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AUTHOR Beyer, Francine S.
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ABSTRACT

This document presents the second year evaluation of the CAI/Cooperative Learning Project. The purpose of this project is to develop a national model for integrating computer-assisted instruction (CAI) through an integrated learning system. The project is a collaborative effort by two Pennsylvania school districts, Hatboro-Horsham and Pittston Area, and Research for Better Schools (RBS). This report begins with an introduction that provides background information on the project and the evaluation questions addressed by the study. Next, the evaluation design and procedures are described including design, student sample, instrumentation, and data collection and analysis. The findings of the evaluation questions for year two are presented in two sub-sections: program implementation and program outcomes. The program implementation sub-section presents data from both the Hatboro-Horsham and Pittson Area School Districts while the program outcome section includes data only from the Pittson Area. Finally, conclusions drawn from this evaluation and implications for year three are presented and examined. Included in the appendix are the surveys used in the evaluation as well as the mean survey responses for rated items. (JLB)

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THE CAI/COOPERATIVE LEARNING PROJECT

Second Year Evaluation Report

by
Francine S. Beyer

IR016838

Research for Better Schools
444 North Third Street
Philadelphia, PA 19123

November 1992

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SECOND YEAR EVALUATION REPORT

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Introduction

This report represents a second-year evaluation of the "CAI/Cooperative Learning Project." The three-year project is a collaborative effort by two Pennsylvania school districts, the Pittston Area School District and the Hatboro-Horsham School District, and Research for Better Schools (RBS). It is federally supported by an Innovation in Education Program Grant.

The introductory section of the report provides some background information on the project and the evaluation questions addressed by the study; later sections of the report describe the evaluation design and procedures, preliminary findings, and some conclusions and implications based on these findings.

Background

Both the Pittston and Hatboro-Horsham School Districts had previously been involved in successful efforts to implement computer-assisted instructional technology. In order to further adopt this technology, in combination with innovative educational practices, the two districts jointly proposed this collaborative project to the Fund for Innovation in Education. Specifically, the project proposed to integrate advanced integrated learning system (ILS) technology with cooperative teaching in the classroom and collaborative learning in the home. It was anticipated that the project could potentially serve as a model for effective computer-assisted instruction that could be nationally validated, disseminated, and adopted by school districts across the nation. To realize this potential, the project needed a sound evaluation plan capable of demonstrating the full extent of its effectiveness. Because of its history in evaluating computer-assisted instructional programs, RBS was invited to collaborate with the two districts in the project, serving as a third-party evaluator.

The project was to include the acquisition of computer hardware and software, initial and on-going teacher training, achievement and attitudinal data collection and analysis, and dissemination. For their software, the two school districts selected a computer-based learning system marketed by Jostens Learning Corporation.

Evaluation Questions

The purpose of the CAI/Cooperative Learning Project is to develop a replicable, independently validated, national model for integrating computer-assisted instruction through an integrated learning system that includes inquiry-based, hyper-media learning and cooperative learning techniques. An original feature of the project is the inclusion of cooperative education, creating a collaborative learning environment both within the classroom and at home. Based on the project goals, as specified in the project proposal, three outcome evaluation questions were formed to focus the evaluation study. They were:

1. To what extent does the program enhance mathematics and language arts achievement for the participating students as measured by an increase in standardized test scores?

2. To what extent does the program enhance positive student and parent attitudes toward learning, the integrated learning system, and education in general?

3. To what extent does the program enhance positive teacher and administrator attitudes toward the integrated learning system and cooperative learning?

The evaluation of the project's first year was primarily descriptive (Beyer, 1991) as the project was not initiated until the second half of the school year and, during this time, was not fully operational. It was hoped that an implementation focus for this first year would help to ensure that prerequisite conditions for proper program implementation were met. Throughout year two, RBS closely monitored implementation and program

operation in the two districts, and found implementation concerns to still be an issue, and paramount for the Hatboro-Horsham School District. This district experienced considerable hardware and software problems throughout the school year and, as a result of these unexpected and frustrating difficulties, the project reached only a minimal level of operation. Thus, the evaluation design, procedures, and outcomes described in this report apply mainly to the Pittston Area School District. In order to include a description of these critical implementation issues, the process evaluation question included in the first year report is included in this second year report as well. This fourth evaluation question is as follows:

4. To what extent was the project implemented as planned?

A discussion of the findings related to this evaluation question will set the stage for interpreting the outcome evaluation findings.

Evaluation Design and Procedures

This section describes the evaluation design, student sample, instrumentation, and data collection and analysis undertaken by RBS in connection with its second year evaluation of the CAI/Cooperative Learning Project implemented in two middle schools, one in the Pittston Area School District and one in the Hatboro-Horsham School District.

Design

The approach used to address the evaluation questions was to include quantitative data collection of curriculum-embedded tests and standardized achievement tests. In addition, implementation and attitude measures were to be obtained through survey data collected at the end of the school year and through observations and informal interviews made during periodic visits to each of the sites. A pretest-posttest control group design was to be used (in years two and three) to enhance the validity of the findings,

although there were differences in the nature of the control or comparison group at each school. For the Hatboro-Horsham School District, the control group was to be constituted from students within the same school who had no contact with computer-assisted instruction. For the Pittston Area School District, the control group was to consist of students within the school who had minimal contact with computer-assisted instruction.

A number of changes were made in the evaluation design originally proposed. Major changes and their rationales are listed below. In terms of the proposed evaluation plan for collecting outcome data:

- The TELLS data were not collected and analyzed as the state discontinued this testing program.
- Outcome data from the Hatboro-Horsham School District were not collected and analyzed as this district experienced extensive implementation difficulties.
- Parent attitude data from the Pittston Area School District were not included in the report (with the exception of home use survey data) as the district did not administer the parent survey.
- Survey data were only collected at the end of the school year (for second year participants) as the previous end-of-year survey served as the pretest.

In terms of the proposed evaluation plan for collecting process data:

- Cooperative learning data were not collected as this portion of the program was not implemented by either district.
- Time-on-task data were not collected and analyzed as preliminary observations indicated very high student engagement rates and very little variability.

Further discussion of some of these issues can be found in the text.

Student Sample

Different strategies were used at each site to select program and control groups. In the Hatboro-Horsham middle school each grade is divided into two heterogeneous teams, a red team and a black team. For year one, the program group was selected from only the red team and consisted of the

25 lowest-achieving students from each of the sixth, seventh, and eighth grades. All of these students had standardized achievement scores below grade level in mathematics and/or reading. The control group consisted of 25 comparable students from each of the black team's three grades (these students did not have computers in their classes). For year two, the goal was to have the seventh and eighth grade program and control groups remain intact; the new sixth grade groups were to be assigned using the year one strategy.

For year one, the Pittston middle school was divided into two groups based on standardized achievement test scores, an at-risk or program group (i.e., scoring below the grade level median) and a not at-risk group. All students in the at-risk group were then randomly assigned to one of two groups, a "low use" group which was to receive 15 minutes of computer time per week, or a "high use" group which was to receive 60 minutes of computer time per week (in 15 minute segments). There were approximately 50 students in each group at each grade level. To balance the low and high use groups, students assigned to one group for mathematics were to be assigned to the other group for reading. It should be noted that although the not at-risk group was also divided into low and high use groups, their data are not included in this report as the initial focus of the project was to be on low-achieving students. Again, for year two, the seventh and eighth grade groups were to remain intact, to the extent possible, and the incoming sixth grade groups were to be formed using the year one strategy. Also, in each school, program students (five at a time) were to be on a rotating schedule to bring a computer home for a six week period.

Instrumentation

A number of evaluation instruments were developed by RBS, and approved by the districts, for use in the three-year study. They included the following:

- Administrator Attitude Survey
- Teacher Attitude Survey
- Student Attitude Survey
- Parent Attitude Survey
- Computer Home Use Survey.

The administrator and teacher attitude forms contain questions which address concerns regarding the new computer learning system, the advantages and disadvantages of the system, the adequacy of training and follow-up technical assistance, the implementation of the system, the adequacy of the computer curriculum, and the effectiveness of the computer learning system. The student attitude form addresses attitude toward using the computer in school, and the advantages and disadvantages of the computer learning system; and the parent attitude form and the home use form ask about parent involvement in the program, their child's attitude toward participation, and the advantages and disadvantages of the computer learning system. The home use survey is developed for parents of those students, who on a rotating basis take a computer home to increase their time on the system and their parents' involvement in collaborative learning. All surveys were also administered during year one.

