Technology and its impact in the classroom

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Abstract

Recent findings have shown that at-risk students in grades k-12 are being deprived of challenges and of the chance to use complex thinking skills. The purpose of this study is to determine the effect that the level of computer technology use in the classroom has on at-risk students' grades and attendance. A teacher technology survey is used to measure teacher use, student use and overall use of technology in the classrooms. The sample for this study consists of teachers from a Northwest Ohio high school. Results of the study indicate that teachers' technology use, students' technology use, and overall technology use have no significant positive effect on the grades and attendance of at-risk students. In addition the study finds that technology use is low among the teachers in the sample. These results suggest that for technology to be effective and make changes in at-risk students' grades and attendance, schools must be prepared for technology use in the classroom. Leaders need to develop a model that would include a shared vision, entire school community involvement, specific training for staff and time for the training, a full time technology director and time for the staff to communicate and share among peers for technology to be an effective tool in the classroom curriculum.
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1. Introduction

Technology is around everything we do. But, does it have a place in the classroom? In this study, teachers had just received new computers over the past year and a half, and some attended specific software classes the past summer. They were ready to infuse their classroom lesson plans with a variety of technology. Students were assigned to create brochures, power point presentations, and use video cameras along with iMovies. This rush of technology could be seen in almost

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all of the regular classes. As the school moves into the 2nd quarter there is a return slowly to traditional classroom instruction leaving power point presentations, use of Publisher and video production. Students are still using the word processor and a few scattered technology projects but the flurry of technology use is over. At-risk students grades drop along with student's attendance in some or for a few in all classes.

The author anticipated this study to show significance in the at-risk student's attendance and grades based on current research related to computers and students. The fact that there are computers in the classroom with an abundance of software and that instructors have minimal professional development does not mean that teacher technology use and student technology use will have an immediate and sustained positive effect on student grades and attendance.

In a traditional teacher-centered classroom, the students are the listeners and followers. The teacher is the one given freedom to move about, to initiate actions and interactions, to ask questions and to set limits on activity times. The teacher is the one who gave the facts and defines the important ideas. The activity is generally the teacher's domain (Sandholtz, Ringstaff, & Dwyer, 1997). Metz (1988) calls this teaching style "real school." In the "real" classroom, students participate in the listening to teacher's lecture, raising their hands to answer questions or working independently on some written assignment.

1.1. Traditional learning vs. constructivism learning

According to Bracey (1991) and Cuban (1991) schools in America during the 1980s that use this traditional teaching methodology shows increased scores in basic skills such as reading and math. But information from Applebee, Langer, and Mullis (1989) reports:

> Sixty-one percent of the 17-year-old students could not read or understand relatively complicated material, such as that typically represented at the high school level. Nearly one-half appear to have limited mathematics skills and abilities that go little beyond adding, subtracting, and multiplying with whole numbers. More than one-half could not evaluate the procedures or results of a scientific study, and few included enough information in their written pieces to communicate their ideas effectively. Additionally, assessment results in other curriculum areas indicate that high school juniors have little sense of historical chronology, have not read much literature, tend to be unfamiliar with the uses and potential application of computers. (p. 26)

The difference between the rise in student test scores and the fall in student performance on complex tasks is explained by the new accountability factor for teachers and administrators (Sandholtz et al., 1997). Schools and teachers are limiting instruction to drill and practice which emphasizes the material that the national norms tests in order to meet the set level on standardized tests (Sandholtz et al., 1997). In this period, students became better test takers and but became worse at higher-order cognitive learning. This action of teaching to the test brought about reform efforts to move teaching instruction from rote learning to problem solving, concept development, and critical thinking. This new instruction philosophy is based on theory of knowledge and learning which today is called "constructivism" (Sandholtz et al., 1997).

Constructivism views learning as a personal, reflective, and transformative process where ideas, experiences, and points of view are processed into something new. In this philosophy, teachers are the facilitators for the students' learning (Sandholtz et al., 1997) rather than the instigators. In the knowledge-constructed classroom, the students work together, sharing the process of learning not only with their peers but with parents and others (Sandholtz et al., 1997).

2. At-risk students

When using the term "at-risk" there is a suggestion that there is a sense of urgency. At-risk lends itself to meaning something that needs immediate attention or something serious might occur. The hazards come from the schools that focused on trying to "fit" the "at-risk" student to the educational system. When at-risk is not defined for the student, when the school does not discover what aspect the "at-risk" student is at risk, the "fit" is likely not to work (Wehlage et al., 1989).

The label "at-risk" alludes to the fact that a student has a problem but schools are not exactly certain of the origin of the problem. At-risk predictors are socioeconomic factors, health factors, family and school factors. Schools typically use the following criteria for identifying at-risk students: failing grades, low GPA, and/or high absenteeism of a student. The predicament with using identifiers is that no at-risk student is the same. How a school prepares to teach these students is the key for the at-risk student's success in school (Wehlage et al., 1989).

According to Means et al. (1991) the dominant teaching methods for at-risk students focus on basic skills, which are not providing the students with challenges. At-risk students need to be challenged and encouraged to use complex thinking skills. Teachers need to encourage the growth of reasoning, problem solving, and independent thinking for the at-risk students as they do for regular students (Means et al., 1991). The research conducted by Means (1994) shows that technology can help students including at-risk students learn and practice a variety of skills and improves their attitudes to learning.

3. Technology in the classroom

Technology can help facilitate the knowledge-constructed classroom. A number of researchers (Bork, 1985; Laboratory for Comparative Human Cognition, 1989; Papert, 1980; Ragosta, 1982) views computers as having an influential effect on the teaching and learning processes. They state that with the use of computers in the classroom, schools would become more student-centered and that more individualized learning would take place than ever before.

