIONS

### Art

Lessons are provided in perspective, shade and shadows, and other lessons in projection.

### Basic Skills Language Arts

There are eight units of intruction in this topic which utilize tracked pretests and posttests for accuate student assignments. Lessons include correct use of irregular verbs; subject-verb agreement; correct use of negative words (avoiding double negatives); subject verbs and direct objects recognition; and a series on synonyms, antonymns, commonly confused words, capitalization, and punctuation. Target grade levels: fourth through eighth.

### Basic Skills Math

There are sixteen units of instruction. Each unit consists of a pretest, computer instruction, and a posttest. Instructions cover operations with whole numbers, fractions, and decimals.

### Basic Skills Reading

There are eight units of instruction. Each unit consists of a pretest, computer instruction, and a posttest. The instruction includes lessons on information-finding, paraphrasing, and fluency skills. In addition, there is a series of lessons on main ideas. Target grade levels: fourth through eighth. The lessons form a part of the learn to read curriculum.

### Basic Skills Spelling

The first unit has four lessons on common spelling rules: final e, doubling, adding prefixes and suffixes, and changing y to i. This unit has tracked pretests and posttests. Units two through five have drills on commonly misspelled words that do not necessarily follow the spelling rules. These words must be learned as whole words. There are thirty words in three groups of ten in each lesson. Target grade levels: fifth through eighth.

### Business

Here users can take lessons in merchandizing, business law, management, typing, job skills, interviewing, career planning, business communications, recordkeeping, accounting, data processing and basic programming.

## Critical Thinking

This topic has a selection of critical thinking skills useful at the twelfth grade level. There are seven units of one lesson each, with pretests and posttests. Lessons cover levels of generality, classification, inductive and deductive reasoning, practice with analogies, introduction to an ideological spectrum, logical facilities and some propaganda concepts.

## Engineering

Basic statistics are included in this topic for architecture, engineering, materials' strength for architecture and engineering, and finite element methods.

## English

This topic has lessons in reading and language improvement, English as a second language, library referencing, grammar and usage, basic writing, creative writing, factual writing, journalism, advanced rhetoric, speech, drama, mass media, vocabulary building, reading techniques, poetry and literature.

## Foreign Languages

Lessons include practice in French, German, Russian, Spanish, Latin, Japanese and Navajo.

## Games

The games included here are challenging and fun. Some games require a partner and some allow up to thirty players to interact.

## Health and Safety

This topic has lessons on first aid, emergency medical training, nutrition, food science, dental hygiene, sports and physical fitness. Examples of lessons include the digestive system, nutrition overview, digestive system functioning and regulation, carbohydrates, lipids, proteins, food energy, fat soluable vitamins, water soluable vitamins, macrominerals, microminerals, the basic four food groups, nutritional needs and dietary analysis.

## Home Economics

This topic includes a food service program and child care programs.

## Industrial Careers

Lessons included in this topic include career planning, employability skills, technical mathematics, automechanics, graphic arts, photography, machine shop, metal trades, electricity and electronics, architectural drafting, engineering drafting and construction engineering.

## Mathematics

In this topic the lessons cover whole numbers, general math, technical math, pre-algebra, algebra, geometry, intermediate algebra, trigonometry, analytical geometry, and calculus.

## Music

This topic covers concepts of music fundamentals, introduction to scales, keyboard drill, music games, beginning guitar, chords, introduction to conducting, Romantic Era composers, and other lessons.

## Notes

This is a forum for NOVANET users. This is a place to ask questions and exchange information and ideas. Available note files include Motorolans, Public Notes (general NOVANET discussions), Consumer Notes, Notes for Industrial Users, Macintosh Notes, Microcomputers, Recipes, Pets, Music, Teen Rap, Kids' Talk.

## Physical Education

This topic includes forehand stroke in tennis, cross country running, the biomechanics of running, and other sports' skills.

## Science

This topic includes math for science courses, life science, biology, environmental science, microbiology, chemistry, physics, anatomy, and psychology.

## Social Studies

This topic includes lessons in introductory social studies, American government, geography, world history, U. S. history, economics, sociology and psychology.

### Study Skills

The nine units in this topic are a selection of study reference skills useful at the high school level. Tracked pretests and posttests are available. Lessons cover dictionary skills, chart reading, card catalog use, recognition of the parts of a book, use of library reference books and periodicals, use of citation and bibliographic reference, and practical information on how to take notes, review for content, and generally organize study materials.

### Typing

This topic includes practice in finding the basic home row, figures and symbols, speed and accuracy, skill building, and special applications for foreign languages.

### Using a Mac

This topic contains introductory lessons on how to use the keyboard on an Apple Macintosh computer.