Data Collection and Analysis

Process data were collected from both school districts participating in the project. These data were collected primarily through frequent informal interviews, telephone conversations, and on-site observations. Visits were made to the school's computer lab approximately every six weeks, during which time the computer coordinator or his assistant was informally

interviewed along with at least one reading and one mathematics teacher at each grade level. During classroom visits, students were observed working on computers whenever possible. Also, RBS' time-on-task measure was not used to collect data, as initial observations of students working on the computer, along with teacher feedback, indicated that students were highly engaged while working through their computer assignments and there was little variability in engagement rates.

The Pittston Area School District also submitted outcome data for the project which consisted of completed attitude surveys and student achievement data (Stanford Achievement Test (SAT) basic skills data, Jostens student achievement reports). Attitude surveys were to be administered at the end of the school year, as year one data were to serve as a pretest. In cases where pretest data were not available (e.g., for the new sixth grade students), surveys were administered two times, at the beginning and end of the school year. Although some second year outcome data were collected from the Hatboro-Horsham School District, they are not included in this evaluation report. As previously mentioned, this district experienced extensive implementation difficulties, documentation of which is provided in the findings section of the report under the process or implementation evaluation question.

Analyses were planned for both attitude and achievement data. Responses to items on the student, teacher, administrator, and home surveys were analyzed separately for each evaluation instrument. Also, only the student survey data were compared to the year one findings, as these surveys were both administered at the end of the school year. For the other surveys, comparisons were not made with the year one data as the pretest-posttest interval was too short (i.e., spring 1991 to fall 1991).

The SAT data were used to examine student achievement in reading and mathematics. In order to assess overall achievement gains, analyses were keyed to the students in sixth and seventh grade during year one. These analyses were carried out in terms of normal curve equivalents (NCEs) in order to look at students' achievement growth; an NCE change of zero indicates that students' achievement growth rate equals the rate of the representative national sample. In terms of the curriculum-embedded basic skills data, both initial placement and final lesson completed were made available as well as the amount of time students spent working on both lessons and unit tests. These data were analyzed to address project implementation and to set the stage for the discussion of outcomes by determining the number of lessons students completed during the year and the corresponding amount of time spent on the computer learning system.

Findings

The findings presented in this section of the report relate to the evaluation questions for year two. They are discussed below in two separate sub-sections, program implementation and program outcomes. The program implementation sub-section presents data from both the Hatboro-Horsham and Pittston Area School districts, the program outcomes sub-section presents data from only the Pittston Area School District.

Program Implementation

Specific feedback on implementation of the project was obtained from informal interviews with teachers and computer coordinators, on-site observations, and telephone contacts. These data are discussed below under the implementation evaluation question.

To what extent was the project implemented as planned?

In the fall of the 1991-92 school year, each of the two sites ordered and received additional hardware and software to continue their implementation of the project during its second year; program and control groups were updated; and schedules were developed for data collection and student computer use. Following these initial preparations, the two school districts attempted to implement the project, as described below.

The Hatboro-Horsham School District experienced a number of problems with its implementation which were related to the school's new building, and to the functioning of both the computer hardware and software. In the summer of 1991, the Hatboro-Horsham middle school moved a short distance to a new location which previously served as the district's high school. In late September, federal funds had not yet been released to carry out the cabling necessary for the networked computer system to operate. The district then used its own funds, and the cabling was completed in mid-October. However, upon completion, the new cabling did not work. It then took one month to identify the problem and to replace a defective cable. By mid-November, when the cabling became operational, project teachers began implementing the Jostens mathematics curriculum as planned.

Teachers and students experienced ongoing difficulties with the Jostens software (this district had purchased and installed the latest update of the software--version 2.9). The major problems were that, while working on the computer learning system, students were frequently being presented with lessons which they had previously completed, and their progress was frequently not being stored in the system. These errors were reflected in student achievement reports; when data on lessons completed are not stored, all other reporting data (e.g., average scores, times, dates) are obviously

inaccurate. Although Jostens worked with the district throughout the school year to correct these problems, the problems continued to frustrate students, teachers, and district staff, to interfere with normal classroom operations, and to severely reduce enthusiasm for the computer learning system.

One problem-solving strategy to address the difficulties experienced with the Jostens software was to "rebuild" the file server. Although this appeared to be successfully accomplished in March, the outcome was unintended. That is, student data accumulated prior to March was no longer stored in the system and thus could not be retrieved. In light of these and other daily problems (e.g., keyboards freezing, system clock loosing time, printers malfunctioning, no boot disc for 2.9 software to use with home learning computers), it was not possible to fully implement the project. Thus, in spite of the district's ongoing concern and efforts, the district and RBS agreed that it would be misleading to report and analyze outcome data.

The Pittston Area School District began implementing the mathematics portion of the Jostens curriculum at the beginning of the school year. Early on, this district also experienced some difficulties with the computer hardware which resulted in students periodically loosing all of their computer work. The source of the problem was finally diagnosed in December; in January, IBM replaced a defective file server. A second problem facing this district concerned scheduling students on the system. As previously indicated, the evaluation design was to include an experimental or "high use" group receiving one hour of computer time a week and a control or "low use" group receiving 15 minutes of computer time a week. However, due to the large number of students and limited number of students per class, it

was difficult to schedule students for 60 minutes of computer time a week. One proposed solution, to rotate students on satellite stations, was rejected because district and school administrators did not want students to leave their regularly scheduled classes for computer assignments. During informal interviews, mathematics teachers reported that the two student groups were generally on 15 and 30 minute schedules, respectively. In addition, these teachers were very positive about the mathematics software and indicated that students enjoyed working on the computer. Student observations supported this finding of high student interest.

This district also had difficulty implementing the home learning portion of the project. Problems here related to the computer software and to scheduling. First, only five of the ten "home" computers could be allocated to students as only five of the ten software discs were compatible with the school computer system. Because the other five were updated, student work could not be transferred to the main system. Second, the computer coordinator experienced difficulty scheduling parent-student meetings to discuss student and parent involvement in the home component; at least three of which were canceled. As a result, only one rotation of five computers was used at home, from September 10, 1991 to December 20, 1992.

In January, upon installation of the Jostens reading curriculum, another major hardware problem occurred; two of the three computers in each classroom were not operating properly and could not be used. Again, IBM diagnosed the problem, and replaced the defective base band extenders. In February, when the system returned to "normal," teachers discovered that most students' placements in the Jostens reading curriculum were not consistent with embedded curriculum test results and student ability. After moving students to appropriate levels, they were then able to work on the

reading curriculum for the remainder of the school year (although also not on the 15 and 60 minute time schedules). During interviews, reading teachers reported that most students had one 15 minute session a week. Unlike the mathematics teachers, most reading teachers were not as pleased with the content of the Jostens curriculum, particularly teachers of older students, as the reading curriculum only goes through level 6.0. Moreover, these teachers felt that portions of their lessons (e.g., introducing new skills) and some entire lessons (e.g., test reviews) could not be missed for computer time. Reading teachers also frequently expressed a need for more information and support for implementing the program.

It should also be noted that during the second half of the school year the teaching staff became aware of the district's budget problems. The impact of this tenuous financial situation on the project was two-fold; first, the project director was given responsibility for working on the district budget, which became very time consuming and thus allowed little time for project activities; and second, because rumors of cost-cutting efforts and layoffs were cause for tension and concern among school staff, administrators were reluctant to strictly enforce a new project.

Program Outcomes

Specific information on outcomes resulting from the Pittston Area School District's implementation of the computer project was gained from attitude surveys, the Stanford Achievement Test (SAT), and Jostens student achievement reports. The sections below describe and discuss analyses of this survey and achievement data.

Survey Data. Attitude surveys were administered to administrators, teachers, students, and parents at the end of the school year. These data are briefly described below, and where appropriate, are compared to the year

one survey results. A summary of all quantifiable survey data (i.e., mean ratings) is presented in Appendix A.