In the student-centered classrooms of today, with the aid of the computer, students are able to collaborate, to use critical thinking, and to find alternatives to solutions of problems (Jaber, 1997). But the shift from teacher-centered delivery to a student-centered model potentially leads to a resistance in change. Student-centered teaching is challenging educators to restudy their teaching methods and student learning methods (Jaber, 1997). Research done by Dwyer, Ringstaff, and Sandholtz (1991) indicates that computers can be used in collaboration for all subject areas, but that teachers have to take into account the different styles of teaching and the students

involved in this learning. This type of teaching requires a change in the teacher's method of teaching and learning, the amount of time needed to learn how to use the technology and the location of models that work with technology (Sheingold & Hadley, 1990).

Negroponte, Resnick, and Cassell (1997) argue:

> ...that digital technologies can enable students to become more active and independent learners. The Internet will allow new "knowledge-building communities" in which children and adults from around the globe can collaborate and learn from each other. Computers will allow students to take charge of their own learning through direct exploration, expression, and experience. This shifts the student's role from "being taught" to "learning" and the teacher's role from "expert" to "collaborator" or "guide" (p. 1).

3.1. Apple classrooms of tomorrow

In 1985, five Apple Classrooms of Tomorrow (ACOT) are created in sites across the United States. These classrooms are a research collaboration between universities, public school and Apple Computer, Inc. The research completed by Sandholtz et al. (1997) on the ACOT study encompasses 10 years of gathering information that includes teachers' personal accounts of their experiences in teaching in these classrooms. Results suggest that the impact of technology on education has the potential to change education in a beneficial way if done under certain circumstances. In the ACOT classrooms, students use technology as a tool to collect, organize, and analyze data; to enhance presentations; to conduct simulations and to solve complex problems. One of the changes seen over this time period is the change in the lower achieving students—the ones teachers could not reach with the teacher-centered learning. These students began to respond positively to the alternate ways of expressing their knowledge, which not only raises their self-esteem but their status with the teachers and their peers (Sandholtz et al., 1997).

3.2. Student-learning with technology

Computers are being used, in part, to enable teachers to improve the curriculum and enhance student learning. One potential target is the at-risk student. Recent findings show that the at-risk student is being deprived by not being challenged and not being given the chance to use complex thinking skills (Means et al., 1991). Means et al. (1993) suggests that technology in the classroom could provide authentic learning opportunities to at-risk students. Teachers can draw on technology applications to simulate real-world environments and create actual environments for experiments, so that students can carry out authentic tasks as real workers would, explore new terrains, meet people of different cultures, and use a variety of tools to gather information and solve problems (Means et al., 1993, p. 43).

Several studies suggest that any student, including the at-risk student, who has technology integrated into the curriculum, could potentially see a positive change in student classroom grades, GPA, and attendance. Research, which examines constructivist teaching and learning models, indicates that technology brings complexity to the tasks that students perform and raises student motivation (Baker, Gearhart, & Herman, 1994; Dwyer, Ringstaff, & Sandholtz, 1990;

Means & Olson, 1994). Technology brings about changes to the classroom roles and organization. It allows the students to become more self-reliant. Students may use peer coaching, and teachers may function more as facilitators than lecturers (Means, 1997).

The study conducted by Sandholtz et al. (1997) on the Apple Classrooms of Tomorrow (ACOT) over a 10-year period shows changes in teacher and student interactions. Teachers are observed more as being guides or mentors and less as lecturers. The cooperative and task-related interactions among the ACOT students are spontaneous and more extensive than in traditional classrooms. Student interest in computers did not decline with routine use. Teacher peer sharing began to increase as students and teachers sought support from one another (Sandholtz et al., 1997). Other changes that are seen during this study are that teachers began teaming and working across disciplines. School schedules are made to accommodate unusually ambitious class projects by the administrators and the teachers (Sandholtz et al., 1997). Teachers and students start to show mastery of technology and start to integrate several kinds of media into lessons or projects. Classrooms are a mix of traditional and nontraditional learning. Teachers are changing the physical layout of the classroom along with daily schedules to give students more time on projects (Sandholtz et al., 1997).

The ACOT study brought to focus that meaningful use of technology in schools went beyond just putting computers in classrooms. Technology is not a change agent for education. Technology when used as an integrated tool with the curriculum could make a difference in education (Sandholtz et al., 1997).

3.3. Barriers to teachers use of computers

Barriers to using technology in education includes lack of teacher time, limited access and high costs of equipment, lack or vision or rationale for technology use, lack of teacher training and support, and current assessment practices that may not reflect what is learned with technology (OTA, 1995). The need for teacher training and the lack of expertise are major barriers to using the microcomputer and related equipment. With computer competence, teachers' anxiety decreases and their attitudes toward computers improves with hands-on computer literacy courses.

Teacher time facilitates the areas of being able to experiment with new technologies, to share these experiences with other teacher, to prepare lessons using the technology and to have the time to attend technology courses or meetings (Barron & Goldman, 1994; Byrom, 1997). Learning how to use new technology includes the time the teacher needs to become competent with the computer as a personal tool but also as an instructional tool (Brand, 1998). Teachers need to train and develop their skills outside of the regular school day so they can concentrate on instruction and training objectives. After the teachers become knowledgeable about using technology, they need time to transfer the skills learned into infusing technology into the curriculum (Brand, 1998). Training could come in many forms, inservices, professional development, collaborative learning and in peer coaching. Whatever methods are pursued, teachers need the time to learn at their speed and with their own learning styles (Brand, 1998).

A major problem with technology in schools is that many schools could not afford to have full-time school-level computer coordinators. This is an important step in having technology work in schools (Byrom, 1997). Training and support within a school district may not always be planned

or may not meet the needs of the teachers. Many times the training may focus on how to use equipment but will miss the importance of how to integrate the technology into the curriculum.