The three administrators in the Pittston Area School District who completed the survey reported having little experience in using computers. In terms of their knowledge of the computer learning system, two of the three reported that they knew enough about the Jostens system and that the staff received adequate training. Of the 20 potential concerns about the new computer learning system listed on the survey form, at least two administrators agreed with fourteen (i.e., a rating of 4 or 5 on the 5-point scale). The items not of concern related to their own knowledge of computers and computer hardware and software, and their need for technical assistance. In their comments, they agreed that the major advantage of the system was its potential to improve achievement by meeting individual needs. One administrator listed a disadvantage; he felt that the system was "somewhat disruptive to traditional classroom and scheduling." There were no recommendations for changes.

One administrator did not respond to the remainder of the survey. Although the two that did respond agreed that the system documents and achievement reports were useful to the staff and to them personally, and that implementation and operation of the system did not create problems for district administrators, they disagreed on the instructional value of the mathematics curriculum (this was the only curriculum area addressed by both respondents). That is, one administrator felt that the computer lesson strategies did not support the school's instructional methods, that the program was not flexible enough to be aligned with the classroom program, and that the computer system's lessons did not adequately prepare students for standardized achievement tests. As an explanation, this administrator

commented that the system is still experimental. In contrast, the other administrator responding to the items noted that the "program is thorough - curriculum follows standards established by leaders in above-listed content areas. This is what I would expect from Jostens." Perhaps these conflicting administrator views on the value of the computer learning system were being transmitted to school staff and students.

Of the twelve teachers who completed the survey, seven reported having some computer experience, one reported having very little experience, and four reported having no prior computer experience (mean rating of 2.3 on a 5-point scale). Seven of the 20 concerns about the new computer learning system listed on the survey were reported by the majority of respondents to be strong concerns (i.e., a rating of 4 or 5 on the 5-point scale). Four of these concerns related to teachers' own knowledge and preparation about computers, about using the software, about their own training and follow-up technical assistance, and about using the computer print-outs; most teachers also indicated interest in learning more about the system. Two other concerns were scheduling of students on the system, and the alignment of the Jostens curriculum with the district's curriculum and testing.

The teachers listed the major advantages of the system to be reinforcement of skills, increase of student involvement and motivation, and individualization. Only two teachers cited disadvantages: one felt that students needed more computer time, the other found scheduling computer time to be difficult. Three teachers offered recommendations for improvement: one felt that the headsets should be disinfected after each use; another saw a need for more computers both in the classrooms and in the computer lab; and the third would like to see a better correlation between the district

and computer curriculum. It should be noted that many teachers felt that it was too soon to comment on implementation, recommendations, and changes.

The student survey was completed by 316 sixth, seventh, and eighth grade students from the high use and low use groups. Overall, student responses to the survey's 30 "yes-no" items were positive, although somewhat less positive than those of last year. Students indicated that the computer is easy to use, that they like computer work better than written assignments, and that they can do most of the computer lessons without help from anyone else (89 percent or more of the students responded positively to these items). Most students (82 percent) also recognized that it is important to do well on computer assignments. Fifty-eight percent of the students felt that the computer helped them to learn math better and thirty-eight percent felt it helped them to read better. The biggest changes from last year were: an increase of 18 percent in students who feel that their teacher knows when they make mistakes on their computer assignments; and a decrease of 18 percent or higher in students who feel that computers make it fun to learn, computers make school subjects more interesting, who get bored working on the computer by themselves, who like going to the computer, who would like to go to the computer more often, and who find computer lessons interesting. It should be noted that, in spite of these decreases, which probably reflect more realistic attitudes than the year one baseline attitude data, the majority of students responded positively to all of these survey items.

Most parents learned about the project through an initial letter describing the project and requesting permission for their child's participation and through periodic progress reports. In addition, parents whose children were selected to participate in the home learning portion of

the project were invited to a student-parent group meeting. Although the district did not administer the parent survey, the parents of the five children who took computers home completed the home use survey. These parents agreed that it was very easy for their children to learn to use the computer and that their children used it very often (i.e., all ratings of 5 on a 5-point scale). The respondents also indicated that their children enjoyed working on the computer system at home. In terms of impact, three parents felt that their children learned from using the computer system at home; two of these parents reported that mathematics skills in particular were improved; the remaining parents did not comment on these items.

Achievement Data. The first type of achievement data analyzed was the Jostens student achievement reports. The rationale for looking at these data is that if the computer learning system is to have an impact on student achievement in general, it must first be demonstrated that students made substantial progress in the system, both in terms of lessons completed and time spent working on the Jostens curriculum. For this district, analysis of time data is particularly important in that it reflects on the validity of the experimental design, i.e., the 60 minute experimental condition and the 15 minute control condition.

Performance records were maintained by the system for each student's interaction with the curriculum and the level of lesson in which the student was engaged. The district provided RBS with students' beginning of year placements and last lessons completed for mathematics. As indicated in last year's report (Beyer, 1991), most students participating in the project were placed on the fourth grade level; the mean placement levels for the Basic Skills Inventory (the curriculum-embedded test) for mathematics, for the three grade levels, were from 2.5 to 3.5 grade levels below students' actual

grade level and, as the actual grades increased, the initial placements relative to them decreased. Although, in the Jostens curriculum, the number of lessons per unit and units per grade are not consistent from grade to grade, the number of lessons completed was felt to be one of the best available measures of student progress in the system. Table 1 presents these data for the high use and low use groups, and includes the number of students in each group (N), the mean number of lessons completed, the standard deviation (SD), and a t test for independent samples at each grade level. This analysis could not be carried out for reading as initial reading placements were not provided to RBS.

Table 1

Mean Number of Mathematics Lessons Completed for Experimental (High Use) and Control (Low Use) Groups

Grade/ Group	N	Lessons Completed Mean	SD	t
6th Grade				
High Use	52	66	47	3.41*
Low Use	54	40	31	
7th Grade				
High Use	37	25	13	ns
Low Use	45	21	25	
8th Grade				
High Use	48	52	56	ns
Low Use	43	35	43	

* $p < .05$

As the table indicates, the sixth grade and eighth grade high use groups completed more lessons over the course of the year than the corresponding low use groups, and this difference was statistically significant at the sixth grade level; both seventh grade groups completed very few mathematics lessons. Also, the standard deviations are quite large indicating a great deal of variability in the number of lessons completed by individual students in each group. In interpreting these data it should be noted that the **Jostens Student Achievement Report Manual** recommends that students complete 12 to 15 lessons over an instructional interval of 4 weeks. It goes on to indicate that students completing fewer than 10 lessons during a 4-week period will be progressing too slowly to make meaningful progress. If this guideline was followed, the appropriate time periods for the three high use groups in Table 1 would be extremely short - 6.6 weeks for 6th grade, 2.5 weeks for 7th grade, and 5.2 weeks for 8th grade - in contrast to the approximately 28 weeks (i.e., 7 months) of reported implementation of the Jostens mathematics curriculum. Thus, the system was being implemented by high use students at a level much lower than that recommended by Jostens for achieving academic growth.

Additional analyses were carried out on the mean amount of time students spent completing the Jostens reading and mathematics lessons (time data were available for reading as well as for mathematics). Unlike the lesson data described above, these data were provided by summary reports and did not have to be calculated individually for each student. Tables 2 and 3 present mean time in minutes that students were engaged in mathematics and reading lessons (test times are not included). Specified in the tables are the number of students in each group (N), the mean number of minutes

Table 2

Mean Mathematics Time for Experimental (High Use) and Control (Low Use) Groups

Grade/ Group	N	Mathematics Time (Minutes) Mean	SD	t
6th Grade				
High Use	59	557	164	7.00*
Low Use	62	356	151	
7th Grade				
High Use	43	302	148	3.26*
Low Use	50	205	138	
8th Grade				
High Use	54	370	181	3.67*
Low Use	50	255	137	

* $p < .05$

Table 3

Mean Reading Time for Experimental (High Use) and Control (Low Use) Groups

Grade/ Group	N	Reading Time (Minutes) Mean	SD	t
6th Grade				
High Use	62	145	98	ns
Low Use	59	135	46	
7th Grade				
High Use	50	117	142	ns
Low Use	43	79	110	
8th Grade				
High Use	50	113	154	ns
Low Use	54	78	112	

* $p < .05$

students spent completing lessons, the standard deviation (SD), and a t test for independent samples at each grade level.

Examination of the data displayed in Table 2 indicates time spent on the Jostens mathematics curriculum, for the high use groups, ranged from a little more than nine hours (557 minutes) to five hours (302 minutes). Assuming the mathematics portion of the program was in operation for approximately seven months, these data suggest that most high use students interacted with the curriculum for less than one hour a month. Although the three high use group times were significantly higher than that of the controls (low use groups), the means are one and one half times higher and not three or four times higher as would be expected (i.e., to reflect the 15 and 60 minute conditions). Thus, these time data also support the fact that the program was not fully implemented. Interestingly, although all three comparisons were significant for mean mathematics time, only the sixth grade comparison was significant for mean number of mathematics lessons completed (see Table 1). As with the lesson data, it should also be noted that the large standard deviations reflect a high within group variability.

Although the reading portion of the Jostens curriculum was operational during the second half of the school year, it is clear from the data in Table 3 that it was minimally used by students; mean times for the high use groups ranged from about two and a half hours (145 minutes) to a little less than two hours (113 minutes). These time data for mathematics and reading are graphically represented by frequency histograms in Figures 1-6. The histograms make immediately clear that most students had six hours or less of mathematics computer time, with the exception of the sixth grade high use group, and two hours or less of reading computer time.

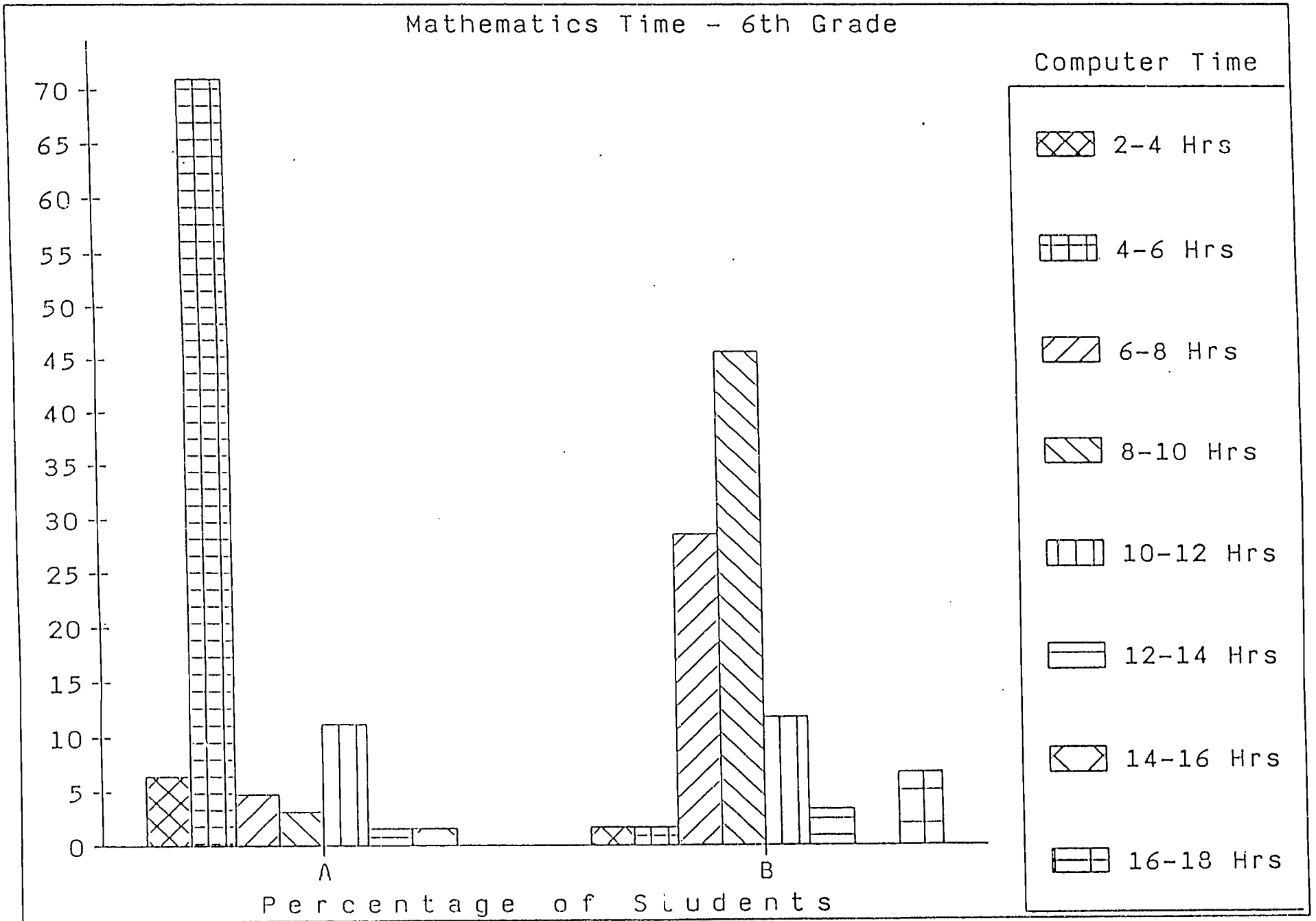

Figure 1. Percentage of Students Mathematics Computer Time for 6th Grade Experimental (High Use-B) and Control (Low Use-A) Groups.

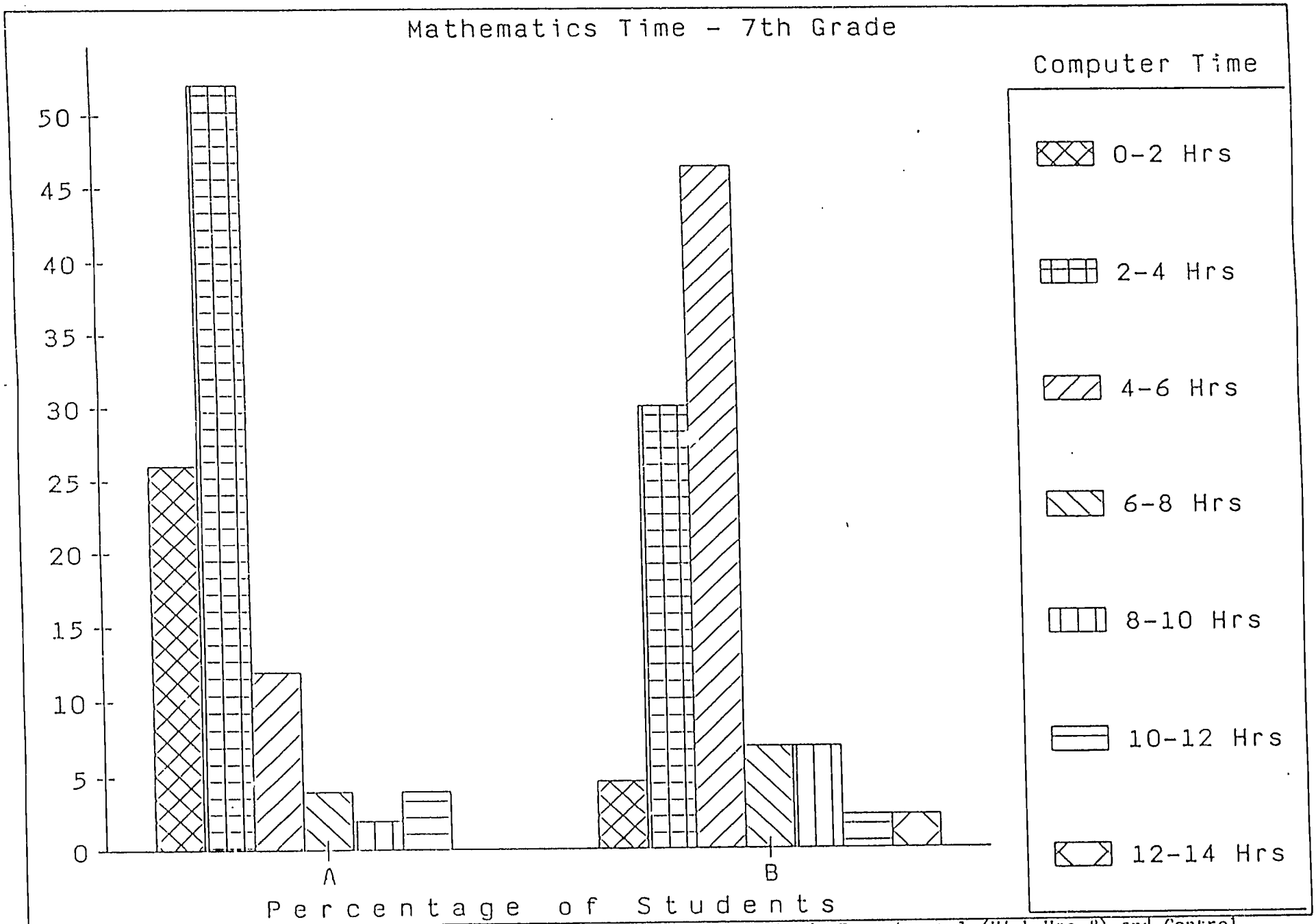

Figure 2. Percentage of Students Mathematics Computer Time for 7th Grade Experimental (High Use-B) and Control (Low Use-A) Groups.