In order to integrate computers into instruction, teachers must have access to technology. Unfortunately, many teachers find hardware and software availability are limited in their schools. The costs of upgrades, support, and training, hardware and software are often not considered in school planning. Many times technology is placed too far from the classroom and much of the hardware is too old to handle the new software applications. Older schools found it difficult to meet the wiring needs to use telecommunications (Byrom, 1997).

Technology is difficult to integrate into the curriculum. When teachers see how technology could benefit their students, they might be willing to become part of the technology plan. Schools and districts need to meet the vision of the new technologies with planning and leadership. Teachers must be included in this process of understanding the curriculum uses and how to incorporate the technology into the lessons. The need for keeping abreast with new technology changes is not communicated many times to the teachers (Byrom, 1997).

One element needed for learning is a teacher. A teacher is the conductor needed for the integration of technology into the classroom. The fact is that to be effective, technology must be ingrained into the broader education reform movement that includes teacher training, curriculum, student assessment, and a school's capacity for change (Roschelle, Pea, Hoadley, Gordin, & Means, 2000).

Teacher support must encompass more than training, it must include time to experiment, permission to change the way they do things, and to make mistakes. There must be ample technological support, and support that allow teachers to focus on pedagogy not the technology (Archer, 1998). With conditions where teachers are individually comfortable and at least somewhat skilled in using computers, where they allocate time for students to use computers as part of class assignments, where equipment is available and convenient to permit computer activities to flow seamlessly alongside other learning tasks, and where teachers' support a student-centered, constructivist pedagogy that incorporates collaborative projects defined partly by student interest, computers are becoming a valuable and well-functioning instructional tool (Becker, 2000).

Teachers had the unwieldy task of keeping up with new styles of learning, new program changes and new technology. They need to prepare themselves and their students for those changes. Schools need to aid in this preparation by addressing these changes through professional development programs (Wenglingsky, 1998). The study, *The Condition of Education: 1999*, indicates that teachers do not think they are prepared to handle some of the new demands but when there is professional development available they feel more prepared. They also feel that with regular collaboration activities they can improve their teaching styles. Professional development according to Wenglinsky (1998) appears to be tantamount to student achievement gains and if there is more elaborate training than just one poorly run training day, students may even achieve higher gains.

4. Study

In the literature reviewed for this study, common links for incorporating technology into the classroom include teacher preparation, teaching instruction, and student-learning. The question

of schools being ready for technology is connected to the incorporation of these areas in the teaching students using technology. With that in mind, this causal comparative study has four goals to examine: (1) the effect of the overall classroom level computer technology use (low/high) on at-risk student's class attendance and classroom grade; (2) the effect of a teacher's computer technology use (low/high) in the classroom on at-risk student's class attendance and classroom grade; (3) the effect of a teacher's perception of a student's computer technology use (low/high) in the classroom on at-risk student's class attendance and classroom grade; and (4) the relationship between a teacher's overall technology score and the at-risk student's attendance and grades.

4.1. Method

The Teacher Technology Survey is used to gather information on how the teachers and his/her students use the computers in the classroom during this time frame. The survey is developed by Vannatta and O'Bannon (in press) as a tool for Goals 2000 Preservice Technology Infusion Project. The survey instrument is designed to identify the teachers' proficiency on computer equipment and applications, and the frequency in which teachers and students use tools/applications in the classrooms. This survey has been used numerous times with various teacher samples and has generated reliability coefficients (Cronbach's alpha) ranging from $r = 0.8185$ to $r = 0.9265$ (Vannatta & O'Bannon, in press).

4.2. Survey

The four-part survey measures technology proficiency and frequency of technology use of the teacher and the students in the classroom. The teacher responds for the student use of technology section. The first part of the survey asks for the teacher's current proficiency of technology equipment and applications. Nineteen items are stated under this section. The teacher reports current proficiency using computer equipment, applications, and instructional methods for integrating technology. A Likert scale of 1–4, with 4 having the highest value, for the response is used on the survey. The survey presents the Likert-style options for the respondents as follows: 1 = none, 2 = little, 3 = moderate and 4 = high. In the second section the teacher answers 6 items about frequency in which administrative tasks are completed on the computer. The survey presents the Likert-style options for the respondents to show frequency as follows: 1 = none, 2 = rarely (once or twice per semester), 3 = moderate (several times per semester) and 4 = high (almost weekly per semester). In sections three and four, teachers are asked in 17 items to indicate the frequency in which tools and applications are used by the teacher and/or the student during the first semester.

4.3. Study design

The design of this study is causal comparative to determine if the level (high/low) of classroom technology use affects the at-risk students' attendance and letter grade. The dependent variables,

grades and attendance, are quantitative and the independent variables are quantitative—overall technology use, teacher use and student use and categorical—level of technology use in the classroom (high/low).

The primary independent categorical variable of this study is the level (high/low) of technology use in the classroom. Each section of the survey is averaged. The mean of each section places the teacher in either high (2 or higher) or low (1.99 or lower) for level of technology use in the classroom. Quantitative independent variables of overall technology use (items 1–59), teacher use (items 26–42), and student use (items 43–59) came from survey. Each of the 43 teacher surveys are given a numerical code starting at 01 through 43 for the purpose of identifying the teacher for a high/low rating.

4.4. Data collection

The school counselors in the present study used attendance and/or grades to determine what students were at-risk. These were the only factors applied to identify the students. Students with this label might be placed in pull-out programs, such as Occupational Work Education (OWE), or placed in classes with rigid instructional strategies. The at-risk students are selected because of their attendance and/or their grade point average from the 2000–2001 school year. The data from 66 at-risk students are examined in this study. The participants for this study were from a university town in Northwest Ohio with diverse socioeconomic backgrounds within its population of approximately 29,000 residents. In 1998, the average household income in the town was below the state average income. The poverty rate for this community was rated at 13.1% (Wood County Comprehensive Plan, 1998).

On September 21, 2001, the guidance counselors are asked to put the names of their at-risk students in a file in the offices. The files are used in January after semester grades are completed. The guidance counselors pull the files, and the attendance secretary compiles the at-risk students' grade and attendance reports. These reports are then sent to the neutral survey administrator. A number is assigned for each student to ensure no one would be able to know who participate in the study. The number for each student is placed on a data sheet with the coded teacher number and allows the neutral survey to place students' grades and attendance information in the database for the researcher. This ensures anonymity for the students and the teachers in this study. This information is then used to analyze changes in the at-risk student's grades and attendance based on the teacher's level of technology use. The teachers who complete the survey are selected because they have direct daily teaching contact with all students and are able to give the student a letter grade for their class.

4.5. General results

Of the 63 high school teachers who volunteer for this study, 43 teachers complete the Technology Survey (Table 1) with 39 teachers having at-risk students in their classrooms. The survey contains four sections that ask the teachers to rate their technology proficiency and the frequency in which they use technology: the administrative use, teacher use in the classroom and student use in the classroom. The survey completion response rate is 68%.

Table 1
2002 Technology Usage Survey

Current Teacher Proficiency of Technology Equipment and Applications
Indicate your level of proficiency for each of the following computer tools and applications.

	Proficiency 1 = None 2 = Little 3 = Moderate 4 = High
1. Computer	1 2 3 4
2. Digital Camera	1 2 3 4
3. Scanner	1 2 3 4
4. LCD Panel and/or Projector	1 2 3 4
5. Distance Education/Video Conferencing System	1 2 3 4
6. Word Processing	1 2 3 4
7. Database	1 2 3 4
8. Spreadsheet	1 2 3 4
9. Drawing/Graphics Programs	1 2 3 4
10. Website Development	1 2 3 4
11. Electronic References (e.g., EnCarta., World Book)	1 2 3 4
12. Discussion Groups/Listserves	1 2 3 4
13. Instructional Software (tutorials, drill and practice)	1 2 3 4
14. Presentation software (PowerPoint)	1 2 3 4
15. Hypermedia (e.g., Hyperstudio, HyperCard)	1 2 3 4
16. Email	1 2 3 4
17. Internet (WWW)	1 2 3 4
18. Assistive Technologies	1 2 3 4
19. Instructional Methods for Integrating Technology	1 2 3 4

Technology Use: *Administrative Tasks* Indicate the frequency you engaged in the following tasks during this semester. For those tasks you engaged in indicate the frequency

	Frequency 1 = None 2 = Rarely (once or twice per semester) 3 = Moderate (several times per semester) 4 = High (almost weekly per semester)
I used technology to. . .	
20. Keep track of student grades	1 2 3 4
21. Keep track of student attendance	1 2 3 4
22. Create course syllabi	1 2 3 4
23. Create course worksheets and/or assignments	1 2 3 4
24. Create computer templates to guide student computer use	1 2 3 4
25. Create a web site for my course(s) to guide student assignments	1 2 3 4

Technology use: *Teacher Use in Class* Indicate the frequency that <u>you</u> used the following tools/applications used in <u>yourinstructionduringthissemester</u>. Examples of teacher use are: teacher demonstration, use of tool/application during lecture/presentation, etc.

Frequency
1 = None
2 = Rarely (once or twice per semester)
3 = Moderate (several times per semester)
4 = High (Almost weekly per semester)

(continued on next page)

Table 1 (*continued*)

Current Teacher Proficiency of Technology Equipment and Applications	
26. Digital Camera	1 2 3 4
27. Scanner	1 2 3 4
28. LCD Panel and/or Projector	1 2 3 4
29. Distance Education/Video Conferencing System	1 2 3 4
30. Word Processing	1 2 3 4
31. Database	1 2 3 4
32. Spreadsheet	1 2 3 4
33. Drawing/Graphics Programs	1 2 3 4
34. Website Development	1 2 3 4
35. Electronic References (e.g., EnCarta., World Book)	1 2 3 4
36. Discussion Groups/Listserves	1 2 3 4
37. Instructional Software (tutorials, drill and practice)	1 2 3 4
38. Presentation software (PowerPoint)	1 2 3 4
39. iMovie/Premier	1 2 3 4
40. Email	1 2 3 4
41. Internet (WWW)	1 2 3 4
42. Assistive Technologies	1 2 3 4

Technology Use: *Student use of Technology* For the following tools/applications, indicate the frequency of the student useinorforyourclassforthissemester. Keep in mind that this use should have been facilitated by you the teacher. Examples of student use are: exploration of applications, using technology to complete assignments, listserve discussion, using technology for presentations, etc.

Frequency
1 = None
2 = Rarely (once or twice per semester)
3 = Moderate (several times per semester)
4 = High (Almost weekly per semester)

43. Digital Camera	1 2 3 4
44. Scanner	1 2 3 4
45. LCD Panel and/or Projector	1 2 3 4
46. Distance Education/Video Conferencing System	1 2 3 4
47. Word Processing	1 2 3 4
48. Database	1 2 3 4
49. Spreadsheet	1 2 3 4
50. Drawing/Graphics Programs	1 2 3 4
51. Website Development	1 2 3 4
52. Electronic References (e.g., EnCarta., World Book)	1 2 3 4
53. Discussion Groups/Listserves	1 2 3 4
54. Instructional Software (tutorials, drill and practice)	1 2 3 4
55. Presentation software (PowerPoint)	1 2 3 4
56. iMovie/Premier	1 2 3 4
57. Email	1 2 3 4
58. Internet (WWW)	1 2 3 4
59. Assistive Technologies	1 2 3 4