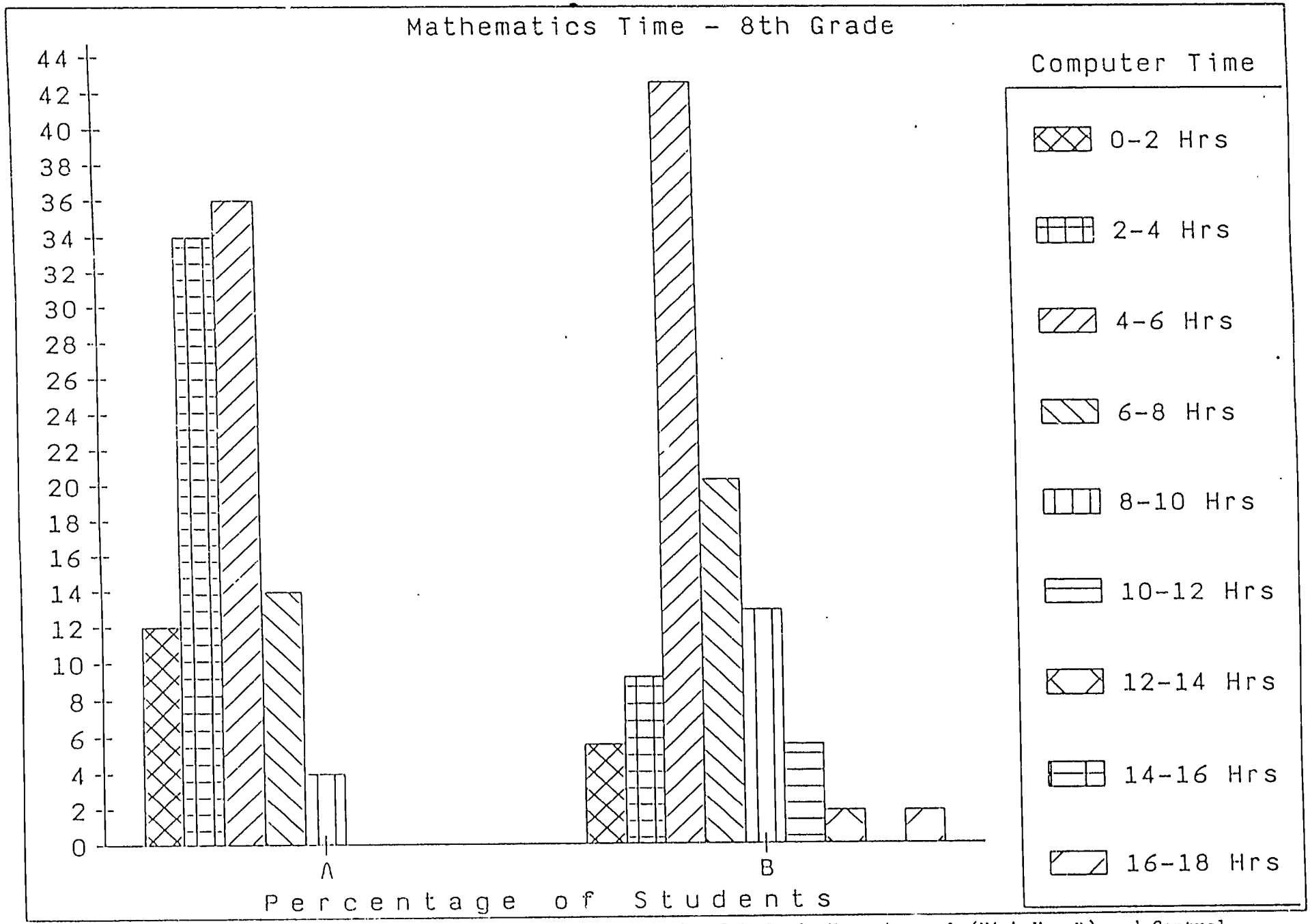

Figure 3. Percentage of Students Mathematics Computer Time for 8th Grade Experimental (High Use-B) and Control (Low Use-A) Groups.

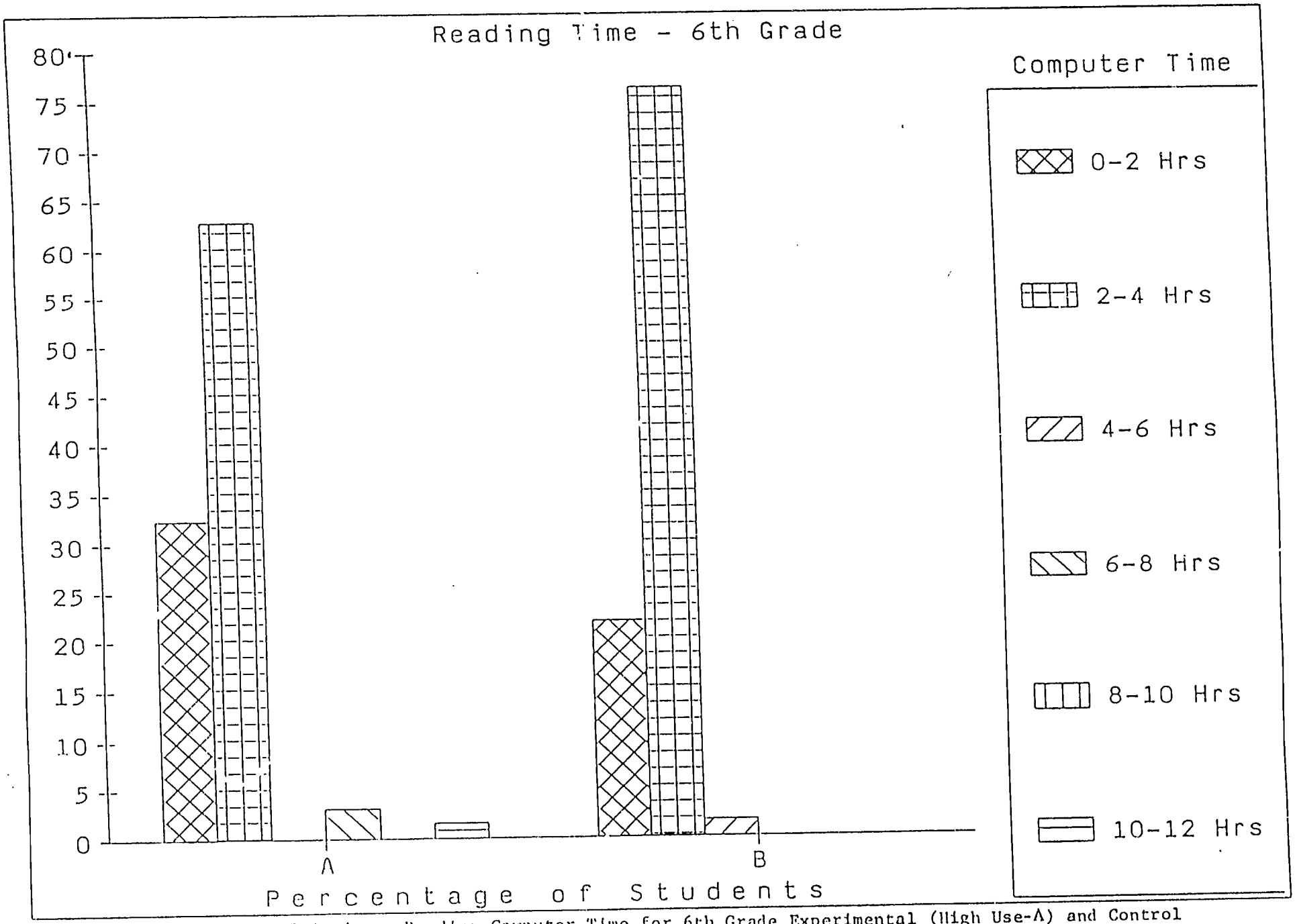

Figure 4. Percentage of Students Reading Computer Time for 6th Grade Experimental (High Use-A) and Control (Low Use-B) Groups.