4.6. Survey results

Technology proficiency (Table 2) among teachers is examined using descriptive statistics. Teachers are most proficient in word processing ($M = 3.49$) and use technology for administrative (Table 3) purposes by creating course worksheets ($M = 3.49$). This result is not a surprise since most teachers need to use a word processor to write and are comfortable doing so. The survey shows that most teachers are using word processing for creating course worksheets or for general use. A word processor is the replacement for the typewriter for many of these teachers since it is easier to work with, to correct mistakes and you can save the document on the computer which is better than a typewritten paper that can be lost or destroyed. In teacher technology use (Table 4), again the word processor ($M = 3.26$) is the tool used most frequently by the teachers. Student technology use (Table 5) indicates that word processing ($M = 2.91$) is the technology tool used

Table 2
Teacher proficiency (%)

	1	2	3	4	M	S.D.
1. Computer	0	18.6	48.8	32.6	3.1395	0.7098
2. Digital Camera	41.9	20.9	30.2	7.0	2.0233	1.0116
3. Scanner	39.5	32.6	18.6	9.3	1.9767	0.9877
4. LCD Panel/Projector	48.8	27.9	18.6	4.7	1.7907	0.9144
5. Distance Education	69.8	20.9	7.0	2.3	1.4186	0.7314
6. Word Processor	4.7	7.0	23.3	65.1	3.4884	0.8273
7. Database	25.6	39.5	20.9	14.0	2.2326	0.9961
8. Spreadsheet	18.6	32.6	25.6	23.3	2.5349	1.0544
9. Drawing/Graphics	41.9	34.9	20.9	2.3	1.8372	0.8432
10. Website	67.4	23.3	9.3	0	1.4186	0.6631
11. Electronic References	30.9	25.6	34.9	18.6	2.5116	1.0322
12. Discussion Groups	39.5	44.2	7.0	9.3	1.9605	0.9150
13. Instructional Software	18.6	44.2	23.3	14.0	2.3256	0.9442
14. Presentation Software	27.9	41.9	18.6	11.6	2.1395	0.9656
15. Hypermedia	72.1	23.3	2.3	0	1.3488	0.6504
16. Email	2.3	14.0	25.6	58.1	3.3953	0.8206
17. Internet	4.7	14.0	25.6	55.8	3.3256	0.8923
18. Assistive Technologies	67.4	23.3	9.3	0	1.4196	0.6631
19. Instructional Methods	32.6	37.2	18.6	11.6	2.0930	0.9956

Table 3
Teacher use of technology in administrative tasks (%)

	1	2	3	4	M	S.D.
20. Keep track of student grades	27.9	14.0	11.6	46.5	2.7674	1.3063
21. Keep track of student attendance	76.7	7.0	2.3	14.0	1.5349	1.0768
22. Create course syllabi	23.3	11.6	27.9	37.2	2.7907	1.1864
23. Create course worksheets	4.7	4.7	27.9	62.8	3.4884	0.7980
24. Create computer templates	58.1	20.9	14.0	7.0	1.6977	0.9645
25. Create a web site	88.4	7.0	4.7	0	1.2093	0.6746

most often by the students. The word processor is used in all the English classes for students' writing assignments. The school had a mobile lab of 30 laptops, bought through the SchoolNet multimedia grant written by an English teacher during the 2000–2001 school year. The lab is taken into the classrooms, so the teacher can work with the students composing on the computer

Table 4
Teacher use of technology in the classroom (%)

	1	2	3	4	M	S.D.
26. Digital Camera	74.7	16.3	9.3	0	1.3488	0.6504
27. Scanner	74.4	18.6	7.0	0	1.3256	0.6064
28. LCD Panel	69.8	20.9	4.7	4.7	1.4419	0.7959
29. Distance Education	97.7	2.3	0	0	1.0233	0.1525
30. Word Processing	16.3	2.3	20.9	60.5	3.2558	1.1147
31. Database	65.1	14.0	11.6	9.3	1.6512	1.0208
32. Spreadsheet	41.9	27.9	11.6	18.6	2.0698	1.1422
33. Drawing	62.8	25.6	7.0	4.7	1.5349	0.8266
34. Website	86.0	9.3	2.3	2.3	1.2093	0.5999
35. Electronic References	46.5	30.2	14.0	9.3	1.8605	0.9900
36. Discussion	76.7	14.0	4.7	4.7	1.3721	0.7875
37. Instructional	60.5	18.6	16.3	4.7	1.6512	0.9228
38. Presentation	60.5	27.9	9.3	2.3	1.5349	0.7668
39. IMovie	83.7	14.0	2.3	0	1.1860	0.4502
40. Email	32.6	20.9	11.6	34.9	2.4884	1.2794
41. Internet	11.6	18.6	34.9	34.9	2.9302	1.0094
42. Assistive	79.1	14.0	7.0	0	1.2791	0.5906

Table 5
Student use of technology in the classroom (%)

	1	2	3	4	M	S.D.
43. Digital Camera	81.4	14.0	4.7	0	1.2326	0.5272
44. Scanner	81.4	11.6	7.0	0	1.2558	0.5812
45. LCD Panel	83.7	14.0	2.3	0	1.1860	0.4502
46. Distance Education	100	0	0	0	1.0000	0.0000
47. Word Processing	18.6	11.6	30.2	39.5	2.9070	1.1300
48. Database	74.4	16.3	4.7	4.7	1.3953	0.7910
49. Spreadsheet	65.1	20.9	7.0	7.0	1.5581	0.9077
50. Drawing	60.5	30.2	9.3	0	1.4884	0.6680
51. Website	95.3	4.7	0	0	1.0465	0.2131
52. Electronic References	46.5	20.9	20.9	11.6	1.9767	1.0799
53. Discussion	95.3	2.3	2.3	0	1.0698	0.3377
54. Instructional	65.1	16.3	11.6	7.0	1.6047	0.9547
55. Presentation	55.8	27.9	14.0	2.3	1.6279	0.8172
56. IMovie	88.4	9.3	2.3	0	1.1395	0.4130
57. Email	60.5	14.0	16.3	9.3	1.7442	1.0487
58. Internet	20.9	16.3	25.6	37.2	2.7907	1.1662
59. Assistive	83.7	7.0	9.3	0	1.2558	0.6208

while other students are assigned different tasks. When the teachers have equipment readily available, they will use the equipment more often (OTA, 1995).

A National study conducted by Becker, Ravitz, and Wong (1999) discovers computer technology teachers and business teachers are the highest technology users of word processing with English teachers the second highest users. The word processor is the highest technology use with secondary teachers. From Becker et al. (1999) information is collected on teacher expertise, teacher professional use and objectives for student use. Results of this study shows that only 13% of high school teachers [n(teachers) = 2185] are rated with high use (Becker et al., 1999). This number of users shows that even the "highest" users of the word processor are really very low users of technology. From the overall low technology using teachers in the present study, word processing is the highest technology use for teachers in all four sections of the survey—teacher proficiency, administrative use, teacher use and student use but it is a low amount of technology use overall.

4.7. Teacher use results

Results from the current study indicate low teacher use in all three independent variables-overall technology use, teacher use and student use scores. When initially categorizing teachers into the predetermined low/high groups, only 1% are categorized into the high use. The criteria for high technology use applies to the present study are first defined as 2.5 and above, with low technology use at 2.49 and below. Due to minimal variance in technology use among this sample, the criterion is changed to 2.00 and above for high technology use and 1.99 and below for low technology use. However, initial analysis of teachers' means for teacher use, student use, and overall technology use indicates that technology use is substantially lower than expected. The three technology variables had mean scores of 1.71 for teacher use, 1.55 for student use and 1.88 for overall technology use. If the original criterion has been applied to the sample, only one teacher would have fallen in the high level of technology use. Consequently, new criteria are developed. Unfortunately, the lower criteria create a high technology using group of teachers who are utilizing technology at quite low levels. Therefore, valid comparisons are difficult to make of teachers with high/low technology use. Since the Likert scale for these variables is 1–4, these means show that the average teacher using technology in this study had little to no technology use in the classroom.

4.7.1. Factors for low teacher use results

A reason for the low technology use among the studied teachers may be due to the fact that technology is fairly new to the studied high school, only being placed in the school over the last two school years. Another reason may have been that some high-end using teachers are not in the building the day the survey is administered. The sample totals 43 teachers with only 39 teachers having at-risk students in their classroom. Of the remaining four survey teachers, three are high technology users. These additional surveys may have increased the means and the variability in the sample.

Since technology had only been in the school for two years, minimal technology training has been provided to the teachers. During the 2000–2001 school year, the first year that technology is introduced into the building, the teachers of the present study are given an opportunity to attend in-service on how to use the school email system and how to use the Internet for research and the

online library. Additionally, ten teachers are part of a grant written to SchoolNet Plus on implementing multimedia use in the classroom. Through the grant, computer training is offered to the grant teachers during the last semester of the school year. Training is also offered for the grant teachers and any teachers during late summer of 2001 who are interested in learning about Power Point, Front Page and iMovie. In the last week of February 2002, all teachers began in-house classes, two sessions of 90 minutes each, on Power Point, Front Page, Publisher or iMovie. The training took place during the school day with substitute teachers taking the teachers' classes. The classes are required for any teacher who acquires the first, second or third wave of computers bought for the classrooms.

Results from the data analyzed shows low levels of computer use and low levels of effective use. In addition, only one of six teachers uses computers regularly in the classroom, mostly for drill and practice. Further information gathered from Becker's study find teachers use the computers more effectively when teaching in schools that offers high levels of teacher development on technology and has technology coordinators available to assist teachers when there are problems. Teachers are uneasy about computers because they lack experience on them, they feel that with support and training they will be ready to use this technology tool in the classroom (Beck, 1994).

4.8. Technology use results

The low technology use found in the survey results is a statement on how little the present study's teachers has been prepared for or given time to embrace technology. The word processor is the only application used at high levels for teacher use and student use. Teachers are in mid-year of the second year of technology in the building. According to some informal information they begin in-house training during the end of February through April of 2002. Lack of time for technology integration is a barrier cited in several studies (OTA, 1995; Sandholtz et al., 1997; Wenglinsky, 1998). The teachers in the present study have little or no time to learn new technology, or to place it into the curriculum. According to OTA (1995), time gives teachers a chance to experiment with new technologies. They are able to share experiences with other teachers, to prepare lessons using technology and to attend technology courses or meetings.

5. Discussion

Dwyer (1994) stated that to fully integrate technology, the educator typically experiences five stages. The first stage is entry, which is characterized by teachers having doubts about technology as their classrooms begin to change. The adoption stage is second and is identified by teachers using technology to support traditional text-based drill and practice; student achievement shows no significant decline or improvement; self-esteem and motivation are strong and student attendance is up with few discipline problems. The third stage is adaptation and is represented by teachers thoroughly integrating technology into traditional classroom practice; student productivity is increasing; students are producing more work faster; and students are more actively engaged in learning. The appropriation stage is fourth and is described by teachers and students use of appropriate technology, teachers gain a perspective on how profoundly they can change the learning experience; students have highly evolved technology skills and can learn on their

own; and student work patterns and communication become collaborative rather than competi-
tive. The last stage is invention which is pictured by teachers being prepared to develop all new
leaning environments utilizing technology as a flexible tool; teachers viewed learning as an active,
creative, and socially interactive process and knowledge is something students constructed rather
than something that can be transferred. The teachers in the current study are in two stages of
technology integration. Since there is a low technology use among the teachers in the study the
majority are in the entry stage where there are doubts about integrating technology. During
informal talks by the researcher with the teachers, some teachers stated they are using technology
to support traditional drill and practice and students achievement showed no significant decline
or improvement which would have placed them in Dwyer's (1994) adoption stage. Other teachers
stated that they needed to learn how to use the software available to them but training had not
been offered until late February of the current year. This would have placed those teachers in the
entry stage where there is uncertainty about how to use technology.