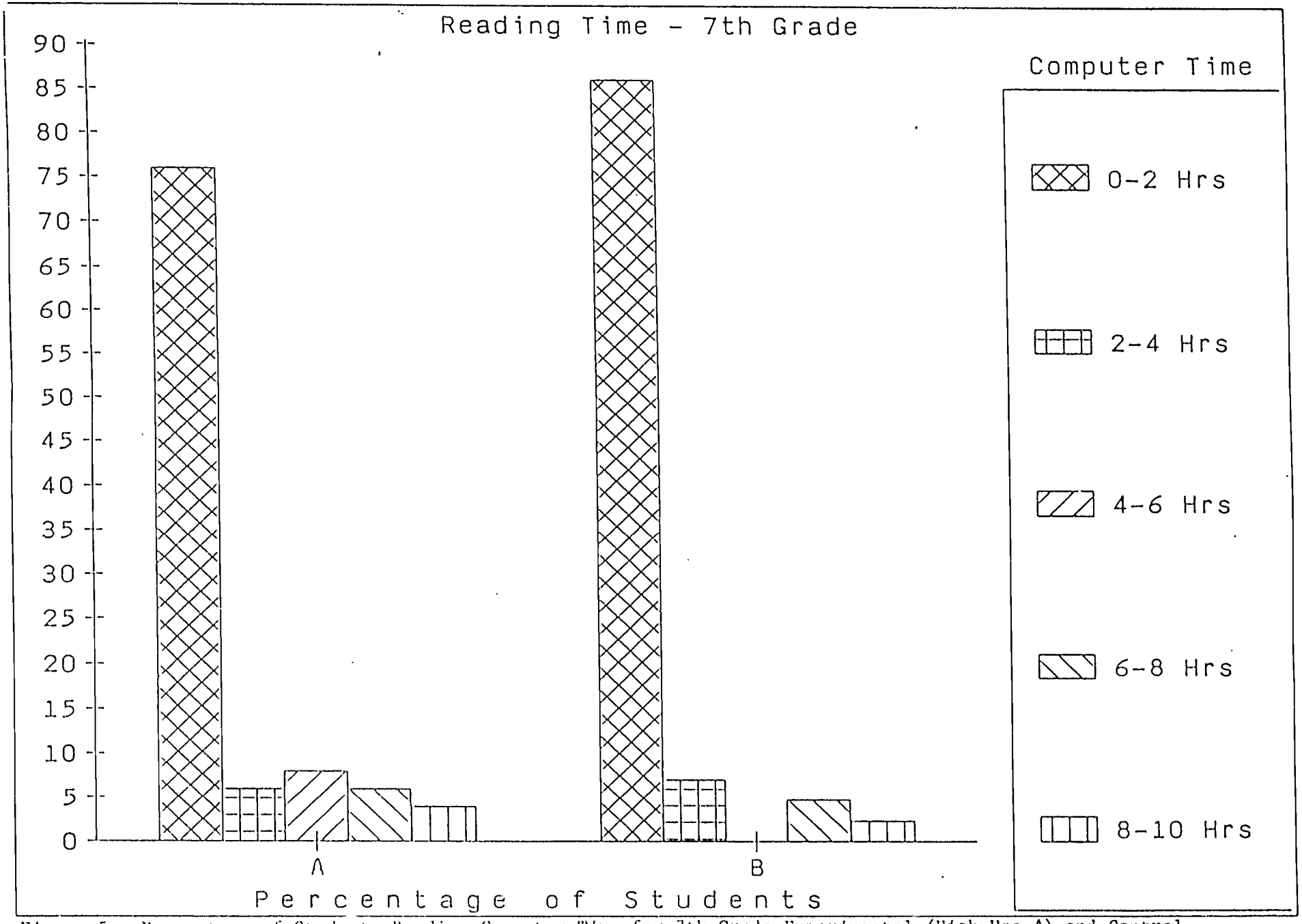

Figure 5. Percentage of Students Reading Computer Time for 7th Grade Experimental (High Use-A) and Control (Low Use-B) Groups.

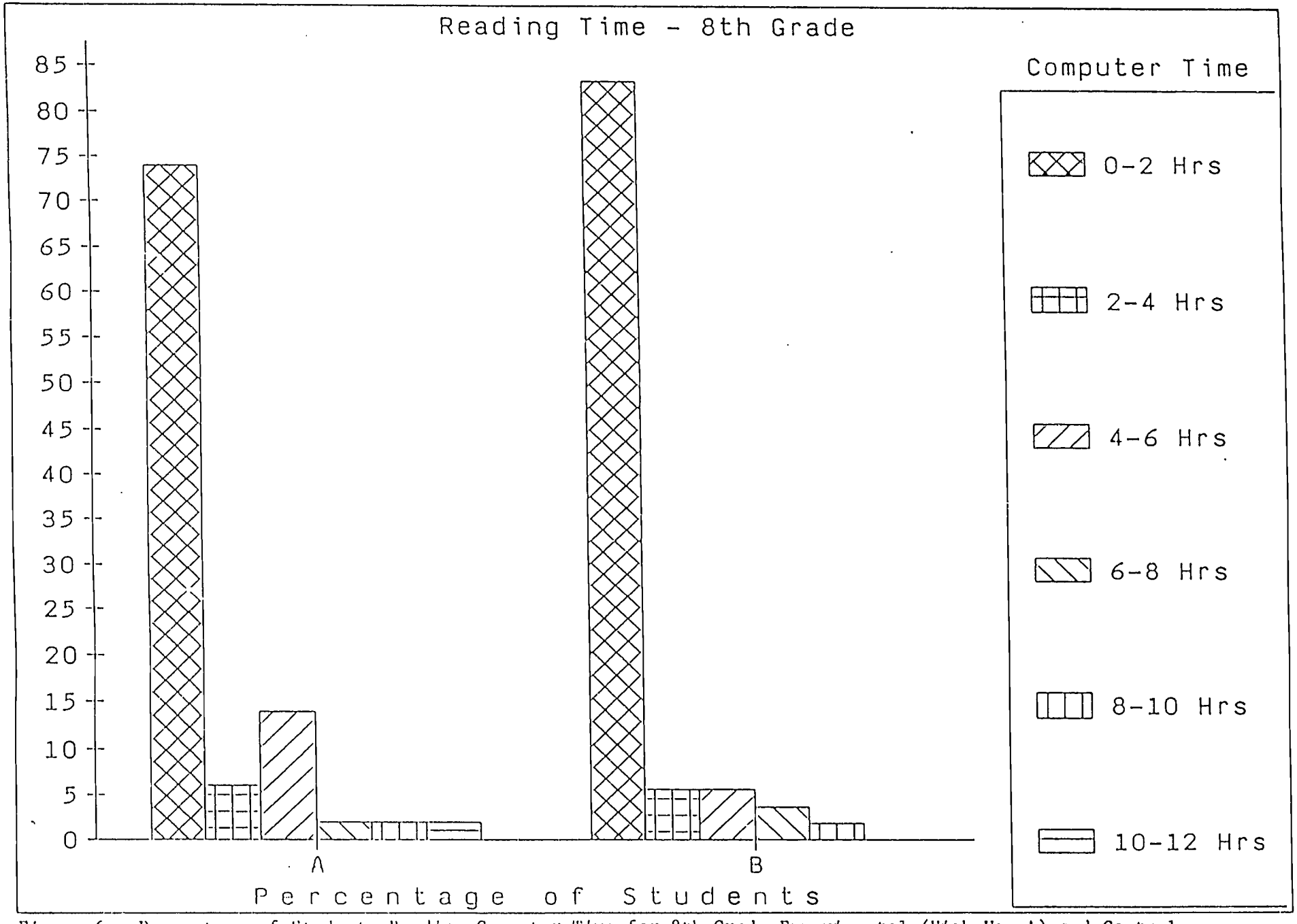

Figure 6. Percentage of Students Reading Computer Time for 8th Grade Experimental (High Use-A) and Control (Low Use-B) Groups.