5.1. Training of teachers

Research completed by Dwyer et al. (1991) indicates that computers can be used in collabora-
tion for all subject areas, but the teachers have to take into account the different styles of teaching
and the students involved in learning. This type of teaching requires a change in the teacher's
method of teaching and learning, the amount of time needed to learn how to use the technology
and where to find the models that works with technology (Sheingold & Hadley, 1990).
According to Means et al. (1993) any student, including the at-risk student, who has technology
integrated into the curriculum can see a positive change in student classroom grades, GPA, and
attendance.

Training is time consuming, but when teachers are shown that technology can be a useful tool
in the classroom, how to use this tool effectively and what the benefits are for the students, most
are willing to take the time to learn (Bryom, 1997). When technology is working, teachers who
are integrating technology directly into the subject matter and developing ways to use technology
as a tool would see the impact on that subject area. The classroom atmosphere would change
with fewer discipline problems and the teacher–student barriers would begin to change into
interactive learning (Cohen, 1997). In the study on ACOT the researchers believe, with time, that
whether each student has a computer or not, a threshold level of technology can slowly transform
a traditional classroom into a student-centered room (Dwyer et al., 1990).

The high school in the present study has begun its second year of technology in the classroom.
The high school teachers of the present study are slowly learning how to incorporate technology
into their administrative use: creating course worksheets, keeping student grades and creating
course syllabi. Not only did teachers need time to learn the new technology, they needed time to
feel comfortable using it as a learning tool (Dwyer et al., 1990). Dwyer (1994) showed from the
ACOT study that teachers used technology as a tool to accomplish personal tasks at the begin-
ning of the third year of technology in the classroom.

Technology implementation at educational institutions requires careful planning that outlines
the framework which technology would be used (Cohen, 1997). Dwyer et al. (1991) state: "Over
time, technology use changes the way teachers teach. As they grow in their use of technology,
they become more willing to experiment, their teaching becomes more student-focused, and they

tend to establish collaborative working relationships with other teachers" (p. 48). Obviously, the studied school is in early stages of technology planning and implementation.

6. Summary and recommendations for practice

The current study results indicated the extremely low means of technology use among the teachers. Technology training is needed for the teachers to apply technology as a tool for their curriculum. Although technology is not a panacea for all educational ills, technology is an essential tool for teaching (OTA, 1995). To use technology as an effective instructional tool, training and time is needed for teachers to infuse technology into their curriculum.

6.1. Technology use impacting student grades

All four research questions considered how technology use (low/high) as defined by overall use, teacher use and student use in the classroom effected at-risk students' classroom grades. Inferential statistics showed no significant affect on at-risk student grades for any of the independent variables—teacher use, student use or overall technology use. For all the independent variables of teacher use, student use and overall technology use, the 1st quarter grades are higher for high technology using teachers. But that trend did not continue into second quarter for any of the independent variables.

Since low GPA is a criterion for being identified at-risk at the studied school, it is logical that these students had low grades. However, some of these students had no passing grades, which is equivalent to a GPA of zero. The grade point average mean for the 66 at-risk students is 1.52 at the end of the school year 2000–2001. Any grade mean above a zero is an improvement for some of the identified at-risk students. During the 1st quarter mean grades for the high users of technology ($M = 1.70$) are higher than the GPA ($M = 1.52$) of the previous school year. But, 2nd quarter mean grades went down for high users ($M = 1.17$) and low users ($M = 1.31$). The overall grade mean for high use ($M = 1.24$) and low use ($M = 1.29$) showed that the GPA at-risk students for this year are lower than the GPA mean of last year. A possible explanation for this decline in grades is a greater use of technology in the 1st quarter. The researcher informally observed that students are immersed in technology in many of the classes: Power Point slide shows, travel brochures, postcards and video interviews are being created for presentations. During the 2nd quarter the classrooms slowly returned to a more traditional style. Some teachers, in informal discussions with the researcher, said they are using drill and practice, word processing for writing, and Internet for research projects. Without the use of technology infused in the classroom teachers would never know that with more constructivist methods students could achieve at higher levels.

From Dwyer's (1994) research on the ACOT classrooms, students use technology as a tool to collect, organize, and analyze data; to enhance presentations; to conduct simulations and to solve complex problems. One of the changes seen over this 10-year study is the change in the lower-achieving students; the ones teachers could not reach with the teacher-centered learning. These students began to respond positively given the alternate ways of expressing their knowledge, which not only raised their self-esteem but their status with the teachers and their peers (Sandholtz et al.,

1997). The at-risk students are likely to show improvement in academic achievement when technology is used in the classroom appropriately (OTA, 1988).

The research conducted by Sandholtz et al. (1997) suggests that the impact of technology on education has the potential to change education in a beneficial way if done appropriately. The conditions needed for appropriate use of technology to improve education are: first, the successful use of technology requires teachers to face their beliefs about learning and the efficacy of different instructional activities. Second, teachers view technology as one possible tool that must be used in the curriculum and instruction framework with meaning. Third, teachers need to become risk takers, experiment with technology, help and share with peers. Fourth, technology can be a catalyst for change, but the process of integrating technology is a long-term challenge for the teachers (Sandholtz et al., 1997).

In closing on student grades and technology, from the ten-year study conducted by Dwyer et al. (1997) on ACOT comes this statement: "teachers also discovered that students who did not do well in a typical setting frequently excelled when working with technology. Low achievers had a chance to experience success and began concentrating and applying themselves to their projects" (p. 95). This study supports the findings in the present study indicating that the technology should be incorporated into the curriculum in meaningful, student-centered methods.

6.2. Technology use impacting student attendance

This study's four research questions examined the effect of the overall technology use (low/high), teacher's computer technology use (low/high), and student's computer technology use (low/high) on student attendance. The relationship between the overall teacher technology score and the at-risk student's attendance is also investigated.

Student attendance is determined by the number of absences per quarter and for the entire semester. The school calendar reported that there are 45 student days in the 1st quarter, 44 student days the 2nd quarter, and 89 student days in the semester. All the independent variables—teacher use, student use, and overall technology use—showed no significant effect on at-risk student attendance. There are also no significant relationships found between overall teachers' technology score and at-risk students' attendance and grades. Again the 1st quarter attendance means are lower for high technology using teachers for all the independent variables with a range of means of 3.21–3.60 than low technology using teachers. In the 2nd quarter the results reversed with a range of means of 7.41–10.78 for the high technology using teachers. This could be in conjunction with the use of technology in the classes during 1st quarter where the researcher informally observed students using Power Point, Publisher and multimedia software.

The present study's high school counselors identify at-risk students through grades and/or attendance and many of these students had extremely high absenteeism. According to school policy a student with over 10 absences is in danger of not passing the class and many of these students exceeded that mark. Again, time is a major factor in showing any changes for the at-risk students' attendance and grades in this present study. Since this study only investigated the impact of technology on student attendance and grades for a semester, change is not likely to occur in such a limited time frame. Furthermore, this school is beginning only its second year with technology. Teachers are just beginning to learn how technology could be used as an effective instructional tool. Technology use needed more time in the classroom to make any significant changes.

With technology being in its infancy at this present school, few teachers are proficient enough to use technology in meaningful and appropriate ways (Becker, 2000). The lack of appropriate technology use among the students might be another reason that students' attendance and grades saw no improvements. The current school schedule did not facilitate effective technology use in the classroom. The school in this study had a 5-day, seven 50 min class schedule. Teachers must collect and return paper work and then try to assimilate various learning models into the curriculum. The high number of absences indicates a minimal and ineffective use of technology.

This result is supported by the Texas Education Agency study (1991) that showed that at-risk students, who may drop out, often had attendance issues as early as elementary school. At-risk students who choose to be passively disengaged from the school setting may show it through absenteeism. In the analysis of the High School and Beyond database, absenteeism is found to be the strongest predictor of dropping out of school (Bryk & Thum, 1989). The attendance variable is found that would separate a student from dropping out of school and a lower achieving student who would graduate (Roderick, 1993). When a student's attendance changed in elementary school through middle school with an increase of 10 or more days annually during those years, the student would drop out.

Dwyer (1994) found in the ACOT research that with technology infused into the classroom, student behavior and attendance improved after two years into his study. Means et al. (1993) stated that changes in student absenteeism, dropout rates, classroom interaction, and independent learning are just a few changes that educators would see after teachers incorporate technology into their curriculum. The present study's school is beginning its second year of using technology, training is just being introduced to the teachers during the current year. The changes technology could produce in students absenteeism are too early to expect.

6.3. Developing a model

Since the findings of the present study revealed that overall technology use for the teachers is extremely low, it is encouraged that schools prepare their teachers with technology training. Before technology is placed in the classrooms, teachers need to receive basic training. Afterwards, the training should be on-going and offered at different levels, such as basic, moderate, and expert. Leaders need to find a model that will enable the school to transition into technology with ease. In Vannatta and O'Bannon (in press) a model is developed to prepare those who would be infusing technology. The components from the Project PICT Training Model (Vannetta & O'Bannon, 2002) included: (a) shared vision where participants had a voice along with leaders in setting goals and activities to bring about technology infusion; (b) team collaboration, supported each other in development and implementation of lesson plans using technology; (c) one-on-one mentoring/collaboration participants went through training together, helped each other with integrating technology into lessons plans; (d) focused technology training where participants are required to attend a specific number of sessions with lessons on integrating technology into lessons, classroom management and methods of implementation and assessment of technology; (e) communication of expectations is what is required of the participants along with long-term goals of technology infusion (Vannatta & O'Bannon, 2002). With these components in place, the school and the teachers would be prepared to infuse technology with the assurance that training, teaming and communications would be available during the school year.

6.4. Technology assistance

The researcher in the present study discovered that technology assistance had been a barrier at both the school and the district level. But over the past 2 years, technology assistance had changed. A part-time director of technology is hired two years ago and became full time along with the high school having two in-house teachers as technology assistants. The director is also able to hire an outside contractor to handle major problems quickly, instead of waiting for days to fix the problems. Lee and Johnson (1998) found that technology assistance is a major barrier to technology infusion. A suggestion when preparing to implement technology is to have a technology assistant in place during the shared vision time.

6.5. Technology as a learning tool

Sandholtz et al. (1997) concluded that the impact of technology in schools is somewhere between it's the only way to make a positive change in schools to it's a new fad. They see technology as a strong tool for positive change but it must be presented in the right ways. Steps must be taken for technology to make a difference. Leaders of the schools must include everyone at the beginning of the plan, not after technology arrives. Leadership in the school system must plan for technology. Find a model, such as the Project PICT Training Model and use it. Hire a full time technology director, involve the school in the changes, and provide the services that are needed for technology to succeed in the schools. Teachers must change the way they teach. Classrooms must take on the student-centered learning methods. Teachers need to become facilitators. Students need to be allowed to use technology as a tool, which will enable them to collect, analyze, and create major projects. When schools are prepared for technology, the entire school benefits. The quality of the time for technology to be integrated into the curriculum is the key to student learning, not the quantity of time with technology (Wenglinsky, 1998). Technology is not the entire solution for keeping at-risk students in the classroom, but it is a start in the right direction.

Uncited references

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