In addition to student progress on the Jostens curriculum, another focus of the evaluation is on the extent to which progress on the computer system is transferable to standardized achievement tests. Tables 4 and 5 present analyses of SAT mathematics and reading scores in terms of normal curve equivalents (NCEs) by grade and group, for tests administered in the spring of 1991 (pretest) and 1992 (posttest). Students' scores are matched for the two years so that overall achievement gains can be examined for students participating in the program for more than one year. The small number of seventh and eighth grade students who did not have data available for both years were eliminated from the analyses. Thus, for this second year evaluation, grades 7 and 8 have participated in the project for two years; for the year three evaluation, grade 7 will have participated for two years and grade 8 will have participated for three years.

NCEs are normalized standard scores, with 50 indicating the national average or grade level. An NCE gain of zero from one year to the next would signify that students maintained the same relative standing with respect to the norm group, which is what would be expected to occur without any special program or intervention. As can be seen in Tables 4 and 5, the SAT results failed to show any significant NCE gains, from pretest to posttest. Upon examining the grade comparisons for the high use groups, seventh grade mathematics scores showed a statistically significant decrement from the expected level of achievement, and the others showed non-significant changes ranging from +3 to -1 NCEs. The pattern for the comparison (low use) group was similar, with seventh grade mathematics scores also showing a statistically significant decrement from the expected level of achievement. Also, in three out of the four comparisons the size of the gains was smaller for the low use groups as compared to the high use groups. In summary,

Table 4

Mathematics Achievement Test Scores (SAT) for Experimental (High Use) and Control (Low Use) Groups

Grade/ Group	N	SAT (Mean NCE) 1991	1992	NCE Gain	t
7th Grade					
High Use	41	52	46	-6	4.63*
Low Use	42	53	45	-8	7.84*
8th Grade					
High Use	49	47	46	-1	ns
Low Use	43	46	47	+1	ns

* $p < .05$

Table 5

Reading Achievement Test Scores (SAT) for Experimental (High Use) and Control (Low Use) Groups

Grade/ Group	N	SAT (Mean NCE) 1991	1992	NCE Gain	t
7th Grade					
High Use	42	44	45	+1	ns
Low Use	41	46	44	-2	ns
8th Grade					
High Use	43	44	47	+3	ns
Low Use	49	47	49	+2	ns

* $p < .05$

there is no evidence of accelerated achievement levels on the SAT resulting from the computer learning system program. In addition, these data show that both seventh grade groups began the program with above average mathematics achievement levels and the following year had a significant decrease to below grade level performance.

Conclusions and Implications

During year two of the CAI/Cooperative Learning Project, the two participating school districts experienced many difficulties with the Jostens Learning Corporations' computer-based learning system. These problems involved both the computer software and hardware. As a result of these and other district problems, one district, the Hatboro-Horsham School District, reached only a minimal level of implementation and was not ready to document the impact of the system; the second district, the Pittston Area School District, had a higher level of implementation, yet analyses of the computer learning system reports suggest these students spent little time working on the system - student use was far below the level deemed to be the minimal requirement as recommended by the Jostens Manual (although the discrepancy between staff reports of student use and Jostens' documentation is puzzling). Because the program was not fully implemented, the drawing of any specific conclusions about the impact of the computer learning system is not possible.

This second year evaluation has several implications for the project in year three:

- Although computer-assisted instructional programs such as these commonly experience setbacks and delays, the amount of difficulty experienced by these two districts is exceptional. For the program to succeed, a district priority must be to have the project fully operational and successful. Thus, Jostens Learning Corporation's full cooperation and support must be engaged until the networked

systems are functioning properly; their ongoing assistance with regard to curriculum planning and implementation is also essential.

- The district administrations must communicate this priority and positive attitude toward the project to the school staff and students. Clear program goals and expectations must also be communicated. To succeed, the project must have leadership.

- In the Pittston middle school, the computer coordinator must increase his involvement with the program and closely monitor teachers' use of the computer learning system. For example, both the year one and year two evaluations found that teachers have positive attitudes toward the computer learning system but have specific needs for additional information and support. Perhaps regularly scheduled meetings with the computer coordinator (e.g., to monitor and review reports, answer questions, monitor individualization) would be a successful strategy to provide for both project leadership and staff support.

- The Pittston Area School District needs to monitor and support the implementation of the evaluation design which it selected for the study, i.e., a 15 minute control group and a 60 minute experimental group. The meaningfulness of the study rests on the validity of the design - a control group minimizes threats to internal and external validity. The computer system must be used for reading and mathematics instruction at or above the level deemed to be the minimal requirement recommended by the computer learning system vendor. Also, because these data are different than those expected by project staff, the accuracy of the Jostens computer performance reporting system must be examined.

- The selection and composition of the program and comparison groups should be closely monitored to maintain consistency over the three year period, particularly with regard to group size and achievement level. For example, the sixth grade groups at the Pittston middle school had mean mathematics scores on the standardized test of 56 and 58 NCEs, which do not reflect "at-risk" performance.

- The cooperative learning component of the program needs to be adequately addressed. Although each district has isolated examples of its successful use, there is no plan for implementing and monitoring cooperative learning. That is, teachers are unclear as to how cooperative learning is defined, and how it relates to students' involvement with the computer learning system. Likewise, parent involvement in cooperative learning at home also needs to be addressed.

This evaluation report obviously recognizes that much of the difficulty experienced by the two districts may be beyond their control, that is, a result of Jostens' premature marketing both of the software and the

networked system. It also recognizes that both districts exerted much time and effort trouble shooting basic problems which should not have occurred and which "snowballed" into larger, unanticipated outcomes.

Reference

Beyer, F. S. (1991). The CAI/cooperative learning project first year evaluation report. Philadelphia, PA: Research for Better Schools.

APPENDIX

Mean Survey Responses for Rated Items

Administrator Survey
Pittston School District (N=3)

	Item	Mean	NR
A.4.	To what extent are you experienced in using computers?	3.7	
B.1.	I don't know enough about the computer learning system.	2.3	
B.2.	I am concerned about the attitude of students toward the computer system.	4.3	
B.3.	I know of other approaches that might work better.	3.3	
B.4.	I have very limited knowledge about computers.	3.0	
B.5.	I am concerned about the effects of the system on students.	5.0	
B.6.	I am concerned about the changes this system will cause teachers to make in their classrooms.	4.7	
B.7.	I am concerned about how much time and paperwork the computer system takes.	3.3	
B.8.	I am concerned about how the scheduling of students on the system works out.	4.7	
B.9.	I am concerned about the time and energy commitments the computer system requires.	4.0	
B.10.	I am concerned about the knowing how to use the hardware.	3.0	
B.11.	I am concerned about knowing how to use the software.	3.7	
B.12.	I am concerned about the curriculum content of the computer learning system.	4.7	
B.13.	I am concerned about the instructional approach used by the computer learning system.	4.7	
B.14.	I am concerned about the training I receive on the computer learning system.	3.7	
B.15.	I am concerned about the follow-up technical assistance I receive on the computer learning system.	3.0	
B.16.	I am concerned about how well the computer system's curriculum aligns with our district curriculum and testing.	4.7	

B.17.	I am concerned about the use of computer printouts from the system.	4.3	
B.18.	I would like to know how this system is better than what we had before.	2.7	
B.19.	I am not interested in learning more about the system.	1.3	
B.20.	I am concerned about the value of instruction students receive on the system.	4.7	
D.1.	How many hours of training did you receive to prepare you, personally, for your role in use of the computer system?	4.0	2
D.2.	To what extent do you feel the training adequately prepared you personally, for your role in use of the computer system?	4.0	2
D.4.	To what extent do you feel the training adequately prepared your staff for use of the computer system?	4.5	1
D.5.	To what extent has the inservice training your staff received adequately covered the following areas?		
	Reading	5.0	2
	Math	5.0	2
	Writing	5.0	2
	Science	1.0	2
	Higher Order Thinking Skills	3.0	2
	Use of Student results reports	5.0	2
	Integration of computer curriculum with classroom program	5.0	2
	Hands-on experience with the computer system	4.0	2
	Scheduling of students	4.0	2
D.7.	To what extent do you feel the follow-up technical assistance provided after training was adequate to meet the needs of you and your staff?	3.0	2
D.8.	To what extent has there been a need for follow-up technical assistance in the following areas?		
	Reading	3.0	2
	Math	3.0	2
	Writing	3.0	2
	Science	-	3
	Higher Order Thinking Skills	3.0	1
	Use of Student results reports	3.0	1
	Integration of computer curriculum with classroom program	2.0	1
	Hands-on experience with the computer system	2.0	1
	Scheduling of students	2.0	1

D.9.	To what extent have the following documents met your staff's needs?		
	Curriculum Guides	4.0	1
	Teacher Guides	4.0	1
	Teacher Handbooks	4.0	1
E.2.	To what extent are the reports clearly organized and easy to use?	4.5	1
E.3.	To what extent have the reports enabled your staff to:		
	Diagnose student needs	4.5	1
	Individualize instruction	4.0	1
	Group students by ability	2.5	1
	Inform parents of student progress	4.5	1
E.4.	To what extent have the reports been useful to you as an administrator?	4.5	1
E.5.	To what extent has the computer system resulted in reallocation of time in the following areas?		
	Reading	1.0	2
	Math	1.0	1
	Writing	1.0	2
	Science	1.0	2
E.6.	To what extent has the computer system resulted in increased time-on-task for all students in the following subject areas?		
	Reading	5.0	2
	Math	5.0	1
	Writing	5.0	2
	Science	1.0	2
E.7.	To what extent do students enjoy working on their computer lessons?	5.0	1
E.8.	To what extent do you observe students working on lessons at the computer?	2.5	1
E.9.	To what extent has the computer system hardware been reliable and dependable?	4.0	1
E.10.	To what extent has implementation and operation of the computer system created administrative problems for you?	1.0	1

F.1	To what extent is the computer curriculum sufficiently comprehensive to provide adequately for the learning needs of students in each of the following subjects?		
	Reading	5.0	2
	Math	4.5	1
	Writing	5.0	2
	Science	-	3
F.2.	To what extent are the learning strategies and models presented in the computer lessons supportive of the instructional methods used in the school in each of the following subjects?		
	Reading	4.0	2
	Math	3.0	1
	Writing	4.0	2
	Science	-	3
F.3.	To what extent is there sufficient flexibility in the sequencing of the units that the computer program can be aligned with the school's classroom programs in each of the following subjects?		
	Reading	4.0	2
	Math	2.5	1
	Writing	4.0	2
	Science	-	3
F.4.	To what extent do computer system lessons adequately prepare students for standardized achievement tests?		
	Reading	5.0	2
	Math	3.5	1
	Writing	5.0	2
	Science	-	3
F.5.	To what extent does the computer system curriculum meet your expectations?		
	Reading	5.0	2
	Math	5.0	1
	Writing	5.0	2
	Science	-	3
G.1.	To what extent is there increased student motivation and interest in your school as a result of students participating in the computer learning system?	3.5	1

G.2.	To what extent has the computer program led to higher student achievement?		
	Reading	4.0	2
	Math	4.0	2
	Writing	4.0	2
	Science	-	3
G.3.	To what extent has the computer system promoted student class participation?	4.0	2
G.4.	To what extent has the computer system promoted greater parent interest and involvement in the school?	4.0	2
G.5.	To what extent has the computer system enhanced teacher effectiveness?	3.0	2
G.6.	To what extent has the computer system enhanced teacher communication and cooperation?	4.0	2

Teacher Survey
Pittston Area Middle School (N=12)

	Item	Mean	NR
A.4.	To what extent are you experienced in using computers?	2.3	
B.1.	I don't know enough about the computer learning system.	3.5	
B.2.	I am concerned about the attitude of students toward the computer system.	2.6	
B.3.	I know of other approaches that might work better.	1.8	
B.4.	I have very limited knowledge about computers.	3.6	
B.5.	I am concerned about the effects of the system on students.	3.2	
B.6.	I am concerned about the changes this system will cause teachers to make in their classrooms.	3.0	
B.7.	I am concerned about how much time and paperwork the computer system takes.	2.6	
B.8.	I am concerned about how the scheduling of students on the system works out.	3.7	
B.9.	I am concerned about the time and energy commitments the computer system requires.	2.9	
B.10.	I am concerned about the knowing how to use the hardware.	3.5	
B.11.	I am concerned about knowing how to use the software.	3.7	
B.12.	I am concerned about the curriculum content of the computer learning system.	2.9	
B.13.	I am concerned about the instructional approach used by the computer learning system.	2.8	
B.14.	I am concerned about the training I receive on the computer learning system.	3.3	
B.15.	I am concerned about the follow-up technical assistance I receive on the computer learning system.	3.5	
B.16.	I am concerned about how well the computer system's curriculum aligns with our district curriculum and testing.	3.3	

B.17.	I am concerned about the use of computer printouts from the system.	3.3
B.18.	I would like to know how this system is better than what we had before.	2.5
B.19.	I am not interested in learning more about the system.	1.3
B.20.	I am concerned about the value of instruction students receive on the system.	2.9

Student Survey
Pittston Area Middle School (N=316)

	Item	Percent Responding Yes	No	NR
1.	Do you like school?	50	47	3
2.	Is the computer easy to use?	93	7	
3.	Is working on the computer fun?	72	28	
4.	Do computers make it fun to learn?	69	31	
5.	Do you learn a lot on the computer?	60	40	
6.	Do computers make school subjects more interesting?	61	38	1
7.	Do you get bored working on the computer by yourself?	50	49	1
8.	Do you need much help when working on the computer?	13	82	5
9.	Does your computer give you help when you need it?	76	23	1
10.	Does the computer help you correct your mistakes?	79	20	1
11.	Do you have to hurry when you work on the computer?	36	64	
12.	Do you like computer work better than written assignments?	90	9	1
13.	Is it important to do well on your computer assignments?	82	17	1
14.	Does working on the computer help you do better in school?	52	47	1
15.	Does your teacher know whether you make mistakes on your computer assignments?	71	25	4
16.	Do you get good grades when you work hard in school?	85	15	
17.	Do you like going to the computer?	71	27	2
18.	Would you like to go to the computer more often?	67	33	
19.	Have you worked on a computer in school before this year?	85	15	

20.	Do you have a computer at home?	36	64	
21.	Do you like using the computer at school?	73	26	1
22.	Has the computer helped you to learn math better?	58	40	2
23.	Has the computer helped you to read better?	38	60	2
24.	Has the computer helped you to write better?	15	83	2
25.	Has the computer helped you to understand science better?	16	80	4
26.	Can you do most of the computer lessons without help from anyone else?	89	11	
27.	Are the computer lessons interesting?	59	39	2
28.	Do your computer lessons help you do work in the classroom better?	45	52	3
29.	Is your time with the computer the best part of your day?	27	73	
30.	Do your parents think you are learning from the computer?	57	36	7

Computer Home Use Survey
Pittston Area Middle School (N=5)

	Item	Mean	NR
B.2.	How difficult was it for your child to learn how to use the computer system?	5.0	
B.3.	Hcw often did your child us the computer system at home?	5.0	
B.7.	How frequently did you work with your child during use of the computer system?	2.8	
B.8.	To what extent did your child enjoy working on the computer system?	4.8	
B.9.	To what extent did your child learn from using the computer system at home?	4.7	2
B.10.	To what extent did your child's math skills improve from working on the computer system at home?	4.5	3
B.11.	To what extent did your child's reading skills improve from working on the computer system at home?	0	4
B.12.	To what extent did your child's writing skills improve from working on the computer system at home?	0	4
B.13.	To what extent did your child's understanding of science improve from working on the computer system at home?	0	4